



U.S. Agriculture's
Opportunities to
Contribute to the
**Sustainable
Development
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Setting the Stage

This graphic provides a simple visualization of the high-level connection between the food and agriculture sectors and the Sustainable Development Goals.


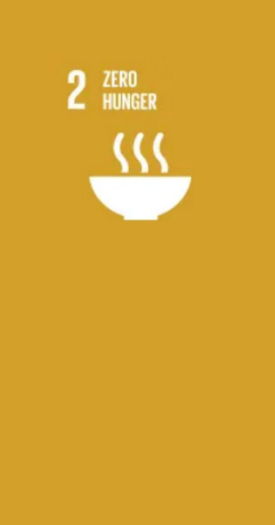

Stewardship is the foundation of our inherent values in the agricultural sector, and from that commitment to our vision and values, we are able to plant the future and grow into the goals. Given the ubiquitous nature of the food and ag sectors, they have a unique opportunity to help the world achieve all 17 goals.



Summary of Findings




This table provides a summary of the current challenges to address and the future opportunities to advance, drawn from the SDG report.

Table 1:
Summary of US Agriculture’s Opportunities to Contribute to the SDGs

Progress Made and Challenges Still to Address	Sustainable Development Goal	Opportunities to Advance
<ul style="list-style-type: none"> • Most farmers receive off-farm income, but small-scale operators depend on it.^a • Poverty is more widespread in rural areas than cities. In 2018, the non-metro poverty rate was 16.1% compared with 12.6% for metro areas.^b 	 <p>1 NO POVERTY</p>	<ul style="list-style-type: none"> • Invest in the agricultural sector, which has a multiplier effect on rural economies, which can contribute to an economic renewal of rural America. • Improve rural broadband and other data and technology infrastructure. • See opportunities under SDG 8 Decent Work and Economic Growth
<ul style="list-style-type: none"> • Ag sector output grew 170% from 1948-2015 while inputs rose only 7% over the same period, demonstrating significant increase in productivity.^c • 88.9% of U.S. households were food secure, but despite plentiful food production and the largest food export market, food deserts continued to pose challenges to ensuring nutritious diets.^d • As a result of the COVID-19 pandemic, an estimated 17 million more Americans will be food insecure in 2020 than in 2019.^e 	 <p>2 ZERO HUNGER</p>	<ul style="list-style-type: none"> • Build resiliency in the agricultural and food supply chains through climate mitigation and adaptation, greater diversity of foods grown, and agile packaging and distribution systems. • Leverage sustainable productivity, innovation and stronger connections between farmers and ranchers and hunger relief organizations to ensure affordable, accessible food is available to all. • Expand urban agriculture to provide more fresh produce, especially to food deserts, as well as employment and green spaces in cities.
<ul style="list-style-type: none"> • Both farm and rural populations experience lower access to healthcare along the dimensions of affordability, proximity, and quality, compared with their nonfarm and urban counterparts.^f 	 <p>3 GOOD HEALTH AND WELL-BEING</p>	<ul style="list-style-type: none"> • See opportunities under SDG 1 No Poverty and SDG 8 Decent Work and Economic Growth

<ul style="list-style-type: none"> Rural and farm populations often face limited access to resources and institutions due to isolation and poor broadband coverage. Nearly one fourth of rural residents lack access to broadband.^g Land grant universities, individually and collectively, are working to expand access to education. 	<p>4 QUALITY EDUCATION</p> 	<ul style="list-style-type: none"> See opportunities under SDG 1 No Poverty and SDG 8 Decent Work and Economic Growth
<ul style="list-style-type: none"> In 2019, 36% of farmers were female, a 27% increase from 2012.^h Despite recent progress, gender equity among farmers and ranchers is still lacking, and studies have shown women are still not included in information sharing to the same degree that men are.ⁱ 	<p>5 GENDER EQUALITY</p> 	<ul style="list-style-type: none"> Continue to support women in places where their representation is already growing: Beef cattle operations, other crop farming (hay or row crops)^j Support women gaining representation in areas where they remain underrepresented.
<ul style="list-style-type: none"> Agriculture accounts for 80% of the U.S.'s consumptive water use, and irrigated agriculture accounts for roughly half of the total value of crop sales.^k Improvements in water management and precision agriculture have led to an increase in on-farm efficiency, decreased runoff, reduced pesticide use, improved crop yields, and water cost savings.^k 	<p>6 CLEAN WATER AND SANITATION</p> 	<ul style="list-style-type: none"> Adapt water use and nutrient management practices to maximize water efficiency and minimize total water use by the sector, help contribute to 'good' water quality ratings in coastal and freshwater bodies.^l
<ul style="list-style-type: none"> Farmers produce, utilize and store renewable energy through managing renewable energy infrastructure on their land such as solar panels and wind turbines, growing biofuel crops, and operating anaerobic digesters in livestock operations. In 2017, 6.5% of U.S. farms had renewable energy systems, up from 2.7% in 2012.^m 	<p>7 AFFORDABLE AND CLEAN ENERGY</p> 	<ul style="list-style-type: none"> Expand use of renewable energy systems on farms. For example, an estimated 8,000 livestock farms in the U.S. have the potential to host biogas systems with a total estimated output of 13.1 billion kWh per year.ⁿ Biofuels can replace fossil fuels for aviation, automotive and other applications for a significant net reduction in GHG emissions. Wind and solar also hold potential as scalable renewable resources that can be produced on farms and displace other GHG-intensive forms of energy.

<ul style="list-style-type: none"> • 8 cents of each food dollar expenditure in 2018 went to farm production, while the rest of the dollar covered costs from processing, wholesale, packaging, distribution, retail, and other value chain players.^o • Farmers and ranchers are caught in a price-cost squeeze due to low profit margins and high levels of risk, often experiencing economic stress and significant levels of debt, which must be taken on well in advance of knowing what profitability will be. • There are concerns around labor practices, safe working conditions, and human rights, particularly as roughly half of hired crop farmworkers are estimated to be undocumented.^q • Most farmworkers are exempted from the Fair Labor Standards Act. 	<p>8 DECENT WORK AND ECONOMIC GROWTH</p> 	<ul style="list-style-type: none"> • Protect and support the sector's workforce. Agricultural and food sectors currently employ 15% of the U.S. workforce and contributed \$2.96 trillion to U.S. GDP.^p • Invest in access to education, training and other workforce development programs to support the increasing sophistication of modern agriculture (for example, technicians to maintain precision agriculture equipment and renewable energy systems on farms, validators to measure environmental benefit outcomes on farms for credit programs, etc.). • Develop mechanisms to increase income for farmers, which could include new revenue streams, opportunities to charge a premium for certain products, or new financing mechanisms that allow farmers to share risk and reward with other value chain partners.
<ul style="list-style-type: none"> • The COVID-19 pandemic highlighted vulnerabilities in the food and agricultural systems' infrastructure, especially in packaging and distribution systems. • The need for segregated transportation and distribution infrastructure for differentiated commodities has been a barrier to innovation, but there are efforts underway to address this both with and without changing physical infrastructure. • Agriculture receives only a tiny fraction of the federal funding for scientific research.^r 	<p>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</p> 	<ul style="list-style-type: none"> • Use Public-Private Partnerships to bring further investment in research and innovation into agriculture. • See opportunities under SDG 2 Zero Hunger.

<ul style="list-style-type: none"> • Farmers and ranchers in the U.S. are still predominantly White (95%), though the number of principal operators who were Hispanic (3.3%), Native American (1.7%), African Americans (1.3%) or Asian (0.6%) increased from 2007 to 2012.^s • From 2001 to 2016, there was consolidation in agriculture toward fewer larger farms, and the number of new farmers decreased.^t • Many workers in the food system take home poverty-level wages.^u • In 2018, food insecurity was prevalent in Hispanic and Black, non-Hispanic households at nearly double the rate of White, non-Hispanic households.^v 	<p>10 REDUCED INEQUALITIES</p> 	<ul style="list-style-type: none"> • Expand programs that support new, young and diverse farmers • Ensure that the opportunities in SDG 8 Decent Work and Economic Growth are provided equitably and with a focus on cultivating and supporting a diverse workforce across the food and agriculture sectors.
<ul style="list-style-type: none"> • 2017 ended six years of population losses by non-metro areas as people moved to metro areas, but cities are still growing at a faster rate than non-metro areas, at 0.82% compared with 0.07% respectively.^w Recent data indicates that this trend could be amplified by the COVID-19 pandemic, with more people escaping to rural areas.^x • Cities once offered opportunity to people whether they had formal education or not, but this has changed. In fact, people without college degrees are leaving urban centers as their compensation fails to keep up with rising cost of living.^y 	<p>11 SUSTAINABLE CITIES AND COMMUNITIES</p> 	<ul style="list-style-type: none"> • Encourage teleworking policies that allow people to live outside of cities (which would be significantly enabled by rural broadband noted in SDG 1). • Create and expand programs that better connect rural and urban residents including efforts by universities, governments, businesses and civil society. • See opportunity on Urban Agriculture in SDG 2 Zero Hunger
<ul style="list-style-type: none"> • An estimated 30-40% of all food produced in the U.S. each year becomes loss or waste.^z • Consumer products packaging, of which a sizable amount is food and beverage packaging, made up 30% of municipal solid waste generated in 2017.^{aa} 	<p>12 RESPONSIBLE CONSUMPTION AND PRODUCTION</p> 	<ul style="list-style-type: none"> • Facilitate nutrient cycling through municipal composting systems for residential and commercial food and yard waste, as well as through the expansion of practices to minimize and repurpose food loss on farms. • Further diversion of food loss and waste to alternative downstream site to landfills such as composting facilities, animal feed and non-food products • Innovate and scale sustainable food and beverage packaging, building off of the efforts by companies who are already focused in this area.

<ul style="list-style-type: none"> • U.S. agriculture currently accounts for about 9.9% of U.S. GHG emissions.^{bb} • Companies across the food and ag value chain have set ambitious goals to reduce their own GHG emissions and work with others to do the same. (See Commitment Landscape) • Climate change and extreme weather continue to pose challenges for the ag sector. 		<ul style="list-style-type: none"> • Use agriculture to drawdown carbon. U.S agriculture has the potential to halve its GHG emissions in less than 5 years using only existing practices and technology. With innovation, U.S. agriculture can be carbon positive by 2035, offsetting not only its own emissions but those of other industries as well, enabling a transition to a net zero economy.^{cc}
<ul style="list-style-type: none"> • Programs supporting farmers to reduce runoff has improved water quality across the country. In one example, the EPA’s Chesapeake Bay program restored water to its highest level in over 30 years.^{dd} • Nutrient runoff from land-based farming in many regions still affects marine water bodies with impacts including algal overgrowth and dead zones due to eutrophication. 		<ul style="list-style-type: none"> • Expand Marine Aquaculture, which can play a restorative role in marine ecosystems while also supporting human health and providing new employment opportunities.^{ee} • Fund proven programs that support farmers to improve water quality in surrounding water bodies.
<ul style="list-style-type: none"> • More than 15% of U.S. farmland is used for conservation and wildlife habitat improvement • Since 2012, soil health efforts have increased by 17%.^{ff} • Between 2001 and 2016, 11 million acres of farmland and ranchland were lost to development.^{gg} • There is still work to be done to continue to address soil erosion and degradation, ecosystem stress, nutrient accumulation and pollution, and increased and varied pests. 		<ul style="list-style-type: none"> • Cultivate Ag Lands as Natural Spaces: Agricultural production accounts for over half of U.S. land use^{hh} which means the impact of continued adoption of practices like conservation tillage, planting cover crops, incorporating buffer strips, and utilizing less productive areas of land within, near and alongside fields for wildlife is potentially very significant. • Protect Farmland from Development, which releases carbon, reduces water retention, and reduces wildlife habitat.
<ul style="list-style-type: none"> • The sector’s contribution to food security and resilient supply chains are vital in preventing and managing conflict as well as social and economic disruptions. 		<ul style="list-style-type: none"> • Food is foundational to peace. All of the opportunities described here will contribute to a more resilient, just, and strong agricultural sector, which is the foundation of a peaceful, just and strong society.
<ul style="list-style-type: none"> • There are ongoing collaborations among U.S. agriculture and academic and government institutions, as well as companies and NGOs, but there are still gaps in terms of effectively sharing knowledge, data, decision making power, and economic value. 		<ul style="list-style-type: none"> • Collaboration and partnership are essential to realizing the potential for U.S. agriculture to contribute to achieving the SDGs.



Sources: All links accessed on August 12, 2020.

