Essex Global Environmental Opportunities Strategy: Investing in Sustainable Farming

GEOS Investment Philosophy: Clean technology solutions to environmental megatrends

As Nelson A. Rockefeller once said, "the opportunities take shape within the problems." The world is facing historic environmental challenges, with climate change headlining the most pressing environmental megatrend. Climate change is a critical threat to environmental and social health around the globe, affecting human lives through severe weather patterns, rising temperatures, droughts, water scarcity, as well as air pollution. The global average temperature in 2020 was *1.2 degrees Celsius higher* than during the pre-industrial period, and time is running out to limit global warming to 1.5 degrees Celsius.[1] Limiting temperature warming to under 1.5 degrees Celsius would drastically decrease the frequency of extreme heatwaves, reduce droughts, limit sea level rise, and lessen the loss of species and extinction compared to warming of 2 degrees Celsius or more.[2] Another megatrend that GEOS seeks to solve is water access, which is an issue deeply connected to climate change. Worldwide, *four billion people experience extreme water scarcity* at least one month per year, a life-threatening situation that will deteriorate as rapidly rising temperatures due to climate change exacerbate existing water scarcity issues.[3] Finally, air pollution leads to more than *five million premature deaths annually*, creating a tremendous burden for health systems and economic productivity.[4] The Essex Global Environmental Opportunities Strategy operates at the nexus of these environmental challenges and finance by using a thematic investment process to invest in solutions. GEOS invests in **listed equity** companies with disruptive clean technologies that are solving the most pressing environmental megatrends of our time, seeking to provide attractive financial returns**.** Equally as important, GEOS companies deploy technological solutions that will accelerate the transition to a more sustainable and equitable society and create significant social impact returns for investors.

Setting the Scene: An overview of agricultural challenges

Decades ago, the Green Revolution avoided the threat of widespread global hunger by significantly boosting crop yields to help feed a growing population. The increase in global productivity was largely due to technology breakthroughs such as the Haber-Bosch nitrogen fixation process, dwarfed and high-yielding crop varieties, and mechanized farm machinery. The Green Revolution was successful in growing more food, but it was fraught with unintended consequences. The Green Revolution created a pattern of environmental degradation and dependence on fossil fuels that still plagues the agricultural sector today. Excessive fertilizer and pesticide use has harmed human health and biodiversity, such as pollinating insects, while unsustainable irrigation practices contribute to groundwater shortages.[5] Global agriculture is now one of the biggest contributors to climate change, emitting more greenhouse gas emissions than the entire transportation sector.

Agriculture now faces another historic challenge. Food demand, compared to 2010, is projected to rise by at least 56% by 2050 due to a growing global population with increasingly higher incomes, putting the

[1] World Meteorological Organization. *2020 was one of three warmest years on record,* 2021
[2] NASA Global Climate Change. A Degree of Concern: Why Global Temperatures Matter, 2019
[3] United Nations. *The Sustainable Development Goals Report*, 2019
[4] Environmental Defense Fund. Health Impacts of Air Pollution. https://www.edf.org/health/health-impacts-air-pollution
[5] International Food Policy Research Institute. *Green Revolution: Curse or blessing?* 2002. https://oregonstate.edu/instruct/css/330/three/Green.pdf

agricultural sector at the forefront yet again.[6] Solutions to meet increased demand cannot degrade the environment as the Green Revolution did, but instead, farmers must adopt sustainable agricultural practices and become stewards of the environment. Achieving greater productivity is difficult, especially when agriculture confronts numerous other environmental issues such as climate change and deforestation, drought and water use, food loss and waste, and nonpoint source pollution (runoff water transports pollutants to waterways). In order to produce more food and address the long list of environmental challenges, deployment of clean technology solutions will be critical.

