Catalysing Sustainable Agriculture and Food Production

Regnan thematic investment insights

December 2020

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Summary

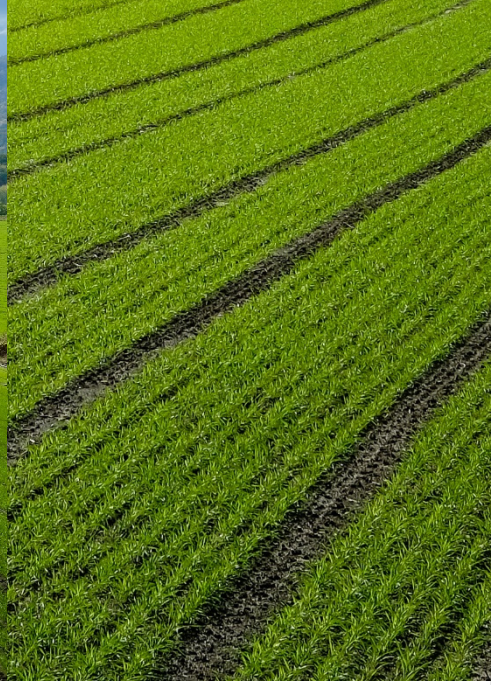
Transitioning global agricultural and food production systems to feed the planet's rapidly growing population, estimated to reach close to 10 billion people by 2050, is one of the most pressing sustainability challenges faced by humanity. We outline the limitations of the currently dominant global agriculture and food production models, highlighting that reliance on these unsustainable models alone will exacerbate ecological loads, including climate change, which present increasing challenges for farmers and risks to return on investment.

Fortunately, solutions are emerging to transition agricultural and food production systems toward sustainability. Regnan's impact investment team has developed leading investment selection processes to identify innovative companies positioned to accelerate this transition.

Ultimately, these companies are not only solving the challenges we face but are also well-positioned for growth in the future. As innovative solutions are often at the early stages of adoption, with large total addressable markets they represent attractive investment opportunities.

This report:

- Shares Regnan's understanding of the fundamental system changes required to transition agriculture and food production to more sustainable and resilient models.
- Identifies innovative and transformative solutions, both established and emerging, where capital can be most effectively directed to bring about transformation of food systems aligned to the UN Sustainable Development Goals.
- Provides insights into the investment selection process underpinning the **Regnan Global Equity Impact Solutions Strategy**.



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About Regnan

Regnan is a standalone responsible investment business division of Pendal Group Limited (Pendal). Pendal is an Australian-listed investment manager and owner of the J O Hambro Capital Management Group. Regnan's focus is on delivering innovative solutions for sustainable and impact investment, leaning on over 20 years of experience at the frontier of responsible investment. "Regnan" is a registered trademark of Pendal.

The Regnan business consists of two distinct business lines. The investment management business is based in the United Kingdom and sits within J O Hambro Capital Management Limited, which is authorised and regulated by the Financial Conduct Authority and is registered as an investment adviser with the SEC. "Regnan" is a registered as a trading name of J O Hambro Capital Management Limited. The investment team manages the Regnan Global Equity Impact Solutions (RGEIS) strategy, which aims to generate market-beating long-term returns by investing in solutions to the world's environmental and societal problems. The RGEIS strategy is distributed in Australia by Pendal Fund Services Limited.

Alongside the investment team is the Regnan Insight and Advisory Centre of Pendal Institutional Limited in Australia, which has a long history of providing services on environmental, social and governance issues. While the investment management team will often draw on services from and collaborate with the Regnan Insight and Advisory Centre, they remain independent of the Regnan Insight and Advisory Centre and are solely responsible for the investment management of the RGEIS strategy. Doug Holmes is employed by Pendal Group Limited (Pendal), an Australian-listed investment manager and owner of the J O Hambro Capital Management Group.