- a. USDA ERS. (2019, November 27). Most farmers receive off-farm income, but small-scale operators depend on it. Retrieved August 22, 2020, from <https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=58426>
- b. USDA ERS. (2020, February 12). USDA ERS - Rural Poverty & Well-Being. Retrieved from <https://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being/>
- c. Wang, S. L., Heisey, P., Schimmelpfennig, D., & Ball, E. (2015, July). USDA ERS - U.S. Agricultural Productivity Growth: The Past, Challenges, and the Future. Retrieved from <https://www.ers.usda.gov/amber-waves/2015/september/us-agricultural-productivity-growth-the-past-challenges-and-the-future/>
- d. Ver Ploeg, M. (2010, March 1). USDA ERS - Access to Affordable, Nutritious Food Is Limited in “Food Deserts.” Retrieved August 22, 2020, from <https://www.ers.usda.gov/amber-waves/2010/march/access-to-affordable-nutritious-food-is-limited-in-food-deserts/#box1>
- e. Tackling Hunger and Food Insecurity | A Conversation with Claire Babineaux-Fontenot of Feeding America. (2020). Retrieved from <https://www.bushcenter.org/catalyst/america-at-its-best/babineaux-fontenot-feeding-america.html>
- f. HRSA. (2019, October 9). Rural Access to Health Care Services Request for Information . Retrieved from <https://www.hrsa.gov/rural-health/rfi-rural-health-care-access>
- g. FCC. (2012). Eighth Broadband Progress Report. Retrieved from <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/eighth-broadband-progress-report>
- h. USDA ERS. (2020, April 22). USDA ERS - Farm Labor. Retrieved from <https://www.ers.usda.gov/topics/farm-economy/farm-labor/#legalstatus>
- i. Carter, A. (2019). “We Don’t Equal Even Just One Man”: Gender and Social Control in Conservation Adoption. *Society and Natural Resources*, 32(8), 893–910. <https://doi.org/10.1080/08941920.2019.1584657>
- j. USDA NASS. (2017). List of Reports and Publications | 2017 Census of Agriculture | USDA/NASS. Retrieved from <https://www.nass.usda.gov/Publications/AgCensus/2017/index.php>
- k. USDA ERS. (2019, September 23). USDA ERS - Irrigation & Water Use. Retrieved from <https://www.ers.usda.gov/topics/farm-practices-management/irrigation-water-use/>
- l. US EPA. (2017). National Water Quality Inventory: Report to Congress. Retrieved from https://www.epa.gov/sites/production/files/2017-12/documents/305brtc_finalowow_08302017.pdf
- m. EESI. (2017, October 3). Fact Sheet - Biogas: Converting Waste to Energy. Retrieved from <https://www.eesi.org/papers/view/fact-sheet-biogasconverting-waste-to-energy>
- n. Laca, A.-L. (2020, July 24). Dairy Farmer Says Federal Support Could Increase Dairy Sustainability. Retrieved from <https://www.agweb.com/article/dairy-farmer-says-federal-support-could-increase-dairy-sustainability>
- o. USDA ERS. (2020, March 17). USDA ERS - Documentation. Retrieved from <https://www.ers.usda.gov/data-products/food-dollar-series/documentation.aspx>
- p. Feeding the Economy. (2020). U.S. Food and Ag Industries Economic Impact Study. Retrieved from <https://feedingtheeconomy.com/>
- q. USDA ERS. (2020, April 22). USDA ERS - Farm Labor. Retrieved from <https://www.ers.usda.gov/topics/farm-economy/farm-labor/#legalstatus>
- r. AAAS. (2020). Trends in R&D by Agency. Retrieved from <https://www.aaas.org/sites/default/files/2020-07/Agencies.png>
- s. USDA NASS. (2012). 2012 Census of Agriculture - Farm Demographics Highlights | USDA - National Agricultural Statistics Service. Retrieved from https://www.nass.usda.gov/Publications/Highlights/2014/Farm_Demographics/index.php
- t. Reiley, L., & Van Dam, A. (2019, April 13). Advocates hoped census would find diversity in agriculture. It found old white people. *The Washington Post*. Retrieved from <https://www.washingtonpost.com/business/2019/04/13/advocates-hoped-new-report-would-find-diversity-ag-it-found-old-white-people/>

- u. Giancattarino, A., & Noor, S. (2014). Building the Case for Racial Equity in the Food System. New York. Retrieved from <https://www.centerforsocialinclusion.org/publication/building-the-case-for-racial-equity-in-the-food-system/>
- v. USDA ERS. (2019, September 4). USDA ERS - Key Statistics & Graphics | “Prevalence of Food Insecurity, 2018” graphic. Retrieved from <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/key-statistics-graphics>
- w. USDA ERS. (2020, February 25). USDA ERS - Population & Migration. Retrieved from <https://www.ers.usda.gov/topics/rural-economy-population/population-migration/>
- x. Rose, J. (2020, August 6). Time To Move? Data Suggests Americans May Flee To Rural Areas Post-COVID. Forbes. Retrieved from <https://www.forbes.com/sites/jrose/2020/08/06/time-to-move-data-suggests-americans-may-flee-to-rural-areas-post-covid/#50897f0e7161>
- y. Gates, E. P. G. (2019, May 21). Why Workers Without College Degrees Are Fleeing Big Cities. The New York Times. Retrieved from <https://www.nytimes.com/interactive/2019/05/21/business/economy/migration-big-cities.html>
- z. USDA. (n.d.). Food Waste FAQs | USDA. Retrieved from <https://www.usda.gov/foodwaste/faqs>
- aa. US EPA. (n.d.). Facts and Figures about Materials, Waste and Recycling. Retrieved from <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/containers-and-packaging-product-specific-data>
- bb. US EPA. (n.d.). Sources of Greenhouse Gas Emissions. Retrieved from <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>
- cc. US EPA. (2018). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016. Retrieved from <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2016>
- dd. US EPA. (2020, May 18). EPA Provides \$6 Million to Reduce Excess Ag Runoff to the Chesapeake Bay. Retrieved from <https://www.epa.gov/newsreleases/epa-provides-6-million-reduce-excess-ag-runoff-chesapeake-bay>
- ee. NOAA Office of Aquaculture. (2020, June 19). U.S. Aquaculture. Retrieved from <https://www.fisheries.noaa.gov/national/aquaculture/us-aquaculture>
- ff. House Select Committee on the Climate Crisis. (2020). Solving the Climate Crisis | The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America. Retrieved from [https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate Crisis Action Plan.pdf](https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf)
- gg. Freedgood, J., Hunter, M., Dempsey, J., & Sorenson, A. (2020). Farms Under Threat: The State of the States. Farmland Information Center. Northampton. Retrieved from <https://farmlandinfo.org/publications/farms-under-threat-the-state-of-the-states/>
- hh. USDA ERS. (2020, May 5). USDA ERS - Land and Natural Resources. Retrieved from <https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/land-and-natural-resources/>

Introduction

The U.S. is a global leader in agriculture production, providing affordable food, fiber and energy to millions in the United States and billions of people worldwide. Today's agriculture and food system requirements are increasingly global, with demand driven by emerging markets and the hundreds of millions of people moving toward the middle class.

In this moment, the world is also confronting historic crises. The COVID-19 pandemic continues to drive both a health disaster and economic disruption. Societies are confronting their own roles in the lack of social and racial equity among their citizens. While the current challenges have us all focused on the very near-term, U.S. Farmers & Ranchers in Action (USFRA) is also looking to the future, and how U.S. agriculture can continue to build greater resiliency and sustainability into the U.S. agricultural system.

This report is an assessment of how the sector is already showing leadership and what opportunities there are from now to 2030 for U.S. agriculture to continue to drive a resilient and sustainable agricultural system while resiliently confronting new crises along the way.

Sustainable Development Goals

A major avenue in which U.S. agriculture can continue to address these challenges and highlight a competitive advantage in the global marketplace is by aligning and highlighting performance against the United Nations' Sustainable Development Goals (SDGs). Established in 2015, the SDGs provide a universal framework to end poverty, protect the planet, and ensure prosperity for all. Each of the 17 goals includes specific targets to be achieved worldwide by 2030 and the agenda as a whole has been adopted by all 193 United Nations member countries. The SDGs can also help farm businesses, processors and companies throughout the agricultural value chain to analyze and address operational and regulatory risks, and to maintain faith and support from society as a whole.

While U.S. agriculture already has substantial positive environmental, social and economic outcomes, helping to achieve these goals by unlocking the potential opportunities and avoiding risks is beyond the reach of any one business, and requires innovative new forms of collaboration at scale. The SDGs are an essential benchmark for observing and measuring sustainable production and ensuring the future growth and inputs needed by U.S. agriculture.

Purpose of an opportunity assessment

The SDGs represent an ambitious agenda with the potential to drive economic growth and significant new business opportunities. Across all sectors these opportunities are estimated to be worth US\$12 trillion per year by 2030, while food-related opportunities alone have the potential to generate US\$2.3 trillion and 80 million jobs globally.¹

This opportunity assessment enables key players in the U.S. agriculture value chain to establish their own contribution to the SDGs and tap into this new market potential. It also provides an initial mapping of U.S. agriculture's performance against the SDGs and identifies how the U.S. agriculture sector can continue to build greater resiliency by contributing to the SDGs while delivering business value through managing operational and regulatory risks and opening up new growth markets. This long-term vision is all the more necessary to address the enduring impacts from COVID-19 and social disruption related to inequity and inequality.



Project methodology

This project followed the framework set out in the SDG Sector Roadmap Guidelines developed by the World Business Council for Sustainable Development (WBCSD). The findings were developed through a literature review and rigorous stakeholder engagement process, through 41 interviews and a review workshop with key stakeholders from across the value chain. Further information on interviews can be found in Appendix III: Stakeholder Interview Breakdown.

Outline

This report will begin by briefly examining the current state of affairs of U.S. agriculture by highlighting the capacity of the U.S. food system, defining the food value chain and then articulating sector trends in relation to the current COVID 19 pandemic, the impacts as a result of climate change, the economic challenges being faced and the prevailing consumer demands. With this information in mind, industry thought leaders and a literature review were conducted in order to compile a mapping assessment of the SDGs with the greatest potential for impact from U.S. agricultural support. Current industry interactions with each of these defined core SDGs are then explored in detail. This is then followed by challenges and areas for impact and improvement related to further embodiment of these core SDGs from within the agriculture sector. Lastly the report concludes with a summary of its major points and a call to action to begin planning to actualize the priority SDGs toward making U.S. agriculture more beneficial for all.

Current State of U.S. Agriculture

Overview

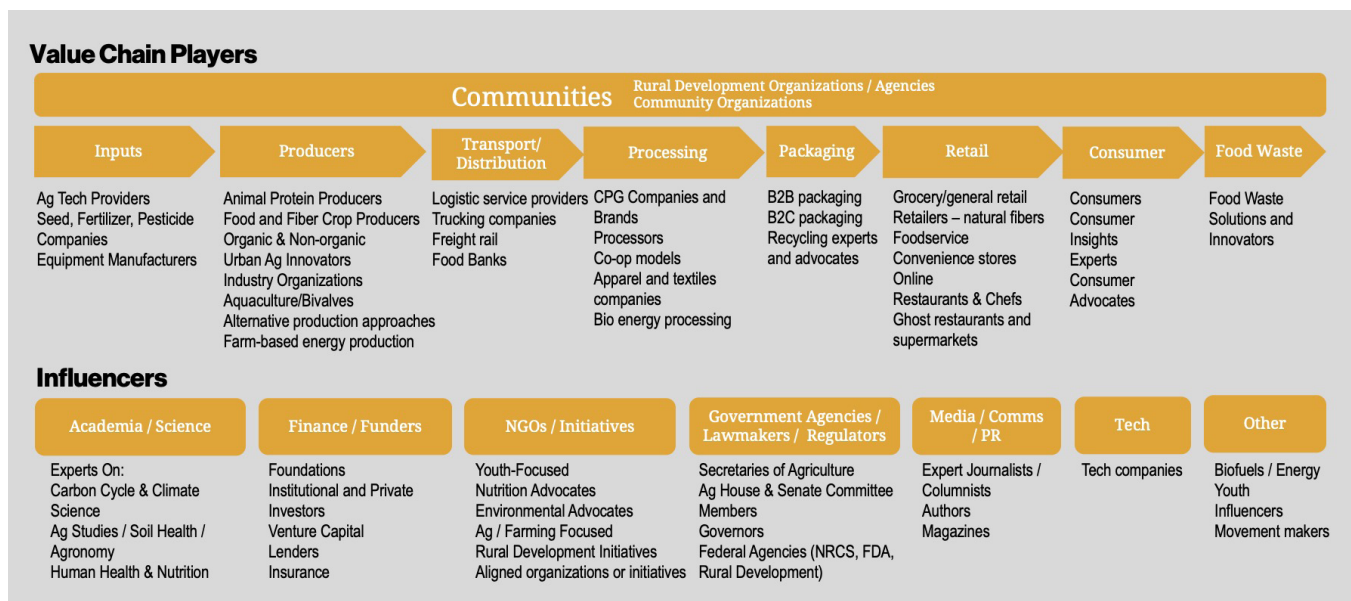
U.S. agriculture is among the largest food and agriculture systems in the world and delivers millions of jobs, significant economic contributions, and enormous quantities of resources globally. There are currently 2.1 million farms in operation in the U.S., accounting for two out of every five acres in the U.S.^{2,3} Farmers and ranchers across the U.S. are on the frontlines of much of the progress being made in climate-smart agriculture.

While the sector is facing unprecedented challenges, exponential global population growth and thus increased food demands, agricultural land development, economic pressures on farming and the economy at large, and a new spotlight on a tenuous supply chain, there is also a lot of opportunity. With investors, non-governmental organizations (NGOs), customers, consumers and other stakeholders demanding increased transparency around sustainability in the supply chain, there is a greater audience for observing on-farm practices and outcomes. It is important that both current industry innovations be highlighted, and future best practices be recognized and endeavored.

Sector Value Chain

U.S. agriculture is composed of an increasingly diverse value chain with millions of independent decision makers. The impact opportunities in this Roadmap focus on the environmental and social issues most significant to farmers and ranchers, inclusive of the value chain outlined in Figure 1.

Figure 1: U.S. Agriculture Value Chain Players & Influencers



Sector Trends

The COVID-19 pandemic triggered severe public health and economic impacts on the food system. While the immediate priority remains containing the virus, long-term impacts include workplace safety, economic contraction, and supply chain disruptions. The pace of change required to react to the new COVID-19 reality was quicker than many in the sector were prepared for, and there has been a new spotlight on the necessity of resilience and flexibility within the U.S. food system as a whole. Additionally, dietary health has been put even more into the public eye as data explicitly shows increased risk of health outcomes resulting from COVID-19 when combined with dietary related comorbidities such as diabetes and hypertension.⁴

Environmental impacts such as climate change and biodiversity loss pose mega-risks to the sector and society. Even as farmers and ranchers work to reduce greenhouse gas (GHG) emissions, the effects of climate change are a reality with increases in average temperature, extreme heat conditions, droughts and other weather events affecting crop production each year. Extreme weather and extended drought conditions are already creating instability for the agricultural sector in the U.S. Biodiversity loss, meanwhile, is being driven by land use change for development across the U.S. and land management practices associated with pollution and overharvesting, while at the same time impacting the ability of farms to produce food, for instance due to widely documented native pollinator declines.^{5,6} Farmers are also experiencing changing seasonal patterns and implementing shifts in production regions for certain crops. As food production has expanded to meet growing populations, environmental impacts such as resource depletion, soil degradation, and water pollution have also increased and are likely to grow due to demand, despite the high rate of increases in efficiency.

The sector is grappling with significant economic and workforce challenges. As production costs increase and commodity prices drop, farmers and ranchers continue to take on high levels of debt and risk in the face of increasing market uncertainty and small profit margins. Rural areas continue to experience population loss to urbanization (though COVID-19 has triggered a counter-trend) and farms and food processing facilities face workforce shortages due to the relative attractiveness of other employment and despite automation reducing labor required in many sector segments.⁷ At the same time, the COVID-19 pandemic has highlighted concerns about food safety and unsafe working conditions in food processing plants.