GEOS Agricultural Productivity and Clean Fuels Theme: Enabling productivity and sustainable growing practices

Companies within the GEOS Agricultural Productivity and Clean Fuels theme help address three of the UN Sustainable Development Goals (SDGs): **Goal 2 Zero Hunger, Goal 6 Clean Water and Sanitation**, and **Goal 14 Life Under Water**. The UN Sustainable Development Goals are 17 goals adopted by United Nations member states in 2015 to solve the current global environmental, social, and economic challenges. The objective of the SDGs is to create a more sustainable, resilient, and inclusive society by 2030. The SDGs replaced the Millennium Development Goals, established in 2000, to ensure that economies adopt more sustainable practices and global development does not leave any country behind.

GEOS companies in the Agricultural Productivity and Clean Fuels theme provide clean technology solutions to help farmers reduce their impact on the environment, such as by reducing water consumption, chemical runoff, and greenhouse gas emissions. However, GEOS holdings also offer technology to stimulate greater productivity and efficiency, enabling farmers to produce more food while saving money on inputs such as water, energy, and fertilizer.

GEOS invests in *precision agriculture technology* that facilitates greater productivity and more sustainable farming by gathering and analyzing data to improve input application and total-farm efficiency.[7] Precision agriculture technology helps farmers reduce the volume of input applications by improving the application quality, reducing the cost of inputs and reducing environmental degradation. Data and connectivity help farmers identify areas of inefficiency so they can optimize their operations to produce more food and reduce their environmental impact. GEOS investment in precision agriculture technology includes wireless software to connect total-farm operations and increase efficiency, customized irrigation management and scheduling technology, autonomous guidance and steering solutions, and flow and application control.

The GEOS team is also evaluating a number of other promising technologies in the agricultural space. One exciting area, controlled environment agriculture (CEA), creates ideal growing environments for crops and enhances plant productivity. Controlled growing environments reduce the use of inputs, such as water, avoid the need for harmful pesticide and chemical use, and enhance crop productivity by up to 30 times traditional agriculture yields. Technologies that support indoor farming include machine learning, computer vision, and LED lighting.

[6] Searchinger et al., *Creating a Sustainable Food Future: A menu of solutions to feed nearly 10 billion people by 2050.* World Resources Institute, 2018
[7] Trimble. What is Precision Ag? 2020. https://agriculture.trimble.com/blog/what-is-precision-ag/

Figure 1: Controlled Environment Agriculture

Source: Vaisala

Another investment megatrend within the agricultural space that the GEOS team is researching is plant-based products. Plant-based products have become mainstream as grocery stores and restaurants now offer numerous brands to meet the growing consumer demand for plant-based meats and milk. Animal protein sources are associated with serious health issues and contribute to issues like climate change, water scarcity, and zoonotic diseases. In contrast, plant-based proteins are associated with 72-99% less water, 47-99% less land, and 90% reduced emission intensities in comparison to traditional animal protein.[8] As an added health benefit, plant-based proteins have no exposure to antibiotics. Due to the high environmental impact associated with animal proteins, shifting to a global diet with less reliance on animal products is an important step in combating the climate crisis and improving global health.

Agriculture Driving Climate Change: Greenhouse gas emissions and deforestation

The impacts of climate change and increased temperature threaten food production, yet agriculture is a major contributor to climate change. Agriculture is responsible for *23% of global greenhouse gas emissions*, 11% from direct agricultural production and 12% from land use change.[9] Of these emissions, agriculture accounts for 45% of methane emissions and 80% of nitrous oxide emissions globally, with nitrous oxide emissions primarily coming from excess fertilizer application.[10] Both methane and nitrous oxide are more powerful greenhouse gases than carbon dioxide and are significant contributors to the climate crisis. Global agriculture, whether for growing crops or providing land for livestock, is also responsible for 80% of global deforestation, an alarming rate that is devastating tropical rainforests globally.[11] Not only is deforestation

[8] Credit Suisse Research Institute, *The Global Food System: Identifying sustainable solutions.* 2021
[9] Ceres. *Climate Change and Agriculture Production: An overview of risks and opportunities.* Engage the Chain, 2019
[10] Ahmed et al. *Agriculture and Climate Change: Reducing emissions through improved farming practices*. McKinsey & Company, 2020
[11] Greenpeace. Agribusiness and Deforestation. https://www.greenpeace.org/usa/forests/issues/agribusiness/

emitting enormous amounts of greenhouse gases, but it is eliminating habitats for biodiversity and destroying valuable carbon sinks. Agriculture is therefore a primary *driver* of climate change, making it important that technology and practices are adopted to reduce greenhouse gas emissions from agriculture.