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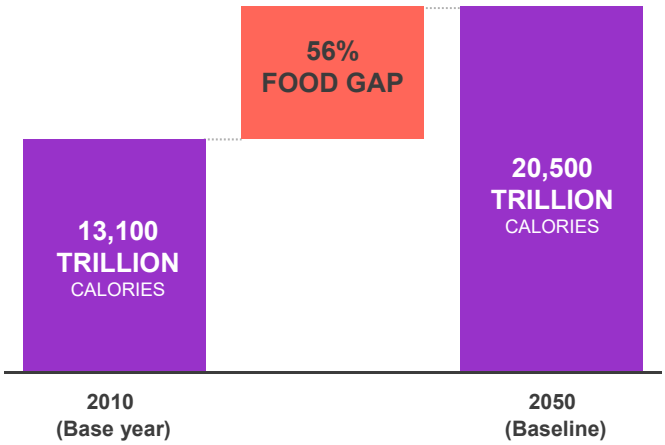
The global agricultural challenge

Feeding the world's rapidly growing population presents a multitude of sustainability challenges. By most estimates, food production will need to increase by more than 50% to feed the 10 billion people on the planet in 2050.[1] Yet expansion of existing agricultural and food production systems would exacerbate multiple negative social and ecological impacts that have become increasingly evident over the past 50 years.

Recognising the need to produce more food, but in ways that are socially, ecologically and economically sustainable, will require fundamental transition of current agricultural and food production systems. This in turn will require transformation of the ways in which food is grown, the types of food produced, and how the vast quantities of waste generated by current agricultural and food production systems are considered and reimagined.

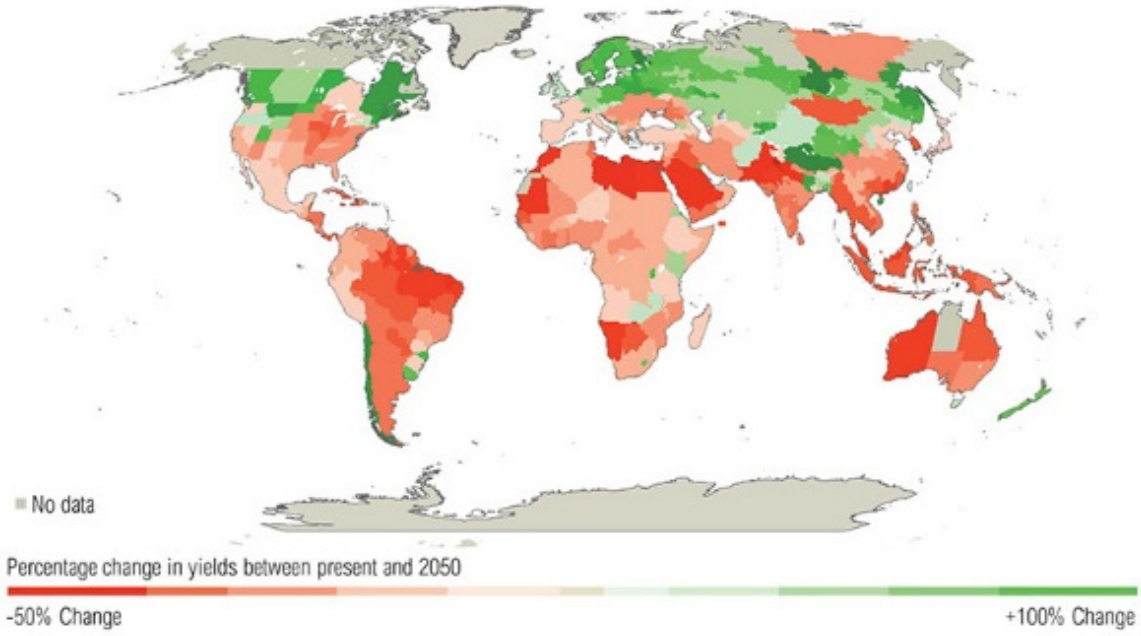
Achieving these transformations is made more difficult by deepening climate change, which is itself driven, in part, by unsustainable greenhouse-intensive agricultural practices. Already evident, increasing extreme weather will add to yield volatility, presenting adaptation challenges across multiple growing regions.

The world needs to close a food gap of 56% by 2050
Crop production (trillion calories per year)



Note: Includes all crops intended for direct human consumption, animal feed, industrial uses, seeds and biofuels.
Source: WRI analysis based on FAO (2017a); UNDESA (2017); and Alexandratos and Bruinsma (2012).