Health-conscious consumers are driving market changes and healthy, sustainable consumption continues to grow as a trend. Consumers are expressing a desire for greater confidence in the quality, safety, nutrition and environmental aspects of their food. This has caused more consumer demand for transparency in food, with farmers and ranchers feeling pressure from others in the value chain to manage and share more data than ever before, as well as meet new standards. In response, processors are reducing or removing artificial and unhealthy ingredients from key products, reducing plastic packaging, and investing in labelling to communicate with consumers. As customers look to buy locally made products, there is a larger market opportunity for farmers and processors to sell food directly to consumers.⁸ An increasing number of customers are also interested in diversifying their protein sources and are consuming more plant-based foods that have known protein quantities.⁹ Another impact of COVID-19 was to spur increased interest in sustainable eating and lifestyles and also resulted in much more food being prepared at home, causing for some people a 'reconnection' with their food.

Mapping Results & Priority SDGs

U.S. agriculture has a role to play in contributing to all of the SDGs. It is a demonstration of the size, scale, and local nature of the food and agricultural sectors that they influence indicators in each of the SDGs in some way. It must also be noted that, while there are opportunities for the U.S. agriculture sector to reduce its negative environmental and social impacts and externalities, there is significant potential for the sector to maximize its positive impact on nature and society, and its tremendous reach gives it the potential to act on a large scale to drive positive change.

To determine the areas for the sector to prioritize for greatest action, each SDG was assessed based on U.S. agriculture's current level of positive and negative impact (on the x-axis), and this was mapped against the sector's potential to contribute to that SDG (on the y-axis). Upon an extensive literature review and with input on the status quo of agriculture among those directly involved throughout the food value chain, consensus on current efforts and potential for improvement was considered. Figure 2 below shows the results of this assessment based on the literature review and stakeholder input.



Through mapping the sector's current level of impact against the opportunities where the sector has the most potential to contribute towards the SDGs, priority areas of focus were established, encompassing seven core SDGs (Figure 3). Note, SDG 14: Life Below Water is part of the core SDGs as workshop stakeholders identified it as a key priority. Though not identified explicitly in the core SDGs, opportunities around both SDG 9: Innovation and Infrastructure as well as SDG 17: Partnerships for the Goals were cited throughout the mapping process.

Figure 2: SDG Mapping

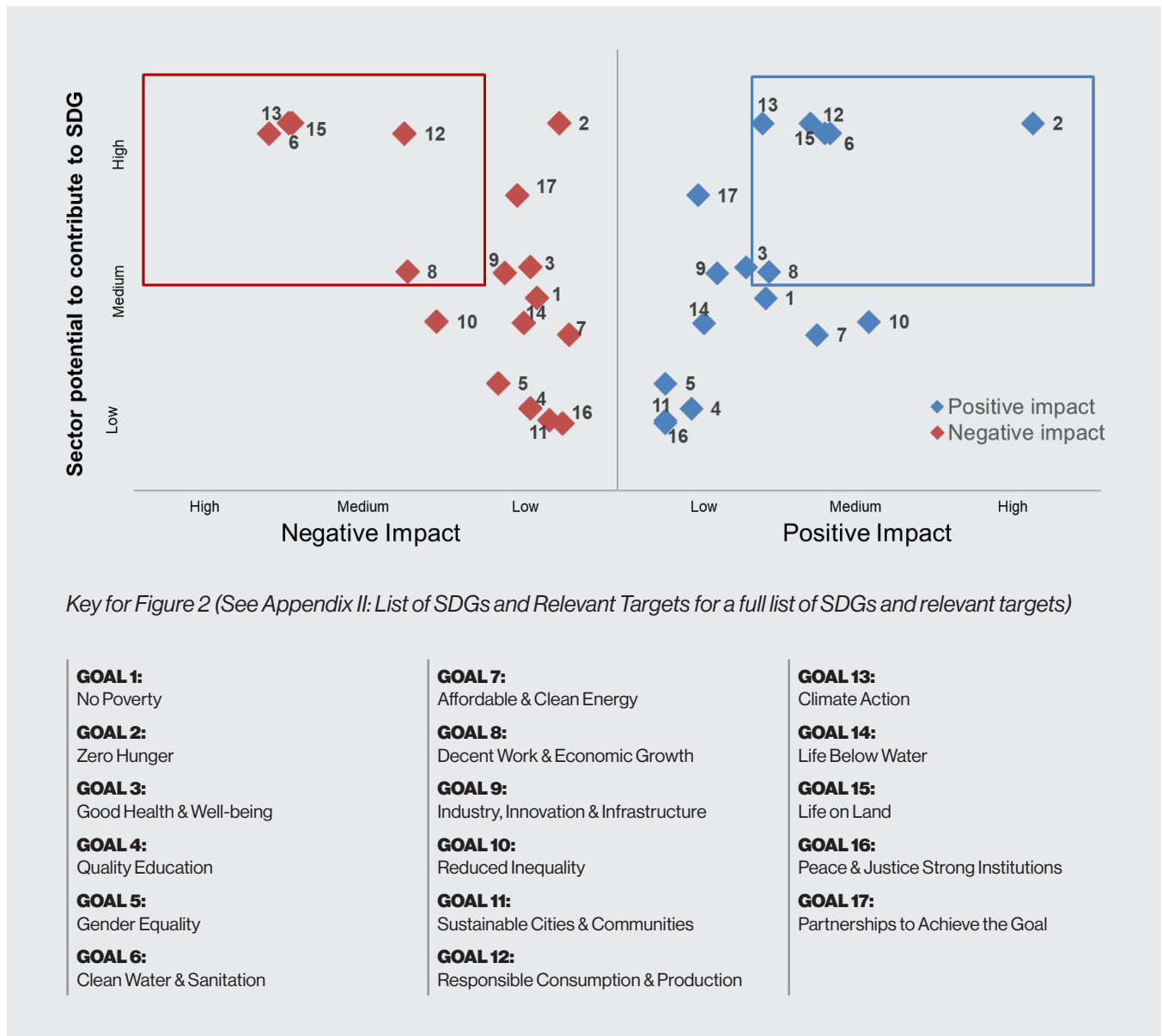


Figure 3 Core SDGs for U.S. Agriculture



Current Sector Interactions with the SDGs

“Agriculture has an impact on all 17 of these topics. These are things we are already addressing, we’re already heading down this path. This is what we’ve done and what we can continue to do. We can be a model for other countries.”

– U.S. Rancher

Core SDGs

SDG 2: ZERO HUNGER

End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Hunger and Food Security

Challenges

Despite plentiful food production and the largest food export market, food deserts and food swamps both pose challenges

to ensuring nutritious diets for all. Geographically long and complicated supply chains affect food availability and food pricing, and non-processed foods and sustainably sourced products are often more expensive than less nutritious less sustainably produced options. In a cruel irony, smaller farmers, and both farm and processing laborers, are especially vulnerable to hunger and poverty; the rural poverty rate was 16.4% versus 12.9% in urban areas in 2017.⁰

The COVID-19 pandemic that started in early 2020 in the U.S. revealed and compounded the challenges that a complex and non-agile supply chain faces in getting food to those who need it most and in minimizing food waste. As a result of the COVID-19 pandemic, an estimated 17 million more Americans will be food insecure in 2020 than in 2019.¹¹ Besides food insecurity, the pandemic has also exacerbated poor nutrition due to interruption of school meals and increased food loss on farms due to packaging and transportation challenges and reduced labor.¹ Climate change and extreme weather also continue to pose challenges for the sector.

Contributions

Food availability in the U.S. is generally high and in 2018, 88.9% of U.S. households were food secure. Ag sector output grew 170% from 1948-2015 while inputs rose only 7% over the same period, demonstrating significant increase in productivity.¹ U.S. farm productivity is higher than any other country in the world, with \$140 billion worth of American agricultural products were exported around the world.¹ The U.S. is also the largest supplier of food aid of any country in the world, donating almost 2.5 million metric tons of in kind food in 2018, along with local commodities, cash transfers and food vouchers totaling over \$3.7 billion of food assistance to other countries.¹

There are strong relationships between the agricultural sector and food banks to address hunger and food security in the U.S., with the pandemic highlighting the importance of resilience to business disruption in ending hunger and achieving food security. The Farmlink project is a student-led initiative that was started in response to the food supply chain disruption caused by the COVID-19 pandemic that serves to better coordinate food bank donations.¹ Producers and processors have also stepped up their donations since seeing their own supply build up excess food.¹ The Supplemental Nutrition and Assistance Program (SNAP) is the largest nutrition assistance program within the USDA and in 2018, reportedly help lift 3.2 million Americans out of poverty.¹

Sustainable Food Production Systems

Challenges

It can be challenging for farmers to adopt practices that also restore the environment, as low margins often mean there is little financial room to take on additional risks or frontier practices. This is compounded by the fact that around 40% of farmers rent their land as opposed to owning it,¹ and therefore do not always have control over, or benefit from, long-term planning choices which can deliver returns in the form of better soil health.

Contributions

As stewards of the environment, many U.S. farmers are already using technology and practices that protect and restore the environment, increase productivity and minimize impact. 15% of all U.S. farmland is used for conservation and wildlife habitat.²⁰ Conventional tillage has decreased 24% while conservation tillage acres have increased by 28% and no till acres have increased by 8%.²¹ In 30 years (1982 to 2012), soil erosion on cropland decreased by 44 percent.²² The GHG emissions from key livestock (milk, pork, beef) and crops (corn, cotton, rice, soy) have declined on a per unit basis since 1990 between 8% (beef) and 43% (soybeans).²³ Government subsidies for climate-smart agriculture practices, such as cover cropping, have begun to become a reality in some states.²⁴ While small scale, this is encouraging and something that could be expanded along with additional economic programs to improve environmental and financial resiliency within agriculture.²⁵

“Growers are always looking for opportunities to be sustainable. As growers, we’re looking for the next thing that’s going to make us more profitable, [that] will be efficient with our water and pesticide use – and it all centers around sustainability. It’s a generational business [so] we want to care for the environment we’re passing down.”

– U.S. Farmer



SDG 6: CLEAN WATER & SANITATION

Ensure availability and sustainable management of water and sanitation for all

Challenges

Agriculture accounts for 80% of the U.S.'s consumptive water use, and irrigated agriculture accounts for roughly half of the total value of crop sales, while clean water is a crucial input for all animal agriculture.²⁶ However, agricultural runoff has a significant impact on freshwater bodies, as does wastewater discharge from processing facilities. In the U.S., agriculture is the main source of pollution in rivers and streams, the second in wetlands, and the third in lakes, all of which can affect the availability and quality of local drinking water.²⁷ While some areas of the U.S. are water-abundant, key regions to the sector's output, such as California, are water-scarce and increasingly more areas are facing extended and severe drought periods and prolonged scarcity. Water availability, ecosystem services, and freshwater aquatic life are impacted by unsustainable withdrawal in certain regions for agricultural and other societal needs.

Contributions

Improvements in water management and precision agriculture have led to an increase in on-farm efficiency, decreased runoff, reduced pesticide use, improved crop yields, and water cost savings.²⁸ Additionally, research into improved nutrient uptake efficiency has helped to begin to decrease excess nutrient runoff.²⁹ Reuse and better containment of agricultural wastewater to generate energy has also begun to improve with technologies such as anaerobic digestors and covered lagoons becoming more commonplace.³⁰

SDG 8: DECENT WORK & ECONOMIC GROWTH

Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent for all

Challenges

The economic benefits of the sector are not shared equally across the value chain. In 2018, 8 cents of each food dollar expenditure went to farm production, while the rest of the dollar covered costs from processing, wholesale, packaging, distribution, retail, and other value chain players.³¹ Farmers and ranchers are caught in a price-cost squeeze due to low profit margins and high levels of risk, often experiencing economic stress and significant levels of debt. As a sector, farmers are increasing the amount of debt they carry, rising from \$385 billion in 2018 to \$409 billion in 2019.³² The pandemic is expected to continue to affect employment opportunities. As more automation is introduced there will likely be large-scale impacts to job prospects, though this may help farmers struggling with current labor shortages.³³



There are also concerns around labor practices, safe working conditions, and human rights, particularly as roughly half of hired crop farmworkers are estimated to be undocumented in the U.S.³⁴ and as most farmworkers are exempted from the Fair Labor Standards Act. Primary human rights concerns for agricultural companies include child labor, excessive hours with low wages, and human trafficking.³⁵ The rate of fatal work-related injuries among agricultural workers is seven times higher than the rate among workers overall, and two times higher than that for construction workers and those employed in the mining industry.³⁶ Though the number of work-related injuries has declined and the percentage of working children in agriculture is small in the U.S., the majority of the country's work-related child fatalities were in the agricultural sector.³⁷

Contributions

There are over 2.1 million farms and ranches in the U.S. and they steward two out of every five acres of the country's land.³⁸ A total of 15% of US employment was in the agriculture and food sector, consisting of 46 million jobs.³⁹ In 2017, agriculture, food, and related industries contributed roughly a fifth of the country's economic activity, paying wages of \$2.96 trillion dollars⁴⁰ and fueling economic growth in rural and urban areas.

Investment in agriculture and rural economies has a multiplier effect on rural and urban economies and also generates ecosystem benefits. A University of California - Berkeley study found that every dollar spent to protect working rangeland returned \$3.43 on the investment in ecosystem benefits.⁴¹

**“How do we make the food system – inclusive of the farmer and rancher world – more equitable?
There is a conversation that needs to be had around social protections.”**

– U.S. Food Processor





SDG 12: RESPONSIBLE CONSUMPTION & PRODUCTION

Ensure sustainable consumption and production patterns

Challenges

While sustainable production practices are already utilized by many in U.S. farming and ranching, certain unsustainable production practices remain common and there is an opportunity to expand, adapt and scale best practices across the range of sub-sectors and varying environmental conditions throughout the country. Most significantly, the current state of food loss and waste in the U.S. is substantial, with an estimated 30-40% of the food supply becoming food waste.⁴² While most waste is concentrated at the consumer end, food loss occurring on farms is significant in some sub-sectors and waste exists at every stage of the value chain including processing, transport, and retail. Consumer products packaging, of which a sizable amount is food and beverage packaging, made up 30% of municipal solid waste generated in 2017.⁴³

Contributions

Farmers and ranchers across the U.S. are changing how they do certain things in an effort to reduce food loss on farms. These include reducing overproduction, using drought-resistant seed varieties and multi-cropping to mitigate weather risk, using technology to track and reduce loss, directing food that is not salable to people to animal feed, and finding ways to ensure that farm labor is available when needed.⁴⁴ A range of innovative companies focused on selling consumers ‘ugly’ fruits and vegetables have been able to minimize food waste while also providing farmers and ranchers with new sources of income.⁴⁵ While food quality date labels are not federally regulated outside of infant formula,⁴⁶ there has been both industry association and governmental support to voluntarily utilize the phrasing “best if used by” or to be more prudent about labeling perishable foods accurately with “best by” or “freeze by” dates.^{47, 48} During the COVID-19 pandemic, when the mismatch between channels food was packaged for and the channels people could use to access food was creating massive food losses and simultaneous food insecurity, farmers and ranchers worked together with the value chain and USDA to reduce food waste and direct food to programs that could distribute it to people who needed it.^{49, 50} Farmers, ranchers and food companies are also working on reducing packaging waste through improving recyclability, strengthening recycling systems, using more reusable packaging and circular packaging services, and using innovative materials.