GEOS Solution #1: Precision guidance and steering solutions

Two companies within the GEOS portfolio offer precision guidance and steering solutions to reduce the number of passes farm machinery, such as tractors, need to accomplish tasks. By optimizing driving efficiency, farmers can reduce fuel consumption and soil compaction while eliminating excess greenhouse gas emissions. One precision agriculture holding enables **595,901 metric tons in avoided carbon emissions** annually through their efficient field navigation solutions which include autonomous guidance and steering for field machinery navigation.[12] Not only does efficient field navigation reduce greenhouse gas emissions, but it also increases yields. Perfectly spaced rows increase crop productivity, ensuring farmers can maximize the potential of their land and grow more food.

GEOS Solution #2: Driverless agriculture technology

Another company within the GEOS portfolio is a leading innovator in driverless agriculture technology.[13] Autonomous farm solutions allow farmers to optimize and control their farm ecosystem to maximize farm efficiency, while eliminating mistakes that are caused by human error. One of the newest solutions announced, an autonomous grain cart, helps farmers improve their harvest efficiency by syncing human-operated combines to the aforementioned grain carts. This technology will increase farm productivity and allow farmers to harvest more food in a shorter time period. In addition, greenhouse gas emissions will be avoided by eliminating inefficiencies in driving and operations caused by human error.

GEOS Solution #3: Carbon soil sequestration

A smart farming and digital agriculture technology company within the GEOS portfolio has created a Smart Carbon program that helps farmers implement climate friendly soil practices.[14] By implementing farm practices to sequester carbon within the soil, farmers are able to reduce greenhouse gas emissions and improve soil health. In order to incentivize climate friendly growing practices, the company connects farmers with buyers who seek verified carbon offsets, allowing farmers to receive payments for their land stewardship. As more companies commit to become carbon neutral or net-zero, the carbon offset market will continue to grow, and each acre of farming land is estimated to have the capacity to sequester two to three tons of carbon.[15] Soil carbon sequestration and other nature-based climate solutions will play a critical role in reducing global emissions and improving agricultural productivity.

Climate Change Threatening Productivity

While global agriculture is a primary contributor to climate change, the effects of climate change significantly threaten food production globally. More frequent extreme weather events such as droughts and floods are expected to increase sediment runoff and erosion, affecting the amount of water crops receive and altering soil quality. Heat waves are becoming more frequent and intense, damaging crop harvests and

[12] GEOS holding in Agricultural Productivity and Clean Fuels theme as of 9/30/2021
[13] GEOS holding in Agricultural Productivity and Clean Fuels theme as of 9/30/2021
[14] GEOS holding in Agricultural Productivity and Clean Fuels theme as of 9/30/2021
[15] Alexander et al., *Food for Thought: Climate stress=More inflation, more capex.* Jefferies Equity Research, 2021

lowering livestock productivity.[16] By 2100, vegetable and legume yields are estimated to fall by up to 35% due to climate change, reducing the availability of healthy food.[17] Greater range of crop pests and diseases and potential extinction of biodiversity, such as pollinators like bees, pose further threats to food production. All of these events jeopardize future food production, making ingenuity and innovation integral to improving the resilience of agricultural systems to climate change.