Most studies now project adverse impacts on crop yields due to climate change (3°C warmer world)



Source: World Resources Institute 2013

[1] Creating a Sustainable Food Future, World Resources Institute, 2019

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Agriculture, food production and sustainability are intertwined

Transformation of agricultural and food production systems is connected with multiple UN Sustainable Development Goals (SDGs). “Actions to achieve SDG 2 (end hunger, achieve food security and improved nutrition, and promote sustainable agriculture) will accelerate progress across most other goals and targets. Achievement of SDG 2 is inseparable from the urgency to eradicate extreme deprivation; overhaul food systems in the broadest sense; tackle climate challenges; build community resilience; and responsibly manage natural resources and rich biodiversity.”[2]

These many connections highlight the need for deliberate identification of solutions that have the potential to catalyse system-wide change to achieve desired sustainability outcomes.

[2] https://www.un.org/sustainabledevelopment/hunger/

The Regnan SDG Taxonomy (see from p17) provides a systematic approach to demonstrate these SDG connections (below), which tie directly to the structured investment process which underpins the Regnan Global Equity Impact Solutions Strategy.

Fortunately, solutions are emerging to transition agriculture and food production systems toward sustainability.

Regnan has developed an analytical approach to identify the changes required to transition agriculture and food production to more sustainable and resilient models and, most importantly, to identify innovative and transformative solutions emerging to commence the transition.

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Current agriculture and food production models

Competing visions of sustainability in the agriculture and food production sector have significant bearing on the nature of solutions proposed, and therefore the investment strategies adopted.

Some proponents see solutions coming from a continuation and intensification of the dominant global agricultural and food production systems. The 'agro-industrial' model, dating from the 1950s, achieved unparalleled yield and production growth through intensive use of synthetic fertilisers, herbicides and pesticides, and development of high yielding crops. But the high operational costs associated with these inputs have tended to concentrate farming into increasingly large scale, commoditised cropping and animal production.

Over use of chemical inputs, high resource intensity and unsustainable land management practices have taken a toll on farmland.

Additionally, agriculture and food production accounts for nearly 25% of the world's greenhouse gas (GHG) emissions. Of these, livestock, land conversion and soil management/nitrogen fertilisers are the main drivers of emissions. Without changes to agriculture and food production systems, emissions could grow by more than 30% by 2050.[3]

The negative social and environmental impacts resulting from the agro-industrial model are now widely recognised, highlighting the need for alternative solutions.

[3] Creating a Sustainable Food Future, World Resources Institute, 2019

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Is excessive focus on yield improvement the problem?

Proponents of the agro-industrial model focus largely on increasing yield as the primary response to rising population and food production challenges. This model generally encompasses conversion of land to large scale mono-cropping or animal production, genetic modification of plant characteristics and animal traits, and intensive application of chemical inputs (fertilisers, herbicides, pesticides and antibiotics). Agribusiness responses to sustainability challenges in this model tend to be narrowly defined, focused largely on seeking to improve resource use efficiencies for production inputs (fertiliser, chemicals, energy, water) as the primary means to reduce negative impacts through, for example, data-driven precision agriculture technologies.

While pursuit of greater input-use efficiencies is a positive goal, the narrow focus on yield and food production does not address other stress points in the food system and so risks perpetuation of inherently unsustainable agricultural and food production systems.

Yield improvement is also increasingly difficult to achieve in mature developed world commodity cropping operations, raising questions about future returns on investments made in further intensification of the agro-industrial model. Further, resistance to herbicide and pesticide chemicals continues to increase, and at the same time, the cost and time required to bring new agricultural chemicals to market continues to escalate.

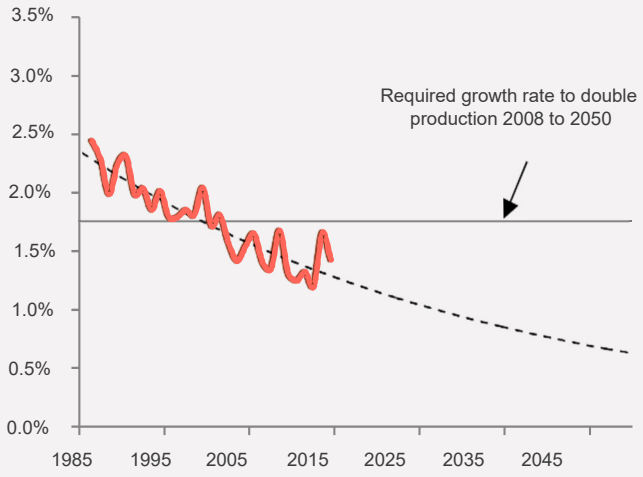
Of greatest long-term impact, the large landholdings required to make high-cost, high-input farming economically viable drives conversion of essential ecosystems, such as forests, to agricultural land, especially in developing countries.