SDG 13: CLIMATE ACTION

Take urgent action to combat climate change and its impacts

Challenges

In 2018, the U.S. agriculture sector accounted for 9.9% of total U.S. greenhouse gas (GHG) emissions, with soil management contributing the highest amount of emissions.⁵¹ Digestive processes from livestock, particularly ruminants, is a close second and manure management is the third most significant, the latter representing 12% of the sector's GHG emission contributions and the only component that has shown significant growth in the recent past.⁵² Additional impacts across the value chain result from manufactured inputs such as synthetic fertilizer, processing plants, transport, and retail. Farmers and ranchers, who rely on weather, were effectively on the front lines of climate adaptation. More frequent and more severe extreme weather caused billions of dollars of damage to farms and ranches.⁵³

Contributions

There is a growing body of scientific research demonstrating that U.S. agricultural soils have the potential to sequester enough carbon each year to more than offset the sector's GHG emissions.⁵⁴ Climate-smart agriculture practices that improve soil health include cover crops; crop rotation; compost application; managed grazing; and integrated crop and livestock systems. In the value chain, many food and ag companies are setting targets to dramatically reduce their emissions, including partnering with farmers and ranchers to reduce their emissions. Fortunately, U.S. agriculture has already been trending in the right direction. According to the World Resources Institute's GlobAgri-WRR Model, agriculture is projected to increase emissions at a much smaller rate compared to all other sources of GHG emissions in a "business as usual" scenario that accounts for current trends in improvements leading up to the year 2050.⁵⁵ While the primary sources of emissions still stem from animal agriculture, a decrease in consumption of animal food products, globally, is not likely.⁵⁶ However, a combination of smaller, methodical improvements in areas like pasture livestock and productivity, crop yield efficiency, soil management, natural ecosystem protections, manure management, technological innovations in enteric fermentation, fertilizer uptake efficiency, utilization of non-fossil fuel based energy sources, reductions in food loss and waste and other dietary shifts could reduce projections for GHG emissions by more than two thirds from the current trajectory according to this model.⁵⁷

SDG 14: LIFE BELOW WATER

Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Challenges

Nutrient runoff from land-based farming affects marine water bodies such as oceans, with impacts including algal overgrowth and dead zones due to eutrophication.⁵⁸ Some production systems for marine aquaculture can also have negative environmental impacts including the release and accumulation of antibiotics, antifoulants (including heavy metals), parasiticides, and excess nutrients from fish waste in the marine environment.⁵⁹ There can also be impacts on the ecosystem through escapes and the introduction or magnification of pathogens.⁶⁰

Contributions

Best Management Practices for nutrient management have enabled significant reductions in nutrient runoff to waterways.^{61, 62} Several states have created programs to provide financial support to farmers to implement practices that reduce runoff. The EPA's Chesapeake Bay programs has succeeded in restoring the water quality to the highest in 30 years⁶³ and this is just one example. Marine aquaculture currently makes up 21% of seafood and fishery production in the U.S. by value and is a growing food production sector that supports human health, employment, and global food security.⁶⁴ Between 2009 and 2014, marine aquaculture production increased at an average of 3.3% per year.⁶⁵ There is evidence of the role restorative aquaculture can play in developing and conserving marine habitats. Cultivation of bivalves and seagrasses provides a number of ecosystem services including improved water quality and carbon sequestration.⁶⁶

SDG 15: LIFE ON LAND

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Challenges

Issues like land-use change and land degradation, pollution, invasive alien species proliferation, and other environmental conditions are affecting crop and livestock production systems and causing localized problems like soil erosion and degradation, ecosystem stress, nutrient accumulation, and increased and varied pests.

Contributions

Agricultural production accounts for over half of U.S. land use, with just under half of U.S. land being used for crop land and grassland pasture and range, and then another 6% in grazed forestland.⁶⁷ The sector is already working to improve ecosystem benefits. For example, more than 15% of U.S. farmland is used for conservation and wildlife habitat improvement, and since 2012, soil health efforts have increased by 17%.⁶⁸ Farmers are encouraging biodiversity and soil health through practices like conservation tillage, planting cover crops, incorporating buffer strips, and utilizing less productive areas of land within, near and alongside fields for wildlife.⁶⁹

“The agricultural sector needs to come together with environmental and health communities to talk about solutions and what we can do for each other. We have the same wants and goals – better soil, cleaner water, and cleaner air.”

– Biofuel Producer



Supporting SDGs

SDG	Challenges	Contributions
<p>SDG 1: No Poverty <i>End poverty in all its forms everywhere</i></p>	<p>Not all farm workers or farmers earn enough for a decent standard of living. Most farmers receive off-farm income and smaller farmers are especially vulnerable to poverty and depend on off-farm income for a living.</p>	<p>Investing in agriculture has a multiplier effect throughout rural economies as farmers spend money and employ people in their communities.⁷⁰</p> <p>The gap between rural and urban poverty rates has narrowed over the last ten years, as rural poverty has declined faster than urban poverty.⁷¹</p>
<p>SDG 3: Good Health and Well-being <i>Ensure healthy lives and promote well-being for all at all ages</i></p>	<p>Consumer Health Nearly 48 million people get are sickened by domestically acquired food-borne illnesses in the U.S. each year both from known pathogens and unspecified agents.⁷² The risk of exposure to food-borne illness from pathogens like Salmonella and <i>E. coli</i> can be minimized through use of best management practices on farms.</p> <p>Worker Health Farmers and ranchers in particular grapple with economic and emotional stress from rural isolation and low profit margins, compounded by a lack of connectivity and low accessibility to physical and mental health services.⁷³ Poverty and financial struggle is also associated with poor diets and long-term health issues.</p>	<p>Consumer Health A healthy diet is a main determinant of health. Proper nutrition is connected to immune system strength and lower rates of the biggest preventable health problems in the U.S., such as obesity and diabetes.⁷⁴</p> <p>Worker Health While government policies related to farmworker health are still limited or when present, not enforced, third party audits from non-profits such as the Equitable Farm Initiative have helped to ensure that worker health is ensured on farms.^{75, 76} With the ongoing COVID-19 pandemic, many state and local governments have activated programs to help improve PPE on farms, ensure more access to handwashing stations, promote smaller working cohorts and provide free testing among workers.⁷⁷</p>
<p>SDG 4: Quality Education <i>Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all</i></p>	<p>Migrant farm workers are skilled laborers but typically have little access to formal education. Rural populations often face limited access to educational resources and institutions due to rural isolation and poor broadband coverage.</p>	<p>Various institutional, government and non-profit programs support ongoing training and education for new and existing farmers and ranchers.⁷⁸</p>
<p>SDG 5: Gender Equality <i>Achieve gender equality and empower all women and girls</i></p>	<p>Gender equality among farmers and ranchers is still lacking, and institutional barriers still exist, such as discrimination in farm loans.⁷⁹ Issues like adequate parental care policies and poor gender diversity in leadership are present throughout the sector.</p>	<p>Women are a growing share of the agricultural workforce. In 2019, 36% of farmers were female, a 27% increase from 2012.⁸⁰</p>

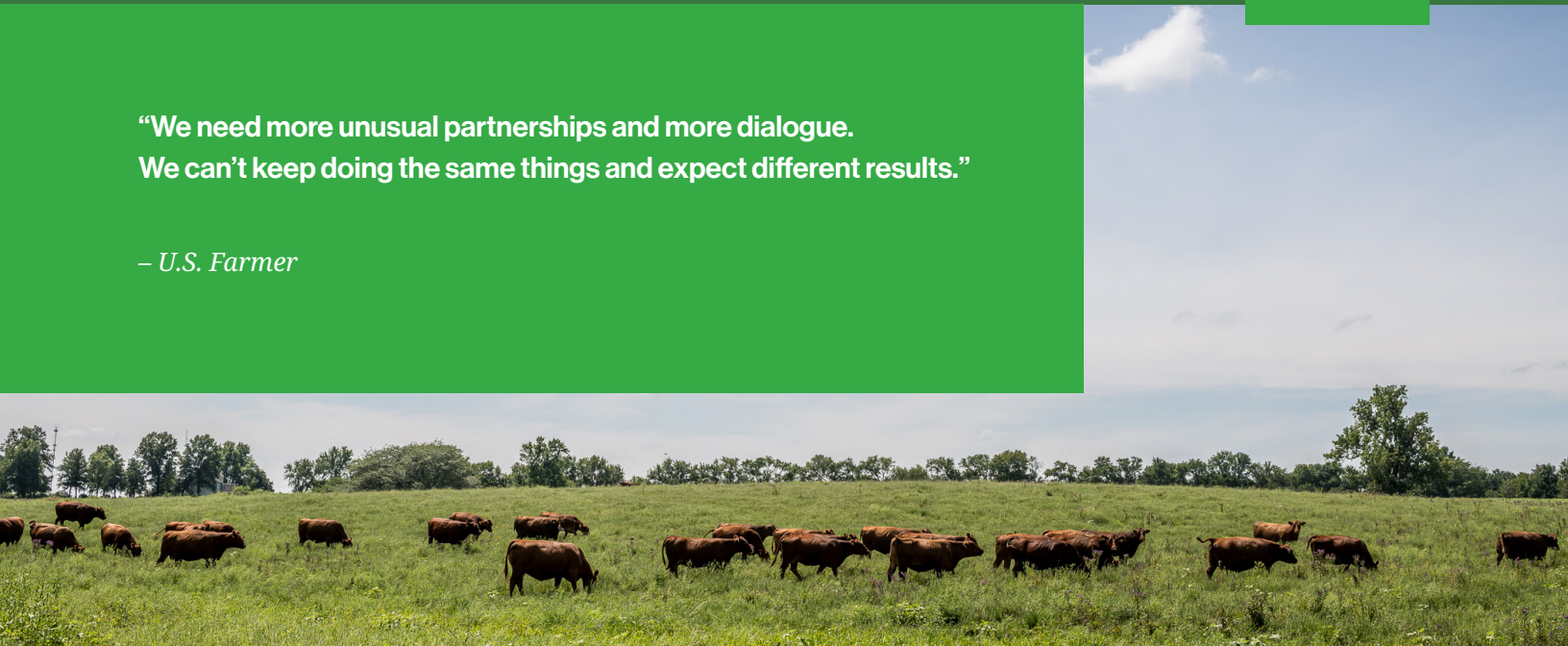
<p>SDG 7: Affordable and Clean Energy</p> <p><i>Ensure access to affordable, reliable, sustainable and modern energy for all</i></p>	<p>Biogas systems that utilize anaerobic digestion to create energy are not yet widely used in the U.S.,⁸¹ though an estimated 8,000 livestock farms in the U.S. have the potential to host biogas systems with a total estimated output of 13.1 billion kWh per year.⁸² This represents a significant potential contribution if the systems can be put in place to harness this energy.</p>	<p>Farmers produce, utilize and store renewable energy through managing renewable energy infrastructure on their land such as solar panels and wind turbines, growing biofuel crops, and operating anaerobic digesters in livestock operations. In 2017, 6.5% of U.S. farms had renewable energy systems, up from 2.7% in 2012.⁸³ Between 2002 and 2019, USDA made 6,179 investments in solar energy worth US\$2.93 billion, and 696 investments in wind worth US\$468 million, and 631 investments in anaerobic digestion worth US\$198 million.⁸⁴ Biofuel from agriculture provides a major economic output as well as an important source of energy.</p>
<p>SDG 9: Industry, Innovation and Infrastructure</p> <p><i>Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation</i></p>	<p>There is some real-time data sensing used across the value chain, though farmers still face burdens with data management. Challenges such as availability of broadband across rural areas and lack of trust related to data ownership in the value chain has stunted adoption of available technologies. Most recently, the COVID-19 pandemic has highlighted the lack of transparency in the supply chain compared to other industries. In addition to the challenges conventional commodity markets might face, organic commodities face challenges such as achieving economies of scale, preventing cross contamination through segregated storage, and transportation.⁸⁵ Scientific research has long supported the agricultural community, though there is an ongoing need for additional research and additional domestic technology development to improve supply chain resiliency.</p>	<p>Innovations in agricultural operations and precision technology have driven productivity increases, enabling continued production growth despite a decline in land and labor used.⁸⁶</p>

<p>SDG 10: Reduced Inequality</p> <p><i>Reduce inequality within and among countries</i></p>	<p>Farmers and ranchers in the U.S. are still predominantly White (95%). Statistics about other types of diversity in agriculture, such as participation by LGBTQ-identifying people, are not available.</p> <p>There is a trend of consolidation toward fewer larger farms, and the number of new farmers decreased.⁸⁷ Workers along the agricultural value chain are disenfranchised in certain communities, and workers in the food system may take home poverty-level wages, feeding into large-scale inequity and inequality.⁸⁸ There are also racial disparities in access to healthy food as well as inequalities felt throughout the value chain. In 2018, food insecurity was prevalent in Hispanic and Black, non-Hispanic households at nearly double the rate of White, non-Hispanic households.⁸⁹</p>	<p>The number of principal operators who were Hispanic (3.3%), Native American (1.7%), African Americans (1.3%) or Asian (0.6%) increased from 2007 to 2017.⁹⁰</p>
<p>SDG 11: Sustainable Cities and Communities</p> <p><i>Make cities and human settlements inclusive, safe, resilient and sustainable</i></p>	<p>U.S. agricultural supply chains are geographically disparate, and farmland is often far from urban population centers where most products are consumed.</p>	<p>Urban agriculture is expanding and providing a variety of products that complement rural farming and ranching production, as well as increasing engagement with and access to food and green space in low-income communities.</p>
<p>SDG 16: Peace and Justice Strong Institutions</p> <p><i>Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels</i></p>	<p>Disparities in access to justice do exist across the workforce in the sector.⁹² Existing regulations provide legal protections for undocumented workers in the sector, but their status often means a lack of legal protection in practice due to both the real and perceived risks associated with appealing to government institutions.⁹³</p>	<p>The sector's contribution to food security and resilient supply chains are vital in preventing and managing conflict as well as social and economic disruptions.⁹⁴</p>
<p>SDG 17: Partnerships to achieve the Goal</p> <p><i>Strengthen the means of implementation and revitalize the Global Partnership for sustainable development</i></p>	<p>There are many NGOs, academic institutions, and companies in the food and agriculture sectors. Given the wide range of efforts underway, positive outcomes could be enhanced through greater collaboration and partnership to achieve solutions at scale.</p>	

Impact Opportunities and Challenges

“We need more unusual partnerships and more dialogue.
We can’t keep doing the same things and expect different results.”