GEOS Solution: Minimize climate impacts using satellite imagery

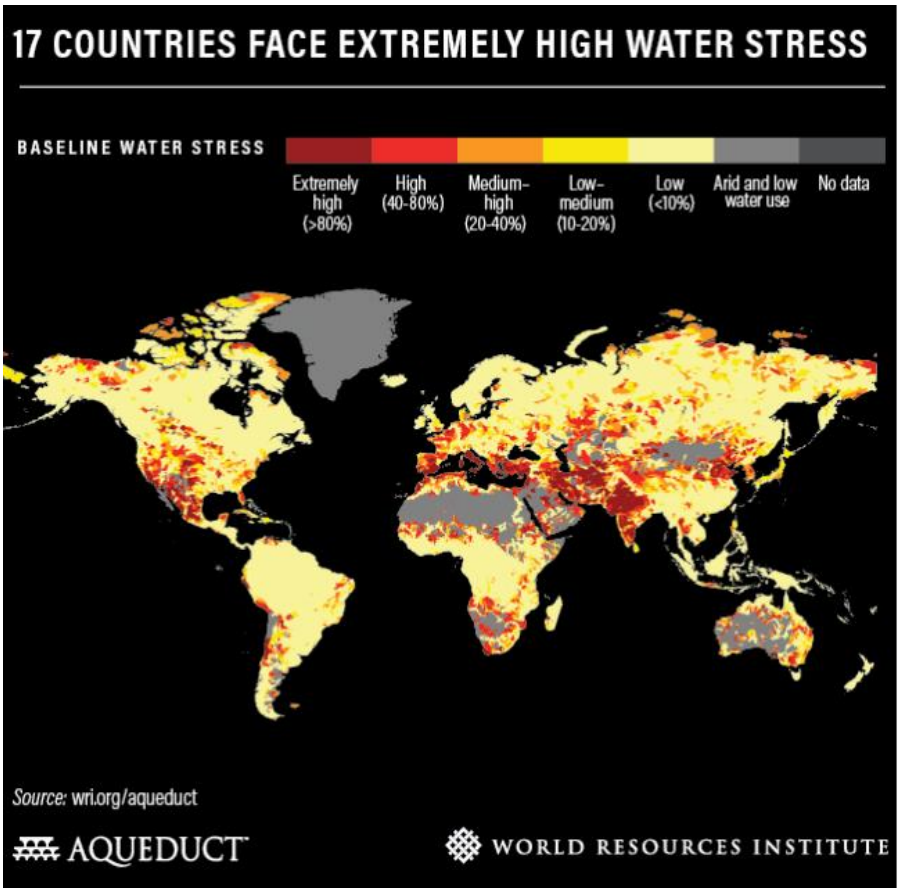
One digital agriculture technology company GEOS invests in provides farmers with satellite imagery mapping capabilities to establish more resilient crop operations. By leveraging satellite technology, farmers can identify potential threats to yields such as pests, diseases, nutrient deficiencies, and damage from weather events. By understanding the threats to crop operations early and in greater detail, farmers can take steps to minimize negative climate impacts and protect their yields.

Global Water Crisis: Agriculture contributes to water stress and is a victim of drought

Agriculture faces two concurrent water issues: droughts caused by climate change are threatening crop yields and impairing our ability to meet global food demand. Meanwhile, agriculture consumes an unsustainable volume of water and is contributing to global water issues that are exacerbated by climate change. Agriculture is responsible for an astounding 70% of global water withdrawals, even higher in some countries, greatly contributing to water stress. Reducing the acres of irrigated farmland could theoretically alleviate this issue, but that is not an adequate solution. Despite comprising under 25% of global cropland, irrigated farmland is responsible for 40% of global food production, making it critical to achieving food security.[18] Climate change is also altering precipitation patterns and leading to more frequent and prolonged droughts, threatening crop productivity and externally contributing to water stress. Nearly three-quarters of world cropland is rainfed, so droughts affecting rainfall patterns will create food insecurity and affect farmers' ability to grow food.[19] To combat the global water crisis, agriculture must increase resilience to climate change by adapting to droughts, but also adopt more efficient and sustainable water practices. The current rate at which agriculture consumes water is unsustainable, but there are solutions to help improve agriculture's water-use efficiency.