On current rates of conversion, crop and pastureland are projected to increase by nearly 600 million hectares by 2050[4], roughly equivalent to current arable land in the United States, India, Russia and China combined.

Additionally, conversion of forests to agricultural use amplifies climate impact by adding to greenhouse load and removing key carbon sinks. Across multiple growing regions, conversion of local farmland to large-scale cash crops has also led to loss of food security and impairment of community autonomy.

Yield improvement is increasingly difficult to achieve

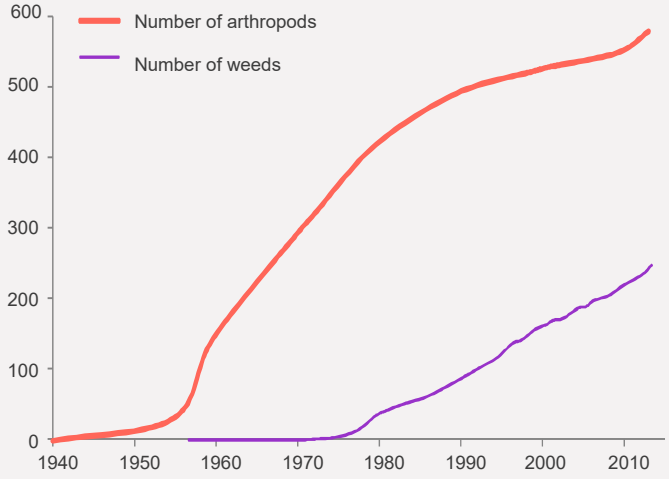
Global growth in grain yields (average of big four – maize, rice, soybeans and wheat), rolling 25-year CAGR



Source: Berenberg research

Insecticide and herbicide resistance is rising rapidly

Cumulative no. of species (insect and plant) resistant to at least one synthetic pesticide/herbicide



Source: CropLife International

[4] Creating a Sustainable Food Future, World Resources Institute, 2019

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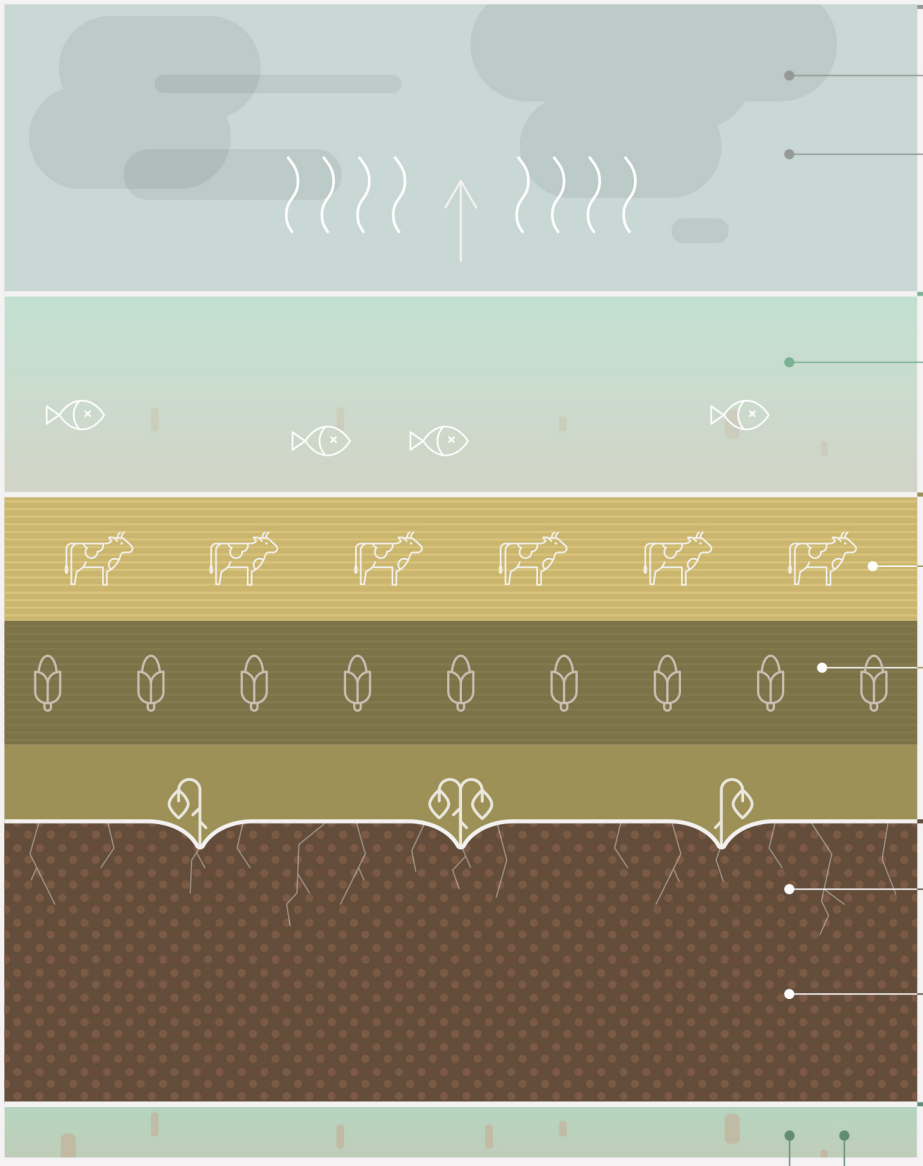
Industrial Agriculture