– U.S. Farmer




PEOPLE

Build and empower the workforce

Expand and share value and risk more equitably throughout the value chain

Address food insecurity and enable healthy and sustainable consumption

1 NO POVERTY	2 ZERO HUNGER	3 GOOD HEALTH AND WELL-BEING	4 QUALITY EDUCATION
5 GENDER EQUALITY	8 DECENT WORK AND ECONOMIC GROWTH	10 REDUCED INEQUALITIES	12 RESPONSIBLE CONSUMPTION AND PRODUCTION



PLANET

Accelerating climate change action

Protect wild and working lands and their benefits for wildlife and biodiversity

Conserve water resources

6 CLEAN WATER AND SANITATION	7 AFFORDABLE AND CLEAN ENERGY	13 CLIMATE ACTION	14 LIFE BELOW WATER
15 LIFE ON LAND	17 PARTNERSHIPS FOR THE GOALS		



PROCESS

Enhance and scale the existing responsible management of agricultural systems and eliminate waste

Enable scale and collaboration through research, data management, and transparency

8 DECENT WORK AND ECONOMIC GROWTH	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	10 REDUCED INEQUALITIES	11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION	17 PARTNERSHIPS FOR THE GOALS		

Build & Empower the Workforce

The food and agriculture sector employs 15% of the U.S. workforce, and indirectly underpins significant employment in the U.S. and globally beyond that. While the industry faces a variety of social stresses – including labor shortages in processing and on-farm work, an aging farmer population, racial inequity, lack of educational opportunities, exclusion from labor law protection, low accessibility to health and mental health services, and minimal social protections for migrant workers – it also presents significant potential to expand and improve employment opportunities, including for people from disadvantaged groups. The occupation of farming and ranching today requires significant knowledge and technical expertise, making both hands-on and classroom educational opportunities critical to supporting the growth and development of the future agricultural workforce. Due to the COVID-19 pandemic there was an immediate focus on ensuring the health and safety of workers throughout the value chain, which included providing workers with personal protective equipment (PPE), staggering schedules to minimize exposure, and providing testing on-site. Potential future workforce impacts are expected to include increased automation in production (with both pros and cons for laborers) and regionalization of production to increase resiliency.

EXAMPLES IN ACTION:

- A number of existing groups and programs support diversity, equity and inclusion in agriculture. Groups like MANRRS, Together We Grow, and others supported racial and ethnic minorities in agriculture. There were also organizations focused on women, indigenous people, the LGBTQ community, and veterans.
- Health care, human rights and other protections were the focus of groups like various farmer and food worker unions or coalitions, universities and university extension services, the National Center for Farmworker Health and the Polaris Project. In one example, Farm Credit, American Farm Bureau Federation and National Farmers Union partnered on a program to train individuals who interact with farmers and ranchers, providing them with the skills to recognize the high levels of stress affecting America's farmers and ranchers
- Workforce development organizations included youth-focused groups such as 4-H and FFA, new farmer support programs through the government and non-profits, and groups ensuring access to education and training opportunities such as Agriculture Future of America. There were also educational resources such as universities, university extension services, technical colleges, and other educational programs.
- To ensure safe working conditions, Idaho Dairymen's Association and Idaho Milk Processors Association partnered up to implement trainings on farms and processing facilities.
- WBCSD's program on the Future of Work established principles for "people-centered technology transformation," with the objective of putting people at the heart of the future of work.

Opportunities	Key Players (See Figure 1)
Strengthen existing support systems and, where needed, create new ones to ensure and improve the well-being of farmers and people working on farms and in processing facilities.	Farmers and ranchers, processors, government, NGOs
Build cross-system partnerships to expand and enhance opportunities for education and training across the food and agriculture sectors.	Farmers and ranchers, processors, retail, finance/ funders, academia/ science, NGOs
Invest in programs to support racial and gender equity throughout the sector and within rural communities. Address systemic discrimination and barriers to entry for women and non-white members of the sector, particularly related to land ownership and access to credit.	Finance/funders, government, NGOs, academia/science, other

Expand & Share Value & Risk More Equitably Throughout the Value Chain

The average return of value to farms for every dollar spent on food rose from 7.7 to 8 cents in 2018, the first year-to-year increase since 2011.⁹⁵ However, food processing companies receive 14.9 cents on the dollar, nearly double compared to farm production value.⁹⁶ Food companies have increasingly set ambitious goals for climate mitigation and biodiversity improvements requiring farmers to adapt management practices and bear the majority of the financial risk. The COVID-19 pandemic has intensified pre-existing economic pressures on farmers and farmworkers, and there has been a disproportionate impact on vulnerable groups such as workers living below the poverty line. Economic and social challenges in the value chain include a high debt-to-income ratio for farm businesses, unsafe working conditions on farms, low prices and unstable pricing for farmers and ranchers. Farmers continue to increase productivity, increase sustainability, and respond to new customer demands without financial safety nets. Farmers renting land face challenges in aligning management practices with stewardship and conservation as they may not see returns on investment during their lease.

There is an opportunity for sector collaboration and greater investment in agriculture to drive economic growth and social resilience in farming communities as well as respond to shifting consumer demands through more shared investments in responsible agricultural practices. One approach would be to aggressively address the challenges of food loss and waste and ‘perverse incentives’ in some agricultural policies, which make the system inherently inefficient and less profitable. Another opportunity is to build on the existing Natural Resources Conservation Service (NRCS) program and smaller scale private initiatives to create alternative revenue streams through investment mechanisms and public and private ecosystem services credits markets.

EXAMPLES IN ACTION:

- USFRA’s report “Transformative Investment in Climate-Smart Agriculture” details 19 different financial mechanisms and 6 examples of enabling infrastructure to illustrate new and emerging concepts for sharing risk and providing access to capital.
- Danone North America launched an impact investing partnership with Replant Capital to support farmers’ expenses related to organic or restorative conversion.⁹⁷
- Pipeline Foods provides 2 to 10-year offtake contracts for all marketable crops in a multi-year cycle for organic growers, enabling them to access lower cost capital and reduce their risk.⁹⁸
- “Ugly” produce businesses such as Misfits Market and Imperfect Foods aimed to provide farmers and ranchers with additional revenue streams while reducing food loss and waste.
- Organizations like Slow Money provide 0% loans for local, organic farms and small food enterprises.⁹⁹

Opportunities	Key Players (See Figure 1)
<p>Financially empower farmers and ranchers, with the parallel objective of revitalizing rural communities.</p> <ul style="list-style-type: none"> • Create new mechanisms to distribute risk and reward between farmers and the rest of the supply chain • Use innovative financial mechanisms and environmental outcomes to attract investment to agricultural businesses and communities • Provide support to farmers expanding into new products and market 	<p>Farmers and ranchers, processors, retail, finance/ funders</p>
<p>Empower people who work on farms and in processing plants through payments and benefits that provide a decent standard of living.</p>	<p>Farmers and ranchers, processors</p>
<p>Create and scale new ways to recognize and reward strong environmental and social stewardship by farmers and ranchers, for instance:</p> <ul style="list-style-type: none"> • Through premiums/labelling • Programs through processors / CPGs that reward farmers for climate-smart practices and carbon sequestration on their operation • Build out ecosystem services credits markets, effectively paying farmers and ranchers for sequestering carbon on their operations 	<p>Finance/ funders, processors</p>
<p>Improve rural broadband and other data and technology infrastructure so farmers can access more resources and implement existing technologies.</p>	<p>Finance/ funders, NGOs, Other</p>



Address Food Insecurity & Enable Healthy & Sustainable Consumption

“We need to get the cost of more sustainable products more in line with conventional products, otherwise it will remain a category only the wealthier can afford to buy regularly.”

– U.S. Food Retailer

A key challenge in addressing food security and improving dietary habits is access to and affordability of healthier foods in both urban and rural communities, particularly as a lack of healthy options is linked to diet-related health conditions. Research has shown that investing \$1 in nutritious food has a \$16 return on investment in terms of public health outcomes.¹⁰⁰ The COVID-19 pandemic has increased public awareness of the impacts and challenges associated with supply chain management and access to nutrition. For instance, even when a sufficient food supply exists, or supplies are increased due to greater production, food may end up becoming loss or waste. Fifty-two million tons of food is wasted in the U.S. every year, which accounts for 18% of cropland production.¹⁰¹ While food insecurity has increased as a result of the COVID-19 pandemic, the sector has the potential to expand food security, improve public nutrition, and nudge consumers toward more healthy and sustainable consumption behavior.

EXAMPLES IN ACTION:

- California Farm to School Program: local food procurement program which ties healthy food access and nutrition education to urban school districts, and connects California agriculture to local consumers.
- The Supplemental Nutrition Assistance Program was recognized as being effective not only in alleviating food insecurity¹⁰² but was also a driver of economic health, as SNAP benefits are immediately reinvested in the economy, with a disproportionate effect on rural economies.¹⁰³
- Organizations such as ReFed and companies such as Food Maven were working to address systemic drivers of food loss and waste.
- Chile implemented front-of-package warning labels for foods high in calories, high in fat, and high in sugar. This initiative has both shifted consumer behavior and caused food companies to reformulate products in order to avoid having to use the label.¹⁰⁴
- Various organizations (for example, the Robert Wood Johnson Foundation) and government agencies (for example, the FTC, CDC, USDA and FDA in a joint report) have recommended voluntary guidelines for food and beverage companies to use when marketing to children.

Opportunities	Key Players (See Figure 1)
<p>Expand access to and affordability of healthy foods.</p> <ul style="list-style-type: none"> • Scale urban agriculture to supply fresh produce close to population centers • Scale programs working to eliminate food deserts in both rural and urban areas • Partner with healthcare and other sectors to scale up programs that promote preventative healthcare through better nutrition • Support stronger regional supply chain development to reduce time-to-market to increase freshness and nutrition content • Strengthen connections and collaboration between farmers and ranchers and food banks 	<p>Farmers and ranchers, processing, retail, academia/science, NGOs, gov. agencies</p>
<p>Build markets for and raise a greater diversity of food crops, including grains, beans, tubers and pulses, in order to increase supply chain resiliency, improve soil health, support security of the food supply at stable pricing and improve access to nutritious foods.</p>	<p>Farmers and ranchers, processing, academia/science</p>
<p>Continue to drive an increased demand for sustainable, nutritious options.</p> <ul style="list-style-type: none"> • Educate consumers through engagement with dietitians, labelling and marketing • Develop economies of scale to lower costs for healthier food • Improve access to nutritious and/or sustainable products and production practices (e.g. not only at higher end grocery stores) 	<p>Packaging, retail, NGOs, media/comms</p>
<p>Support nutritious diets, especially in younger generations.</p> <ul style="list-style-type: none"> • Reduce unhealthy components of products such as sugar and sodium • Increase product nutrient-density • Provide transparent information about nutrition • Responsible marketing and labeling of those products 	<p>Processors</p>

Accelerate Climate Action

With a clear need to build greater resiliency in the supply chain, there is significant potential for the agricultural sector to provide climate solutions and mitigate its own contribution to GHG emissions. This includes intersecting opportunities to bank carbon in soils, improve water quality and quantity, increase biodiversity, generate ecosystem services and grow the bioeconomy. Climate-smart practices have already contributed to mitigation efforts and healthy soils have proven to result in higher crop yields, enhanced carbon sequestration, and greater resilience to flood and drought.¹⁰⁵

While there have been some temporary environmental benefits and short-term reductions in GHG emissions due to COVID-19,¹⁰⁶ the pandemic has caused a reduction in energy prices, which is expected to reduce incentives for renewables in the medium- to long-term. There has also been pressure to reduce

environmental safeguards. Despite these setbacks, American farmers and ranchers are already providing valuable climate and ecosystem benefits and can expand this role to actively solve the climate crisis. Part of this process includes continuing to share best practices and funding more research into innovations in order to expedite industry-wide improvements.

EXAMPLES IN ACTION:

- The Ag Climate Partnership, a joint effort between US Farmers and Ranchers in Action, the World Farmers’ Organization, and the Foundation for Food and Agriculture Research, aims to mobilize farmers, ranchers and scientists around the world to better leverage research and data to enable the agriculture sector to be net negative by 2030.¹⁰⁷
- Bayer joined companies such as Indigo Ag and Nori when it launched its Carbon Initiative, a pilot program to pay American and Brazilian farmers to capture carbon in cropland soils.¹⁰⁸ Cargill was also piloting an approach to leverage outcomes payments to channel capital to farmers to implement climate-smart practices called the Soil and Water Outcomes Fund.
- The Ecosystem Services Market Consortium (ESMC) is working to launch a fully functioning national scale ecosystem services market conceived and designed to sell both carbon and water quality and quantity credits for the agriculture sector by 2022.
- White Oak Pastures was able to integrate regenerative grazing practices onto their livestock operation and conducted a life cycle assessment to prove that they are net carbon negative in emissions.¹⁰⁹

Opportunities	Key Players (See Figure 1)
<p>Capture greater market value for climate-smart land management.</p> <ul style="list-style-type: none"> • Address the barriers to uptake of climate-smart agricultural practices • Advocate for public and/or private financial incentives for using climate-smart practices • Address the carbon impacts of animal protein, for example, through different feed and best management practices 	<p>Inputs, farmers and ranchers, processing, academia/ science, gov. agencies, NGOs, finance/ funders, other</p>
<p>Expand renewable energy production on farms.</p> <ul style="list-style-type: none"> • Farm land alongside solar PV panels and wind turbines • Use waste products and biomass to produce renewable energy. • Help decarbonize other sectors such as transport through agricultural biofuels 	<p>Finance/ funders, Other (including energy companies)</p>
<p>Transition toward a bioeconomy by using primarily renewable resources from the surface of the earth.</p>	<p>Inputs, farmers and ranchers, processing, academia/ science, trade organizations</p>



Protect Wild & Working Lands & Their Benefits for Wildlife & Biodiversity

Cross-sector challenges such as land-use change, land degradation, pollution, invasive alien species, and degrading habitats are stressing ecosystems and affecting genetic diversity. There has been recent pressure to reduce ecosystem safeguards. For example, the EPA announced an enforcement discretion policy, suspending enforcement of environmental regulations during the COVID-19 pandemic.¹¹⁰ Globalization and the destruction of wildlife habitats facilitate the rapid spread of viruses, such as COVID-19, around the world, and embedding ecosystem resilience is vital for keeping the planet and its people healthy and fed. There is an opportunity to align U.S. agriculture production practices and land management with natural ecosystems to provide expanded habitat for wildlife and support biodiversity.