[16] Center for Climate and Energy Solutions. Heat Waves and Climate Change. https://www.c2es.org/content/heat-waves-and-climate-change/
[17] Renee Cho. How Climate Change Will Alter Our Food. Columbia Earth Institute, 2018. https://blogs.ei.columbia.edu/2018/07/25/climate-change-food-agriculture/
[18] World Bank. Water in Agriculture. https://www.worldbank.org/en/topic/water-in-agriculture
[19] Walker et al. Water Could Limit Our Ability to Feed the World. World Resources Institute, 2019. https://www.wri.org/blog/2019/11/water-could-limit-our-ability-feed-world-these-9-graphics-explain-why

Figure 2: Global Water Stress



To understand the extent of the global water crisis, consider Figure 2, which demonstrates that water stress is not only an important future issue, but a significant current issue. Currently, 17 countries with about a quarter of the world's inhabitants face extremely high-water stress, where annual withdrawals demand 80% or more of the available supply, with agriculture being a primary driver.[20] Another 44 countries, comprising one-third of the global population, face high water stress conditions, where more than 40% of the available water supply is withdrawn annually.[21] Water stress increases food insecurity, raises food prices, increases mass migration, and contributes to violence. In India, half the population combats high to extremely high water stress while farmers consume a staggering 90% of available groundwater, often for growing cotton and rice for export.[22] Water use in India and the other extremely-high water stressed countries is unsustainable and the situation is projected to become even more dire as climate change intensifies, making the adoption of sustainable water practices within agriculture essential.

[20] Hofste et al. 17 Countries, Home to One-Quarter of the World's Population, Face Extremely High Water Stress. World Resources Institute, 2019. https://www.wri.org/blog/2019/08/17-countries-home-one-quarter-world-population-face-extremely-high-water-stress
[21] Hofste et al. 17 Countries, Home to One-Quarter of the World's Population, Face Extremely High Water Stress
[22] Pradhan and Parija. India's Water Crisis Is Becoming a Problem for Modi. Bloomberg, 2020. https://www.bloomberg.com/news/features/2020-07-21/india-water-crisis-forces-farmers-to-rethink-their-crops

While most severe cases of water stress are in the Middle East and Africa, highly developed countries are not immune. The US ranks 71st in terms of country water stress, but specific areas and states within the country, like New Mexico and California, currently face extremely high-water stress conditions that are projected to intensify with climate change.[23]

GEOS Solutions to Water Stress: Precision irrigation technology and indoor agriculture

With the global water crisis underway and projected to worsen, conserving and utilizing water resources efficiently within agriculture is essential. GEOS companies offer clean technologies that improve the quality of water application and reduces total water consumption within agriculture. Farmers inevitably require water to grow food, but GEOS companies help to minimize the amount of water that crops need by providing technology to irrigate crops more efficiently.

GEOS Solution #1: Customized irrigation management and pivot irrigation to optimize water application

One GEOS holding has developed a remote and customized irrigation scheduling software platform to reduce water consumption and increase efficiency.[24] Their remote irrigation monitoring tool helps farmers optimize water use by offering data-driven irrigation recommendations based on soil moisture content, crop root depth, and weather patterns. During the company's 2020 fiscal year, Essex believes this irrigation tool saved farmers **80.1 billion gallons of water globally**, significantly improving the sustainability of irrigation practices. This software provides customized irrigation insights to eliminate excess water application, saving farmers money and reducing agriculture's water footprint, by recommending to farmers when, where and how much to irrigate their crops. The company recently added a water outlook tool to their portfolio which provides a seven-day forecast of precipitation and crop water usage. While the main environmental benefit from the irrigation platform is water saved, we believe the technology has also helped farmers avoid more than **413,000 metric tons of carbon emissions** since the platform was unveiled in 2017.