Large-scale mono-cropping and animal farming systems have increased food productivity since the 1950s but now threaten the ecosystems upon which they rely.



Atmosphere

Agriculture and associated deforestation is estimated to be ~23% of total GHG emissions.

Accelerating climate change amplifies challenges for agricultural production from increasing drought and extreme weather.

Water System

Runoff from chemical inputs, especially nitrogen and phosphorous fertilisers pollutes waterways and marine habitats, and can cause algal blooms toxic to aquatic life, animals and humans.

Land/Ecosystems

Cropland and pastureland are projected to increase by nearly 600 million hectares by 2050, removing forests and ecosystems essential to the biosphere.

Natural systems are dependent on diversity to function – monocropping and industrial animal farming create ecological dead zones.

Soil

Loss of organic matter from soil increases reliance on synthetic fertilisers and removes a carbon sink key to global climate change mitigation.

~1/3 of the planet's soil has already degraded, and 90% of soil could be degraded by 2050 without significant change to soil management practices.

Aquifers

Excessive irrigation depletes water tables – agriculture accounts for 70% of all freshwater withdrawals globally.

Agricultural chemicals leach into groundwater, which can contaminate community water supplies.

Source: Regnan 2020

Soil health is key

Restoring degraded soils is central to the sustainability of future agricultural systems, and a key to climate change mitigation.

Soil restoration entails rebuilding organic matter through modified farming and grazing methods. While most soils are only 2% to 10% organic matter, it plays a vital role in soil health. For example, each 1% increase in soil organic matter helps soil hold 20,000 gallons per acre[4], building resilience through both drought and heavy rain. And the healthier the soil, the healthier the crop.

Equally important, building organic matter in soil sequesters carbon dioxide and at scale has the potential to act as a key climate change mitigation strategy.

Project Drawdown[6] on soil carbon restoration

The scope for soil carbon restoration to mitigate GHG load is significant.

Project Drawdown models show a potential reduction in greenhouse emissions of ~0.86-0.98 gigatons per year by 2030 through the adoption of conservation agriculture and regenerative annual cropping, and a further reduction of ~0.4-0.7 gigatons per year through regenerative managed grazing practices.

The opportunity to sequester carbon through these practices is similar in scale to GHG reduction opportunities across the entire global transport sector.

As Drawdown states, “bringing the carbon back home through regenerative agriculture is one of the greatest opportunities to address human and climate health.”