EXAMPLES IN ACTION:

- The Honey Bee Health Coalition seeks to “collaboratively implement solutions that will help to achieve a healthy population of honey bees while also supporting healthy populations of native and managed pollinators in the context of productive agricultural systems and thriving ecosystems.”¹¹¹
- USA Rice Federation and Ducks Unlimited created the Rice Stewardship Partnership to strengthen the natural partnership between rice agriculture and waterfowl conservation.¹¹²
- General Mills has committed to advance restorative agriculture practices on one million acres of farmland by 2030.¹¹³
- USDA’s Natural Resources Conservation Service has a number of programs to protect and conserve both wild lands and agricultural lands. For example, the Agricultural Conservation Easement Program (ACEP) “helps landowners, land trusts, and other entities protect, restore, and enhance wetlands, grasslands, and working farms and ranches through conservation easements.”¹¹⁴ Additionally, the Conservation Reserve Program (CRP) provides a yearly rental payment for farmers to remove environmentally sensitive land from production and plant long-term resource-conserving vegetative species.¹¹⁵

Opportunities	Key Players (See Figure 1)
Scale agricultural practices that restore the environment and maximize positive impacts on land, water, air, and biodiversity alongside the economic value of output.	Inputs, farmers and ranchers, processing, academia/ science, funders/finance
Conserve and legally protect wild land and working land from land-use change and unsustainable development, and work to create contiguous corridors of green space to support wildlife and biodiversity.	Farmers and ranchers, gov. Agencies, NGOs, funders/finance
Scale effective partnerships between conservation organizations and agricultural organizations.	Farmers and ranchers, NGOs, funders/finance
Leverage existing and emerging technologies to enable and optimize agricultural practices to best support wildlife and biodiversity on and near agricultural lands.	Farmers and ranchers, ag-tech providers
Conduct and disseminate research on the “win-win” approaches (practices, agreements, partnerships, policy, funding mechanisms) for wild and working lands.	Academia/science, farmers and ranchers

Conserve Water Resources

While some regions of the U.S. are water-abundant, increasing areas are facing extended and severe drought periods and prolonged water scarcity. While this opportunity encompasses impacts on marine and coastal water resources, impacts on freshwater bodies are especially significant and both water availability, ecosystem services and freshwater aquatic life is impacted by unsustainable withdrawal in certain regions for agricultural and other societal needs. Water reliability and access is key to maintaining and growing secure food systems. U.S. agriculture has the opportunity to adapt water use and nutrient management practices to maximize water efficiency and minimize total water use by the sector, help contribute to ‘good’ water quality ratings in coastal and freshwater bodies,¹¹⁶ and improve and expand habitats for life under water.

EXAMPLES IN ACTION:

- Relatively recent innovations in irrigation include “raindrop mimicking” technology that finds the sweet spot of size, pressure and spray pattern; technologies enabling a shift in thinking from the productivity per drop of water to the profitability per drop of water, which optimizes water use and cost; technology that integrates data from a range of sensors, imaging equipment, weather stations and other sources to enable more informed irrigation; and chemistry adjustments which can maximize the effectiveness of the water used.¹¹⁷
- The EPA has validated a series of techniques ranging from planting buffer crops, to nutrient efficiency strategies and conservation tillage and drainage practices that can all be implemented today¹¹⁸ and NRCS provides matching grant funding to support the implementation of these practices.
- The Chesapeake Bay Program has led not only to increased water quality but also sustained crop yields, restored rivers and streams, and valuable insect, bird and animal habitat.¹¹⁹

- Several municipalities are implementing direct potable reuse systems to effectively recycle water by treating wastewater to meet drinking water standards. Indirect potable reuse systems use treated wastewater to recharge lakes, rivers, or groundwater/aquifers for withdrawal later.¹²⁰

Opportunities	Key Players (See Figure 1)
Fund and scale programs that support implementation of water management plans, with an emphasis on water-scarce regions.	Farmers and ranchers, academia/ science, ag-tech, funders/finance, government
Fund and scale programs that address water quality impacts in both fresh and saltwater bodies through nutrient management plans and other effective strategies.	Farmers and ranchers, academia/ science, ag-tech, funders/finance, government
Create / scale financing mechanisms (public and/or private capital) to support adoption of innovation technologies and strategies that enable water quality/ quantity improvements.	Farmers and ranchers, processors, academia/science
Invest in applied research for drought-resistant crops.	Finance/ funders, academia/ science
Expand restorative aquaculture practices in fresh and saltwater bodies to rebuild ecosystems and improve water quality.	Farmers and ranchers, academia/ science

Enhance & Scale the Existing Responsible Management of Agricultural Systems & Eliminate Waste

Current food loss in the field and food waste by consumers is significant. Food waste can also occur in transport, storage, and retail. Supply chain disruptions due to COVID-19 have led to a notable increase in food waste. There has been an increased trend toward sustainable packaging – packaging which seeks to minimize packaging waste without increasing food loss or waste. While hampered by the pandemic and concerns about food safety, we believe this will continue to be a focus for companies and consumers. Recognizing that sustainability measures are not one size fits all, the sector has the opportunity to implement biological and technical solutions for these waste issues, while keeping in mind the right blend of performance, cost, and safety.

EXAMPLES IN ACTION:

- ReFed works with stakeholders across the system to solve the food waste problem in the U.S. ReFed’s Roadmap to Reduce U.S. Food Waste, a first-of-its-kind economic analysis, showed that solutions already exist to cut food waste by 20% nationwide, and 27 of the best opportunities are detailed in an effort to make it easier for stakeholders across the food supply chain to meet the national 50% reduction goal by 2030.¹²¹



- Newtrient is a manure management company that advances manure-based management and product technologies regarding energy production, nutrient recovery, and value-added, nutrient-related technologies.
- More than 850 organizations have signed on to the Ellen MacArthur Foundation’s Global Commitment for a New Plastics Economy which requires companies to commit to ensure that all plastic packaging is reused, recycled or composted in practice.¹²² Given than a nearly a third of municipal solid waste is packaging, of which a significant share is food and beverage packaging, this commitment enables consumers to reduce their waste foodprint without increasing food waste.
- The Pork Checkoff established the We Care standard in 2008 to promote responsible practices. We Care includes guidance on Food Safety, Animal Well-Being, Safeguarding Natural Resources and Practices to Protect Public Health, among others.¹²³

Opportunities	Key Players (See Figure 1)
Reduce food waste and loss across the value chain through improved data management, value chain collaboration, production efficiency and better resource use/management.	Food waste solutions and innovators, ag-tech, manufacturers, consumers, distributors, retailers, farmers and ranchers, industry organization, packaging
Develop high-yield, stress-resistant crop varieties which will be resilient in climate change conditions and require minimal inputs.	Ag-tech providers, food waste solutions and innovators, finance/ funders
Invest in areas such as AI-automated decision making, precision agriculture equipment, biotechnology, and remote sensing.	Ag-tech providers, innovators, finance/funders
Support programs to accelerate the uptake for new technologies.	Farmers and ranchers. NGOs, academia/ science, funders/ finance
Improve the “circularity” of agricultural systems, through practices such as residential food waste composting programs and nutrient upcycling.	Farmers and ranchers, academia/ science, communities
Scale and invest in circular resource use and production systems, such as reusable and/or truly compostable packaging.	Packaging, tech companies
Unite around high standards for farm animal well-being and act upon needed areas of improvement with new tools and technology.	Farmers and ranchers

Enable Scale & Collaboration Through Research, Data Management, & Transparency

There are existing institutions and collaborations advancing the sector in a variety of ways, including land grant universities and initiatives from food processor and retailer companies' foundations. Yet overall, interviewees described a heavily fragmented industry, characterized by a silo-ed value chain and in need of greater innovation and technology uptake, particularly on the farm-level. Additionally, farm data can be costly and time consuming to collect and often seen as a top-down request, and companies are asking for more field-level data than ever before, in part to meet the needs of investors and consumers. The pandemic made the technological challenges faced by rural farmers and ranchers even starker, especially related to rural connectivity, as education, government alerts, and consumer and bank interactions all moved fully online. Interviewees noted current challenges in data management, high expectations of farmers, wariness around sharing data, and public demands for transparency. While significant progress has been made in this area, there is also capacity to improve through co-creating harmonized, integrated data collection and reporting systems that work for everyone. There is potential to strengthen existing partnerships both within and outside of the U.S. and develop more unconventional ones with other sectors as well. A shared desire in the industry to improve food metrics collection, better share data, and increase data's value in order to advance good stewardship is present and can still increase.

“Data is tricky – people might not feel comfortable sharing a lot of data. But data is going to be the key to everything we do; we need to grow some comfort in sharing. A lot of growers are used to working in secrecy, but to move things forward and revolutionize the industry, we need to start sharing this info and data.”

– Ag-Tech company

EXAMPLES IN ACTION:

- The Open Ag Data Alliance works use technology to bring interoperability, security and privacy to agricultural data to allow farmers to get the most out of their data.¹²⁴
- Purdue University's Open Ag Technologies and Systems Center seeks to use open source data and algorithm exchange paradigms to enable the use of novel applications of sensing, networking, and computation to big data science, visualization, and analytics for sustainable food production.¹²⁵
- Field to Market's Fieldprint Platform¹²⁶ is an assessment framework that empowers users to measure their current impact through proper calculations of on farm data and the identify areas for improvement.

- The Sustainable Agriculture Initiative Platform’s Farm Sustainability Assessment (FSA) allows members to access the proper tools and skills to improve the footprint of their production methods.¹²⁷
- There are more than 16 metrics frameworks that have been developed by industry groups or through multi-stakeholder processes. These frameworks establish common metrics and measurement methodologies to allow practices and performance to be compared across farming operations.¹²⁸ Please see “Navigating the Maze of Food and Agriculture Metrics” for more information.

Opportunities	Key Players (See Figure 1)
Invest in and standardize electronic traceability technologies, such as Blockchain, as one way to improve transparency to customers and drive greater collaboration and risk/profit-sharing across the supply chain.	Ag-tech providers, finance/ funders, other
Improve access to knowledge, information and resources through sector investment in community infrastructure, particularly where farm businesses operate.	Finance/ funders, tech companies, NGOs
Leverage the U.S. agricultural research community to prioritize applied (over basic) scientific research for farming practices that improve business and environmental resilience	Academia/ science
Increase data interoperability and support farmers in data collection/privacy through value chain investment in simple and easy-to-use systems and creating data governance structures	Ag-tech providers, finance/ funders, NGOs



Conclusion

The U.S. is a global leader in efficient and productive agricultural systems and the people within and supporting the agricultural value chain are responsible not only for food, fiber and energy production, but also for maintaining and enhancing the goods and services derived from natural ecosystems.

The sector’s contribution to food security and resilient supply chains are vital in preventing and managing conflict as well as social and economic disruptions.

Though challenges exist, there are unprecedented opportunities for U.S. agriculture to collaborate and build on its existing strengths to deliver business value for the sector as a whole while contributing to the SDGs and the improved well-being of people and the planet. Especially now, as the world grapples with historic crises, the path forward demands ever-greater resiliency and cooperation across the value chain.

This report demonstrates how U.S. agriculture already interacts with the SDGs and how the SDGs can be used as a lens to identify opportunities for impact. The actions identified here can be used to drive a shared approach for maximizing the sector’s positive impacts and this opportunity assessment invites users to engage with the impact opportunities identified to help inform future collaborations and action throughout the value chain.

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Appendix I:

Overview of Impact Opportunities and SDG Targets

Summary of SDG Goals & Target Contributions of the Impact Opportunities Identified in this Report

	Society			Stewardship			Systems	
	Build and empower the workforce	Expand and share value and risk more equitably throughout the value chain	Address food insecurity and enable healthy and sustainable consumption	Accelerate climate action	Protect wild and working lands and their benefits for wildlife and biodiversity	Conserve water resources	Enhance and scale the existing responsible management of agricultural systems and eliminate waste	Enable scale and collaboration through research, data management, and transparency
1 NO POVERTY 	1.3, 1.4	1.4						
2 ZERO HUNGER 	2.1, 2.3	2.3	2.1, 2.2, 2.4	2.4	2.4, 2.5		2.4	2.3, 2.a
3 GOOD HEALTH AND WELL-BEING 	3.4, 3.8, 3.9		3.4		3.9	3.9		
4 QUALITY EDUCATION 	4.1, 4.3, 4.4						4.7	4.3
5 GENDER EQUALITY 	5.1, 5.4, 5.a	5.5						5.b
6 CLEAN WATER AND SANITATION 				6.4	6.3	6.1, 6.4, 6.5, 6.6, 6.a, 6.b	6.a	

7 AFFORDABLE AND CLEAN ENERGY 				7.2, 7.a				7.a, 7.b
8 DECENT WORK AND ECONOMIC GROWTH 	8.5, 8.7, 8.8	8.8, 8.10				8.4	6.2, 8.4	8.2
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE 		9.c					9.2, 9.4	9.5, 9.b, 9.c
10 REDUCED INEQUALITIES 	10.2, 10.3, 10.4	10.1						
11 SUSTAINABLE CITIES AND COMMUNITIES 					11.a	11.5	11.a	
12 RESPONSIBLE CONSUMPTION AND PRODUCTION 			12.4, 12.7		12.2	12.2	12.1, 12.3, 12.5	12.6, 12.8, 12.a
13 CLIMATE ACTION 				13.1, 13.3	13.1	13.1		
14 LIFE BELOW WATER 		14.7, 14.b			14.5	14.1, 14.2, 14.5	14.1	14.a
15 LIFE ON LAND 		15.6, 15.9			15.1, 15.2, 15.3, 15.5, 15.8	15.1, 15.8	15.9	
16 PEACE, JUSTICE AND STRONG INSTITUTIONS 	16.1, 16.3, 16.b	16.b						
17 PARTNERSHIPS FOR THE GOALS 								