This same company also offers pivot or lateral irrigation systems that water crops in a circular pattern, centered around a pivot, ensuring uniform application of water to all crops. Historically, irrigation systems have applied too much water or have created irregular watering patterns, but pivot irrigation systems solve these problems. Pivot systems also provide benefits over two competing systems: drip and flood irrigation. Drip irrigation systems are similar in efficiency to pivot systems but create issues in terms of irregular water application, where some crops get too little water while others get too much. Flood irrigation systems, meanwhile, are extremely inefficient and lead to excessive water use. With pivot irrigation systems, farmers enjoy both increased efficiency and lower water consumption along with irrigation uniformity. This helps farmers reduce their strain on local water supply while also creating an ideal growing environment for their crops.

[23] Hofste et al. 17 Countries, Home to One-Quarter of the World's Population, Face Extremely High Water Stress.
[24] GEOS holding in Agricultural Productivity and Clean Fuels theme as of 9/30/2021

Figure 3: Pivot Irrigation

Source: Zimmatic by Lindsay

GEOS Solution #2: Land leveling technology to reduce water runoff

Another company GEOS invests in has developed land leveling technology to help farmers manage water flow better and ensure less water exits the growing area. Differences in farmland grade can lead to runoff, inefficient consumption of water, and decreased yields due to water pooling on fields. Their land leveling technology helps farmers achieve perfectly level fields, thereby reducing the amount of irrigation needed, more efficiently utilizing rainwater, and reducing runoff.[25] In Pakistan, farmers using this technology have been able to **decrease their water consumption by 40%**, while also increasing the quantity and quality of their crop yields. As water stress continues to plague billions of people around the globe, technology that improves irrigation systems will magnify in importance and improve both productivity and sustainability within agriculture.

GEOS Solution #3: Moisture monitoring technology

A final company within the GEOS portfolio offers an AI-driven farm management platform that includes a Moisture Manager support tool. The water focused decision tool provides granular, real-time moisture data to farmers to help them understand the water needs of their crops. By tracking soil moisture and understanding when crops are experiencing water stress, farmers can effectively irrigate crops to enhance yields. The monitoring technology also offers sustainability benefits since farmers can avoid irrigating fields when soil moisture content is sufficient, thereby saving water and inputs costs.

Potential Solution: Leveraging machine learning to reduce water usage

GEOS is evaluating companies within the indoor agriculture space that consume 90% less water than traditional growing methods to grow fruits and vegetables. Companies leverage technology such as machine learning to gather data from hundreds of sensors to determine how much water crops need. This ensures

[25] GEOS holding in Agricultural Productivity and Clean Fuels theme as of 9/30/2021

plants receive the perfect amount and no water is wasted, enabling fewer water resources to grow more food.

Nonpoint Source Pollution: Environmental degradation and inefficient input application

Nonpoint source pollution (NPS) is an agricultural issue that is caused when rain, snow, or irrigation water transports natural and manmade pollutants toward watersheds and other water resources.[26] NPS pollution can impair and degrade natural ecosystems, pollute water sources, and threaten human and environmental health.

In the US, about one-third of fertilizer applied to farmland runs off into waterways.[27] When runoff enters water sources and contains pollutants rich in nitrogen, like fertilizers, it stimulates plant growth such as algal blooms. The algae then die and rot, while bacteria consume available oxygen in the water, suffocating all life and creating dead zones. Agricultural runoff from the "Corn Belt" pollutes the Mississippi River annually and creates a dead zone where the river enters into the Gulf of Mexico, the size of Delaware and Connecticut combined in 2020.[28]

Nonpoint source pollution is dependent on the timing, quantity, and location of chemical application, making precision agriculture technology a proven solution to addressing the problem. Adopting more sustainable chemical application practices on farms is a time-sensitive issue because heavy rains caused by climate change are projected to increase the risk of pollution if no action is taken.

GEOS Solution #1: Optimizing chemical applications using flow and application control

GEOS invests in companies offering technology that help reduce the frequency and intensity of NPS pollution by providing flow and application control technology to optimize the application of fertilizers, pesticides, and other inputs. Flow and application control helps farmers determine the optimum quantity, location, and timing of chemical applications. By optimizing chemical applications and applying the efficient amount, less pollution enters the surrounding environment, crops are able to utilize chemicals more efficiently, and farmers are able to achieve cost-savings. Precision agriculture technology also reduces nitrous oxide emissions, which agriculture creates 80% of globally, by eliminating the overapplication of fertilizers.

One company within the GEOS portfolio offers variable rate technology (VRT) and crop sensors that enable farmers to optimize application rates by automatically adjusting water, fertilizer, pesticide, and other inputs to fit their needs. Instead of uniformly applying the same volume of inputs to fields, VRT varies chemical application rates based on land and growing conditions. Certain areas of fields might need different volumes of input application than others due to soil quality and land grade, and VRT helps farmers optimize input application. By creating optimum growing conditions and efficiently applying chemicals, VRT eliminates nonpoint source pollution, but also increases crop productivity.

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[26] EPA. Protecting Water Quality from Agricultural Runoff, 2006. https://nepis.epa.gov/Exe/ZyPDF.cgi/P10039OH.PDF?Dockey=P10039OH.PDF

[27] Rebecca Boehm. Reviving the Gulf Dead Zone Is Worth it: Our new report shows the benefits of action. Union of Concerned Scientists, 2020. https://blog.ucsusa.org/rebecca-boehm/reviving-the-gulf-dead-zone-is-worth-it-our-new-report-shows-the-benefits-of-action

[28] Boehm. Reviving the Gulf Dead Zone Is Worth It.

Figure 4: Flow and Application Control

Source: Trimble

GEOS Solution #2: Nitrogen management technology

One company within the GEOS portfolio offers a nitrogen management tool which leverages field-centric variable data to help farmers determine precise nitrogen needs for their crops. Historically corn farmers have overapplied nitrogen inputs to ensure their crops had sufficient nutrients to maximize yields. The excess nitrogen that is not utilized by the plants often accumulates in bodies of water, making it an unsustainable practice. By understanding the exact amount of nitrogen that crops need, farmers can optimize efficiency and yields while avoiding the harmful environmental externalities caused by overapplication of nitrogen.

Potential Solution: Integrated Pest Management (IPM)

While traditional agriculture operations employ pesticides and other harmful chemicals to control pests and diseases, many controlled environment agriculture operations utilize Integrated Pest Management (IPM) to avoid chemical use entirely. Companies rely on computer vision and other advanced technologies to provide real time alerts on pest and disease risks by equipping robots with high resolution cameras to traverse growing facilities to look for pests. By leveraging computer vision technology, companies avoid chemical use which reduces pollution in local environments and ensures no chemical residue is found on produce. As more attention is paid to healthy eating habits, more scrutiny will be paid not only to what types of food people are eating, but also what chemicals are found on foods.

UN Sustainable Development Goals

In recent years the SDGs have become a common language among investors to assess the impact of investments, particularly for thematic investment strategies. We believe the SDGs framework illustrates how GEOS investee companies solve environmental challenges and helps us to better understand the impact of our investments. By utilizing the SDGs, we are also able to highlight the funding gap to accomplish the

SDGs, despite the positive developments made since 2015. The SDGs require $6-7 trillion in annual investment, yet there is an annual investment gap of at least $2.5 trillion that needs to be addressed in order to accomplish the goals.[29] The Sustainable Development Goals are presented in Figure 3, with black boxes around the nine goals that GEOS solve for.

Figure 5: GEOS Alignment to SDGs

Agricultural Productivity and Clean Fuels Theme and the SDGs

In relation to agriculture, the SDGs aim to end malnutrition, hunger, and food insecurity, in addition to implementing more sustainable growing practices and increasing agriculture's resilience to climate change. The GEOS **Agricultural Productivity and Clean Fuels theme solves for three SDGs**, as discussed below along with the relevant SDG targets the theme addresses.