Appendix II:

List of SDGs and Relevant Targets

GOAL 1: End poverty in all its forms everywhere	1.3 Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable.
	1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance.
GOAL 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture	2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round
	2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons
	2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment
	2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
	2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed
	2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries
GOAL 3: Ensure healthy lives and promote well- being for all at all ages	3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being
	3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all
	3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

GOAL 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes
	4.3 By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university
	4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship
	4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development
GOAL 5: Achieve gender equality and empower all women and girls	5.1 End all forms of discrimination against all women and girls everywhere
	5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate
	5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic and public life
	5.a Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws
	5.b Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women
GOAL 6: Ensure availability and sustainable management of water and sanitation for all	6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all
	6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
	6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
	6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
	6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
	6.a By 2030, expand international cooperation and capacity-building support to developing countries in water and sanitation-related activities and programs, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies
	6.b Support and strengthen the participation of local communities in improving water and sanitation management
GOAL 7: Ensure access to affordable, reliable, sustainable and modern energy for all	7.2 By 2030, ensure universal access to affordable, reliable and modern energy services
	7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology
	7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States and landlocked developing countries, in accordance with their respective programs of support

GOAL 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labor-intensive sectors
	8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programs on Sustainable Consumption and Production, with developed countries taking the lead
	8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value
	8.7 Take immediate and effective measures to eradicate forced labor, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labor, including recruitment and use of child soldiers, and by 2025 end child labor in all its forms
	8.8 Protect labor rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment
	8.10 Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all
GOAL 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries
	9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities
	9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending
	9.b Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities
	9.c Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020
GOAL 10: Reduce inequality within and among countries	10.1 By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average
	10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status
	10.3 Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard
	10.4 Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality
GOAL 11: Make cities and human settlements inclusive, safe, resilient and sustainable	11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations
	11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

GOAL 12: Ensure sustainable consumption and production patterns	12.1 Implement the 10-Year Framework of Programs on Sustainable Consumption and Production Patterns, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries
	12.2 By 2030, achieve the sustainable management and efficient use of natural resources
	12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses
	12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment
	12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse
	12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle
	12.7 Promote public procurement practices that are sustainable, in accordance with national policies and Priorities
	12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature
	12.a Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production
GOAL 13: Take urgent action to combat climate change and its impacts	13.1 Strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries
	13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
GOAL 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development	14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution
	14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans
	14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information
	14.7 By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism
	14.a Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries
	14.b Provide access for small-scale artisanal fishers to marine resources and markets

GOAL 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements
	15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally
	15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation neutral world
	15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species
	15.6 Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed
	15.8 By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species
	15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts
GOAL 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	16.1 Significantly reduce all forms of violence and related death rates everywhere
	16.3 Promote the rule of law at the national and international levels and ensure equal access to justice for all
	16.b Promote and enforce non-discriminatory laws and policies for sustainable development
GOAL 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development	17.7 Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favorable terms, including on concessional and preferential terms, as mutually agreed
	17.10 Promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system under the World Trade Organization, including through the conclusion of negotiations under its Doha Development Agenda
	17.16 Enhance the Global Partnership for Sustainable Development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the Sustainable Development Goals in all countries, in particular developing countries
	17.17 Encourage and promote effective public, public private and civil society partnerships, building on the experience and resourcing strategies of partnerships
	17.19 By 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement gross domestic product, and support statistical capacity-building in developing countries

Appendix III:

Stakeholder Interview Breakdown

Category	Number of Interviews
Farmer and Rancher	12
Agricultural value chain	23
Larger ecosystem (e.g. industry associations, ag-tech companies, finance)	6
TOTAL	41

- 1 Business and Sustainable Development Commission (n.d.). Better Business, Better World. Retrieved from <http://report.businesscommission.org/report>
- 2 Feeding the Economy. (2020). U.S. Food and Ag Industries Economic Impact Study. Retrieved from <https://feedingtheeconomy.com/>
- 3 Ibid.
- 4 Sanyaolu, A., Okorie, C., Marinkovic, A., Patidar, R., Younis, K., Desai, P., ... Altaf, M. (2020). Comorbidity and its Impact on Patients with COVID-19. *SN Comprehensive Clinical Medicine*, 2(8), 1069–1076. <https://doi.org/10.1007/s42399-020-00363->
- 5 FAO. (2019). THE STATE OF THE WORLD'S BIODIVERSITY FOR FOOD AND AGRICULTURE FAO COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE ASSESSMENTS • 2019 S. Rome. Retrieved from <http://www.fao.org/3/CA3129EN/CA3129EN.pdf>
- 6 Kopec, K., & Burd, L. A. (2017). POLLINATORS in Peril POLLINATORS in Peril A systematic status review of North American and Hawaiian native bees. Retrieved from https://www.biologicaldiversity.org/campaigns/native_pollinators/pdfs/Pollinators_in_Peril.pdf
- 7 Johnson, K. M., & Lichter, D. T. (2019). Rural Depopulation: Growth and Decline Processes over the Past Century. *Rural Sociology*, 84(1), 3–27. <https://doi.org/10.1111/ruso.12266>
- 8 Low, S. A., Adalja, A., Beaulieu, E., Key, N., Martinez, S., Melton, A., Jablonski, B. B. (2015). United States Department of Agriculture Trends in U.S. Local and Regional Food Systems. Retrieved from https://www.ers.usda.gov/webdocs/publications/42805/51173_ap068.pdf?v=1301.9
- 9 Szejda, K., Urbanovich, T., & Wilks, M. (2020). Accelerating Consumer Adoption of Plant-Based Meat: An Evidence-Based Guide for Effective Practice February 2020. Retrieved from <https://www.gfi.org/images/uploads/2020/02/NO-HYPERLINKED-REFERENCES-FINAL-COMBINED-accelerating-consumer-adoption-of-plant-based-meat.pdf>
- 10 Cromartie, J. (2018). Rural America at a Glance, 2018 Edition. Retrieved from <https://www.ers.usda.gov/webdocs/publications/90556/eib-200.pdf>
- 11 Tackling Hunger and Food Insecurity | A Conversation with Claire Babineaux-Fontenot of Feeding America. (2020). Retrieved from <https://www.bushcenter.org/catalyst/america-at-its-best/babineaux-fontenot-feeding-america.html>
- 12 Sachs, J., Schmidt-Traub, Kroll, G., Lafortune, G., Fuller, G., & Woelm, F. (2020). The Sustainable Development Goals and COVID-19. Sustainable Development Report 2020. Cambridge. Retrieved from https://s3.amazonaws.com/sustainabledevelopment.report/2020/2020_sustainable_development_report.pdf
- 13 Wang, S. L., Heisey, P., Schimmelpennig, D., & Ball, E. (2015, July). USDA ERS - U.S. Agricultural Productivity Growth: The Past, Challenges, and the Future. Retrieved from <https://www.ers.usda.gov/amber-waves/2015/september/us-agricultural-productivity-growth-the-past-challenges-and-the-future/>
- 14 USDA ERS. (2019, August 20). USDA ERS - Agricultural Trade. Retrieved from <https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/agricultural-trade/>
- 15 USAID. (2020, June 8). Frequently Asked Questions | Food Assistance . Retrieved from <https://www.usaid.gov/food-assistance/faq>
- 16 Farmlink Project. (2020). About Us. Retrieved from <https://thefarmlinkproject.org/about-us>
- 17 Iowa Pork Producers Association. (2020, April 20). Iowa Pork Producers Donate Pork to Food Banks as Need Surges. AgWeb. Retrieved from <https://www.agweb.com/article/iowa-pork-producers-donate-pork-food-banks-need-surges>
- 18 Food Research & Action Center (FRAC). (n.d.). Supplemental Nutrition Assistance Program (SNAP) . Retrieved from <https://frac.org/programs/supplemental-nutrition-assistance-program-snap>
- 19 USDA ERS. (2019, August 20). USDA ERS - Farmland Ownership and Tenure. Retrieved from <https://www.ers.usda.gov/topics/farm-economy/land-use-land-value-tenure/farmland-ownership-and-tenure/>
- 20 Farmers for a Sustainable Future. Retrieved from <https://www.fb.org/market-intel/more-than-140-million-acres-in-federal-farm-conservation-programs>
- 21 Farmers for a Sustainable Future (n.d.). Retrieved from https://www.fb.org/files/FSF-Factsheet_3_17_20_r.pdf using page 58 of source data of https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usv1.pdf
- 22 USDA NRCS. (n.d.). Retrieved from https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd396218.pdf
- 23 Farmers for a Sustainable Future. (n.d.). Farmers for a Sustainable Future. Retrieved from <https://www.fb.org/land/fsf>
- 24 Maryland Department of Agriculture. (2020). Cover Crop Program. Retrieved from https://mda.maryland.gov/resource_conservation/Pages/cover_crop.aspx
- 25 USDA Risk Management Agency. (2019, June). Cover Crops and Crop Insurance Fact Sheet | RMA. Retrieved from <https://www.rma.usda.gov/en/Fact-Sheets/National-Fact-Sheets/Cover-Crops-and-Crop-Insurance>
- 26 USDA ERS. (2019, September 23). USDA ERS - Irrigation & Water Use. Retrieved from <https://www.ers.usda.gov/topics/farm-practices-management/irrigation-water-use/>
- 27 Mateo-Sagasta, J., Marjani Zadeh, S., Turrall, H., & Burke, J. (2017). Water pollution from agriculture: a global review Executive summary LED BY. Rome/Colombo. Retrieved from <http://www.fao.org/3/a-i7754e.pdf>
- 28 Ibid.
- 29 USDA. (2016). Improving nutrient uptake efficiency and reducing risk of nutrient losses to surface water.
- 30 US EPA. (2015). Anaerobic Digestion and its Applications. Retrieved from https://www.epa.gov/sites/production/files/2016-07/documents/ad_and_applications-final_0.pdf
- 31 USDA ERS. (2020, March 17). USDA ERS - Documentation. Retrieved August 22, 2020, from <https://www.ers.usda.gov/data-products/food-dollar-series/documentation.aspx>
- 32 Assets, Debt, and Wealth, U.S. Department of Agriculture Economic Research Service, February 2020.
- 33 USDA ERS. (2020, April 22). USDA ERS - Farm Labor. Retrieved from <https://www.ers.usda.gov/topics/farm-economy/farm-labor/#legalstatus>
- 34 USDA ERS. (2020, April 22). USDA ERS - Farm Labor. Retrieved August 22, 2020, from <https://www.ers.usda.gov/topics/farm-economy/farm-labor/#legalstatus>

- 35 Nestor, P. (2013, February 13). Four Human Rights Issues Every Food and Agriculture Company Needs to Understand | Blog | BSR. Retrieved from <https://www.bsr.org/en/our-insights/blog-view/four-human-rights-issues-every-food-and-agriculture-company-needs-to-understands>
- 36 APHA. Improving Working Conditions for U.S. Farmworkers and Food Production Workers (2017). Retrieved from <https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2018/01/18/improving-working-conditions>
- 37 US GAO. (2018). WORKING CHILDREN Federal Injury Data and Compliance Strategies Could Be Strengthened Report to Congressional Requesters United States Government Accountability Office.
- 38 Feeding the Economy. (2020). U.S. Food and Ag Industries Economic Impact Study. Retrieved from <https://feedingtheeconomy.com/>
- 39 Ibid.
- 40 Ibid.
- 41 Ross, K., & Delbar, M. (2020, August 6). You can put a price tag on environmental and economic returns from protecting rangeland | CalMatters. Retrieved from <https://calmatters.org/commentary/my-turn/2020/08/you-can-put-a-price-tag-on-environmental-and-economic-returns-from-protecting-rangeland/>
- 42 USDA. (n.d.). Food Waste FAQs | USDA. Retrieved August 22, 2020, from <https://www.usda.gov/foodwaste/faqs>
- 43 US EPA. (n.d.). Facts and Figures about Materials, Waste and Recycling. Retrieved from <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/containers-and-packaging-product-specific-data>
- 44 Flatt, B. (2020, June 3). Minimizing Food Waste on Farms – U.S. Farmers and Ranchers Alliance. USFRA. Retrieved from <https://usfarmersandranchers.org/food-trends-culture/minimizing-food-waste-on-farms/>
- 45 Kateman, B. (2020, March 2). The Time Is Ripe For Ugly Fruits And Vegetables. Forbes. Retrieved from <https://www.forbes.com/sites/briankateman/2020/03/02/the-time-is-ripe-for-ugly-fruits-and-vegetables/#66fe67264a85>
- 46 USDA Food Safety and Inspection Service. (n.d.). Food Product Dating. Retrieved from <https://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/food-labeling/food-product-dating/food-product-dating>
- 47 Ibid
- 48 FMI The Food Industry Association. (2017, June 13). Product Code Date Labeling. Retrieved from <https://www.fmi.org/about-us/policy-statements/view/policy-statements/2017/06/13/product-code-date-labeling>
- 49 Curds + Kindness program feeds hungry with surplus dairy products | Dairy West. (n.d.). Retrieved from <https://www.dairywest.com/2020/05/04/curds-kindness-program-feeds-hungry-with-surplus-dairy-products/>
- 50 USDA Agricultural Marketing Service. (2020, August 31). USDA Farmers to Families Food Box | Agricultural Marketing Service. Retrieved from <https://www.ams.usda.gov/selling-food-to-usda/farmers-to-families-food-box>
- 51 US EPA. (n.d.). Sources of Greenhouse Gas Emissions | Greenhouse Gas (GHG) Emissions | US EPA. Retrieved August 22, 2020, from <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>
- 52 Smith, P., Bustamante, M., Ahammad, H., Clark, H., Dong, H., Elsiddig, E. A., ... Tubiello, F. (2014). Agriculture, Forestry and Other Land Use (AFOLU) . Climate Change 2014: Mitigation of Climate Change. Retrieved from https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf
- 53 NOAA. (2020). U.S. Billion-dollar Weather and Climate Disasters, 1980 - present. NOAA National Centers for Environmental Information. <https://doi.org/10.25921/STKW-7W73>
- 54 House Select Committee on the Climate Crisis. (2020). Solving the Climate Crisis | The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America. Retrieved from [https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate Crisis Action Plan.pdf](https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf)
- 55 Searchinger, T., Waite, R., Hanson, C., & Ranganathan, J. (2019). Creating a Sustainable Food Future A Menu of Solutions to Feed Nearly 10 Billion People by 2050. (p. 24 and 313). Retrieved from www.SustainableFoodFuture.org.
- 56 Ibid (p. 313).
- 57 Ibid (p. 3 and 408-413).
- 58 US EPA. (n.d.). Nutrient Pollution - The Issue. Retrieved from <https://www.epa.gov/nutrientpollution/issue>
- 59 Volpe, J.P., M. Beck, V. Ethier, J. Gee, A. Wilson. (2010). Global Aquaculture Performance Index. University of Victoria, Victoria, British Columbia, Canada.
- 60 Ibid.
- 61 Iowa State University. (2017). Management Practices-Phosphorus Land Use Practices-Nitrogen and Phosphorus Edge-of-Field Practices-Nitrogen and Phosphorus. Retrieved from <http://cnrc.agron.iastate.edu>
- 62 US EPA. (n.d.). Nutrient Pollution - The Issue. Retrieved from <https://www.epa.gov/nutrientpollution/issue>
- 63 US EPA. (2020, May 18). EPA Provides \$6 Million to Reduce Excess Ag Runoff to the Chesapeake Bay. Retrieved from <https://www.epa.gov/newsreleases/epa-provides-6-million-reduce-excess-ag-runoff-chesapeake-bay>
- 64 NOAA Office of Aquaculture. (2020, June 19). U.S. Aquaculture | NOAA Fisheries. Retrieved August 22, 2020, from <https://www.fisheries.noaa.gov/national/aquaculture/us-aquaculture>
- 65 Ibid.
- 66 Alleway, H. K., Gillies, C. L., Bishop, M. J., Gentry, R. R., Theuerkauf, S. J., & Jones, R. (2019). The Ecosystem Services of Marine Aquaculture: Valuing Benefits to People and Nature. *BioScience*, 69(1), 59–68. <https://doi.org/10.1093/biosci/biy137>
- 67 USDA ERS. (2020, May 5). USDA ERS - Land and Natural Resources. Retrieved from <https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/land-and-natural-resources/>
- 68 House Select Committee on the Climate Crisis. (2020). Solving the Climate Crisis | The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America. Retrieved from [https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate Crisis Action Plan.pdf](https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf)
- 69 SARE. (2019). What is Soil Health? - SARE. Retrieved from <https://www.sare.org/resources/what-is-soil-health/>
- 70 Farm Aid. (n.d.) Rebuilding America's Economy with Family Farm-Centered Food Systems. Retrieved from <https://www.farmaid.org/our-work/family-farmers/rebuilding-americas-economy-with-family-farm-centered-food-systems/#ripple>
- 71 USDA ERS. (n.d.) Rural Poverty & Well-Being. Retrieved from <https://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being/>
- 72 Scallan, E., Hoekstra, R. M., Angulo, F. J., Tauxe, R. V., Widdowson, M.-A., Roy, S. L., ... Griffin, P. M. (2011). Foodborne Illness Acquired in the United States—Major Pathogens. *Emerging Infectious Diseases*, 17(1), 7–15. <https://doi.org/10.3201/eid1701.P11101>