- **Goal 2: Zero Hunger: "**End hunger, achieve food security and improved nutrition, and promote sustainable agriculture"[30]
    - Precision agriculture technology improves farm productivity and helps implement more sustainable growing practices. Investment examples include autonomous field machinery navigation that reduces energy use and irrigation technology to optimize input applications and create ideal growing conditions for crops. Another investment example is farm drainage technology which improves agriculture's capacity to withstand climate change and extreme weather events. **(Target 2.4 and 2.a)**
- **Goal 6: Clean Water and Sanitation: "**Ensure availability and sustainable management of water and sanitation for all"

[29] Gornitzka and Wilson. *Charting the course for SDG financing in the decade of delivery.* World Economic Forum, 2020. https://www.weforum.org/agenda/2020/01/unlocking-sdg-financing-decade-delivery/
[30] SDG definitions from United Nations. https://sdgs.un.org/goals

  - Precision agriculture technology within the GEOS portfolio reduces nonpoint source pollution from farm chemicals and ensures water sources are pollution-free. In the US, pesticides have been detected in 90% of streams and rivers.[31] **(Target 6.3)**
  - Precision irrigation solutions reduce farm water consumption by improving the quality of water application, helping to limit the contributions of agriculture to the global water crisis. Customized irrigation software provides farmers with insights that reduce farm water consumption while pivot irrigation systems efficiently irrigate crops in a uniform manner. **(Target 6.4)**
- **Goal 14: Life Under Water:** "Conserve and sustainably use the oceans, seas, and marine resources for sustainable development"
  - Precision agriculture technology enables the reduction in frequency and intensity of nonpoint source pollution. Variable rate application technology reduces chemical overapplication and land leveling technology ensures farm chemicals do not exit the farm area. Precision agriculture technology eliminates agricultural nutrient pollution and protects ecosystems from the growth of harmful algal blooms that result in hypoxic areas, protecting both marine biodiversity and communities who rely on marine ecosystems for food and employment. **(Target 14.1)**

Outlook

The assortment of daunting challenges that the global agricultural system faces are only going to multiply in the coming years and decades. The impacts of climate change will intensify and accelerate until at least 2050, regardless of global climate action to reign in emissions that has moved too slowly to this point. Farmers are also going to be called upon to supply at least 50% more food by midcentury to feed a growing global population that consumes more calories as per capita income increases. The reality and urgency of the situation provides a strong outlook for smart farming and precision agriculture technology. With so many conflicting forces affecting the profits and yields of farmers, technologies that improve efficiency and enhance productivity will have strong demand. Smart farming and precision agriculture technology can help farmers establish operations that are more resilient to drought, flooding, heatwaves, and other impacts of climate change. Furthermore, as sustainability continues to be a key global megatrend, farmers will continue to be encouraged to adopt technologies that help them decrease their environmental footprint and become stewards of the environment.

Disclosures:

[31] Courtney Lindwall. Industrial Agricultural Pollution 101. NRDC, 2019. https://www.nrdc.org/stories/industrial-agricultural-pollution-101

are based on assumptions that may involve known and unknown risks and uncertainties. This does not constitute an offer to sell or the solicitation of an offer to purchase any security or investment product, nor does it constitute a recommendation to invest in any particular security. An investment in securities is speculative and involves a high degree of risk and could result in the loss of all or a substantial portion of the amount invested. There can be no assurance that the strategy described herein will meet its objectives generally, or avoid losses. Essex makes no warranty or representation, expressed or implied; nor does Essex accept any liability, with respect to the information and data set forth herein, and Essex specifically disclaims any duty to update any of the information and data contained in the commentary. This information and data does not constitute legal, tax, account, investment or other professional advice. Essex being registered by the SEC does not imply a certain level of skill or training.