- 73 Rural Health Information Hub. (2019, November 26). Rural Response to Farmer Mental Health and Suicide Prevention Introduction. Retrieved from <https://www.ruralhealthinfo.org/topics/farmer-mental-health>
- 74 Office of Disease Prevention and Health Promotion. (2020). Access to Foods that Support Healthy Eating Patterns | Healthy People 2020. Retrieved from <https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-health/interventions-resources/access-to-foods-that-support-healthy-eating-patterns>
- 75 APHA. (2017, November 7). Improving Working Conditions for U.S. Farmworkers and Food Production Workers. Retrieved from <https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2018/01/18/improving-working-conditions>
- 76 EFI. (2020, April 30). Our Impact - Equitable Food Initiative. Retrieved from <https://equitablefood.org/our-impact/>
- 77 National Center for Farmworker Health, I. (2020, August 25). COVID-19 in Rural America: Impact on Farms & Agricultural Workers. NCFH. Retrieved from http://www.ncfh.org/uploads/3/8/6/8/38685499/msaws_and_covid-19_fact_sheet_8.25.2020.pdf
- 78 USDA. (n.d.). Education and Assistance | USDA New Farmers Website. Retrieved from <https://newfarmers.usda.gov/education-and-assistance>
- 79 Carter, A. (2019). "We Don't Equal Even Just One Man": Gender and Social Control in Conservation Adoption. *Society and Natural Resources*, 32(8), 893–910. <https://doi.org/10.1080/08941920.2019.1>
- 80 USDA ERS. (2020, April 22). USDA ERS - Farm Labor. Retrieved from <https://www.ers.usda.gov/topics/farm-economy/farm-labor/#legalstatus>
- 81 EESI. (2017, October 3). Fact Sheet - Biogas: Converting Waste to Energy. Retrieved from <https://www.eesi.org/papers/view/fact-sheet-biogasconverting-waste-to-energy>
- 82 Laca, A.-L. (2020, July 24). Dairy Farmer Says Federal Support Could Increase Dairy Sustainability. Retrieved from <https://www.agweb.com/article/dairy-farmer-says-federal-support-could-increase-dairy-sustainability>
- 83 USDA NASS. (2017). 2017 Census of Agriculture-UNITED STATES DATA.
- 84 Laca, A.-L. (2020, July 24). Dairy Farmer Says Federal Support Could Increase Dairy Sustainability. Retrieved from <https://www.agweb.com/article/dairy-farmer-says-federal-support-could-increase-dairy-sustainability>
- 85 Kroll, K. (2019, November 13). It's Only Natural: The Challenges of Organic Food Logistics. *Inbound Logistics*. Retrieved from <https://www.inboundlogistics.com/cms/article/its-only-natural-the-challenges-of-organic-food-logistics/>
- 86 USDA ERS. (2011, December). The Changing Organization of U.S. Farming | Economic Information Bulletin . Retrieved from <https://www.ers.usda.gov/webdocs/publications/44619/eib-88.pdf?v=3728.3>
- 87 Reiley, L., & Van Dam, A. (2019, April 13). Advocates hoped census would find diversity in agriculture. It found old white people. *The Washington Post*. Retrieved from <https://www.washingtonpost.com/business/2019/04/13/advocates-hoped-new-report-would-find-diversity-ag-it-found-old-white-people/>
- 88 Giancatarino, A., & Noor, S. (2014). Building the Case for Racial Equity in the Food System. *New York*. Retrieved from <https://www.centerforsocialinclusion.org/publication/building-the-case-for-racial-equity-in-the-food-system/>
- 89 USDA ERS. (2019, September 4). USDA ERS - Key Statistics & Graphics | Prevalence of Food Insecurity, 2018" graphic. Retrieved from <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/key-statistics-graphics/>
- 90 USDA NASS. (2014, May). 2012 Census of Agriculture - Farm Demographics Highlights. Retrieved from https://www.nass.usda.gov/Publications/Highlights/2014/Farm_Demographics/index.php
- 91 Hernandez, M., & Manu, R. (2018, January 25). Generation 2030: Growing Greener Cities: Urban Agriculture and the Impact on SDG 11 . *SDG Knowledge Hub | IISD*. Retrieved from <https://sdg.iisd.org/commentary/generation-2030/growing-greener-cities-urban-agriculture-and-the-impact-on-sdg-11/>
- 92 Wellingham, Z., & Mathema, S. (2020, April 23). Protecting Farmworkers From Coronavirus and Securing the Food Supply - Center for American Progress. Retrieved from <https://www.americanprogress.org/issues/economy/reports/2020/04/23/483488/protecting-farmworkers-coronavirus-securing-food-supply/>
- 93 Ibid.
- 94 USDA. (n.d.). Food Security. Retrieved from <https://www.usda.gov/topics/food-and-nutrition/food-security>
- 95 USDA ERS. (2020, March 17). USDA ERS - Quick Facts. Retrieved August 22, 2020, from <https://www.ers.usda.gov/data-products/food-dollar-series/quick-facts/>
- 96 USDA ERS. (2020, March 17). USDA ERS - Documentation. Retrieved from <https://www.ers.usda.gov/data-products/food-dollar-series/documentation.aspx>
- 97 Danone North America. (2020). Danone North America Announces Partnership with rePlant Capital. Retrieved from <https://www.danonenorthamerica.com/news/danone-north-america-announces-partnership-with-replant-capital/>
- 98 Pipeline Foods. (2020). Pipeline Foods Farm Profit Program: Long-term Offtake Agreements. Retrieved from <https://www.pipelinefoods.com/longterm-offtake-agreements>
- 99 Slowmoney. (n.d.). Slow Money. Retrieved August 22, 2020, from <https://slowmoney.org/>
- 100 Center at the Center for Strategic and International Studies (CSIS) Retrieved from https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/NutritionPrimer_layout_WEB_v5.pdf
- 101 ReFED. (n.d.). 27 SOLUTIONS TO FOOD WASTE. Retrieved from <https://www.refed.com/?sort=economic-value-per-ton>
- 102 Center on Budget and Policy Priorities. (2018, January 17). SNAP is Linked with Improved Nutritional Outcomes and Lower Health Care Costs. Retrieved from <https://www.cbpp.org/research/food-assistance/snap-is-linked-with-improved-nutritional-outcomes-and-lower-health-care>
- 103 USDA. (2019, July 18). Quantifying the Impact of SNAP Benefits on the U.S. Economy and Jobs. Retrieved from <https://www.ers.usda.gov/amber-waves/2019/july/quantifying-the-impact-of-snap-benefits-on-the-us-economy-and-jobs/>
- 104 Jacobs, Andrew. (2020, February 11). Sugary Drink Consumption Plunges in Chile After New Food Law. *New York Times*. Retrieved from <https://www.nytimes.com/2020/02/11/health/chile-soda-warning-label.html>
- 105 House Select Committee on the Climate Crisis. (2020). Solving the Climate Crisis | The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America. Retrieved from https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate_Crisis_Action_Plan.pdf
- 106 Le Quéré, C., Jackson, R.B., Jones, M.W. et al. Temporary reduction in daily global CO₂ emissions during the COVID-19 forced confinement. *Nat. Clim. Chang.* 10, 647–653 (2020). <https://doi.org/10.1038/s41558-020-0797-x>

- 107 Foundation for Food and Agriculture Research (2020, February 6). Mobilizing Farmers, Ranchers and Scientists as Window of Opportunity Narrows on Climate Change. Retrieved from <https://foundationfar.org/2020/02/06/mobilizing-farmers-ranchers-and-scientists-as-window-of-opportunity-narrows-on-climate-change/>
- 108 Bayer. (2020, July 21). Bayer takes steps to make carbon sequestration a farmer's newest crop opportunity - Bayer News. Retrieved August 22, 2020, from <https://media.bayer.com/baynews/baynews.nsf/id/Bayer-takes-steps-to-make-carbon-sequestration-a-farmers-newest-crop-opportunity>
- 109 Thorbecke, M., & Dettling, J. (2019). CARBON FOOTPRINT EVALUATION OF REGENERATIVE GRAZING AT WHITE OAK PASTURES RESULTS PRESENTATION. Retrieved from <https://blog.whiteoakpastures.com/hubfs/WOP-LCA-Quantis-2019.pdf>
- 110 US EPA. (2020, March 26). EPA Announces Enforcement Discretion Policy for COVID-19 Pandemic | U.S. EPA News Releases | US EPA. Retrieved August 22, 2020, from <https://www.epa.gov/newsreleases/epa-announces-enforcement-discretion-policy-covid-19-pandemic>
- 111 Honey Bee Health Coalition. (n.d.). Coalition Mission. Retrieved from <https://honeybeehealthcoalition.org/about-the-coalition/>
- 112 Hankins, J., & Manley, S. (n.d.). Conservation: Rice Stewardship | Working together to conserve rice lands, water and wildlife. Retrieved from <https://www.ducks.org/conservation/conservation-rice-stewardship>
- 113 General Mills. (n.d.). Regenerative Agriculture 2020. Retrieved from <https://www.generalmills.com/en/Responsibility/Sustainability/Regenerative-agriculture>
- 114 USDA NRCS. (2020) Retrieved from: <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/acep/>
- 115 USDA FSA. (n.d.). Conservation Reserve Program. Retrieved August 22, 2020, from <https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/>
- 116 US EPA. (2017). National Water Quality Inventory: Report to Congress. Retrieved from https://www.epa.gov/sites/production/files/2017-12/documents/305brtc_finalowow_08302017.pdf
- 117 Temple, Laura. (2019, August 21). Irrigation Innovation – Emerging Technologies Can Improve Water Use Efficiency. US Soy. Retrieved from <https://ussoy.org/irrigation-innovation-emerging-technologies-can-improve-water-use-efficiency/>
- 118 US EPA. (n.d.). Nutrient Pollution - The Sources and Solutions: Agriculture. Retrieved from <https://www.epa.gov/nutrientpollution/sources-and-solutions-agriculture>
- 119 Parson, W. (n.d.). Agriculture | Chesapeake Bay Program. Retrieved from <https://www.chesapeakebay.net/issues/Agriculture>
- 120 US EPA. (n.d.). Potable Water Reuse and Drinking Water. Retrieved from <https://www.epa.gov/ground-water-and-drinking-water/potable-water-reuse-and-drinking-water>
- 121 ReFed. (n.d.) About. Retrieved from <https://www.refed.com/about>
- 122 Ellen MacArthur Foundation. (n.d.) New Plastics Economy Vision. Retrieved from <https://www.ellenmacarthurfoundation.org/our-work/activities/new-plastics-economy/vision>
- 123 Pork Checkoff. (n.d.) We Care. Retrieved from <https://www.pork.org/about/we-care/>
- 124 Open Ag Data Alliance. (n.d.). Home Page. Retrieved from <http://openag.io/>
- 125 OATS Center. (n.d.). About. Retrieved from <https://oatscenter.org/>
- 126 Field to Market. (n.d.). Fieldprint Platform - Field to Market. Retrieved from <https://fieldtomarket.org/our-programs/leading-with-science/fieldprint-platform/>
- 127 SAI Platform. (n.d.). Farm Sustainability Assessment — SAI Platform. Retrieved August 22, 2020, from <https://saipatform.org/fsa/>
- 128 US Farmers and Ranchers in Action. (2019). Navigating the Maze of Food and Agriculture Metrics. Retrieved from <https://usfarmersandranchers.org/wp-content/uploads/2020/06/2019-Food-MetricsReport-Summary.pdf>