[5] Jehangir H. Bhada, et al, Raising Soil Organic Matter Content to Improve Water Holding Capacity, University of Florida IFAS Extension, 2017
[6] www.drawdown.org/solutions

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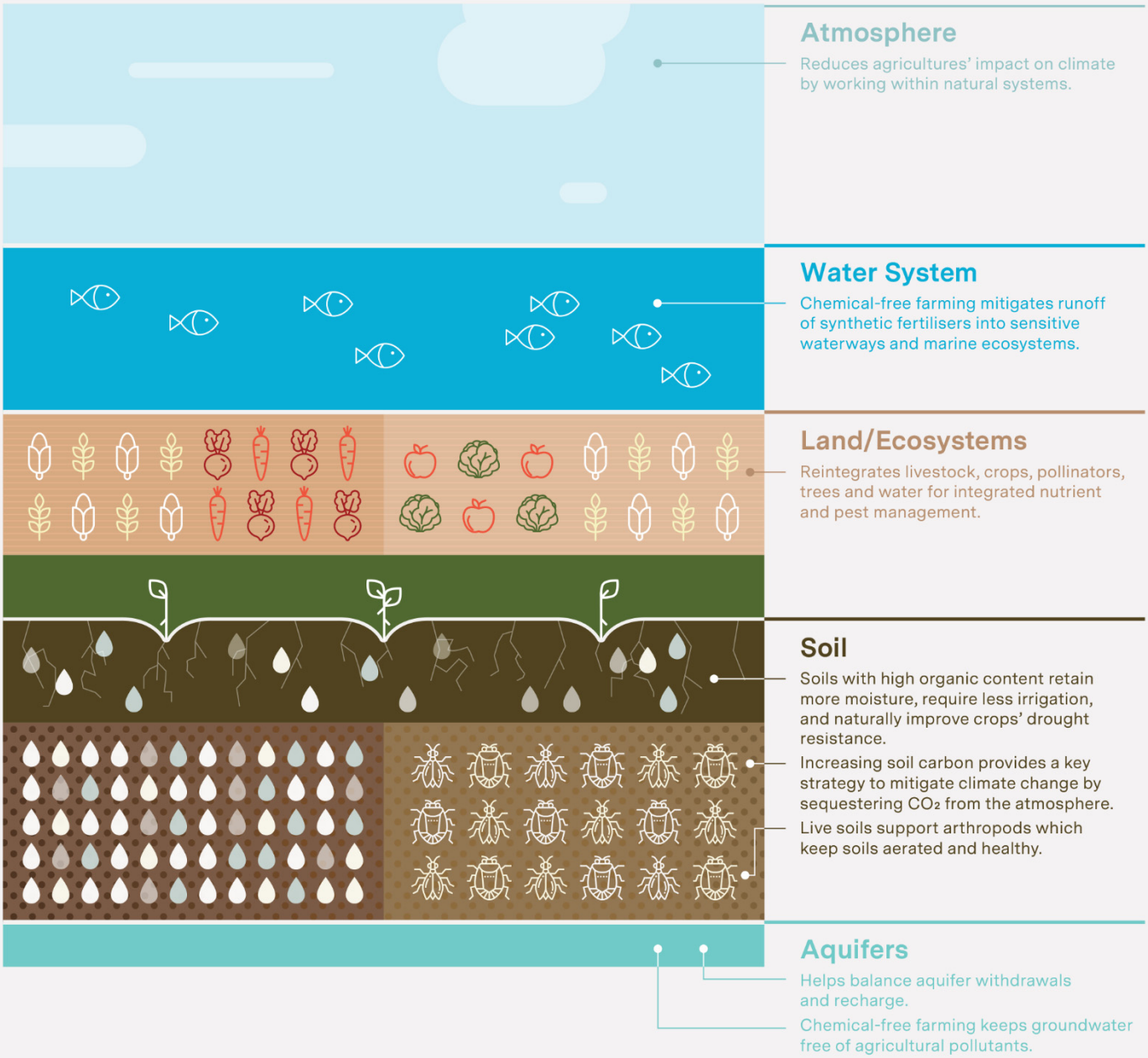
Regenerative Agriculture

Transition to regenerative practices creates opportunities to repair farmland damaged by industrial agriculture while improving food security for our growing population.



Source: Regnan 2020

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Expanding solution sets: alternative proteins

Regnan has sought to identify leverage points that can bring about the fundamental changes needed across food systems. The types of food produced, for example, have a very large bearing on the quantities of land, water and energy required, and GHG emissions produced.

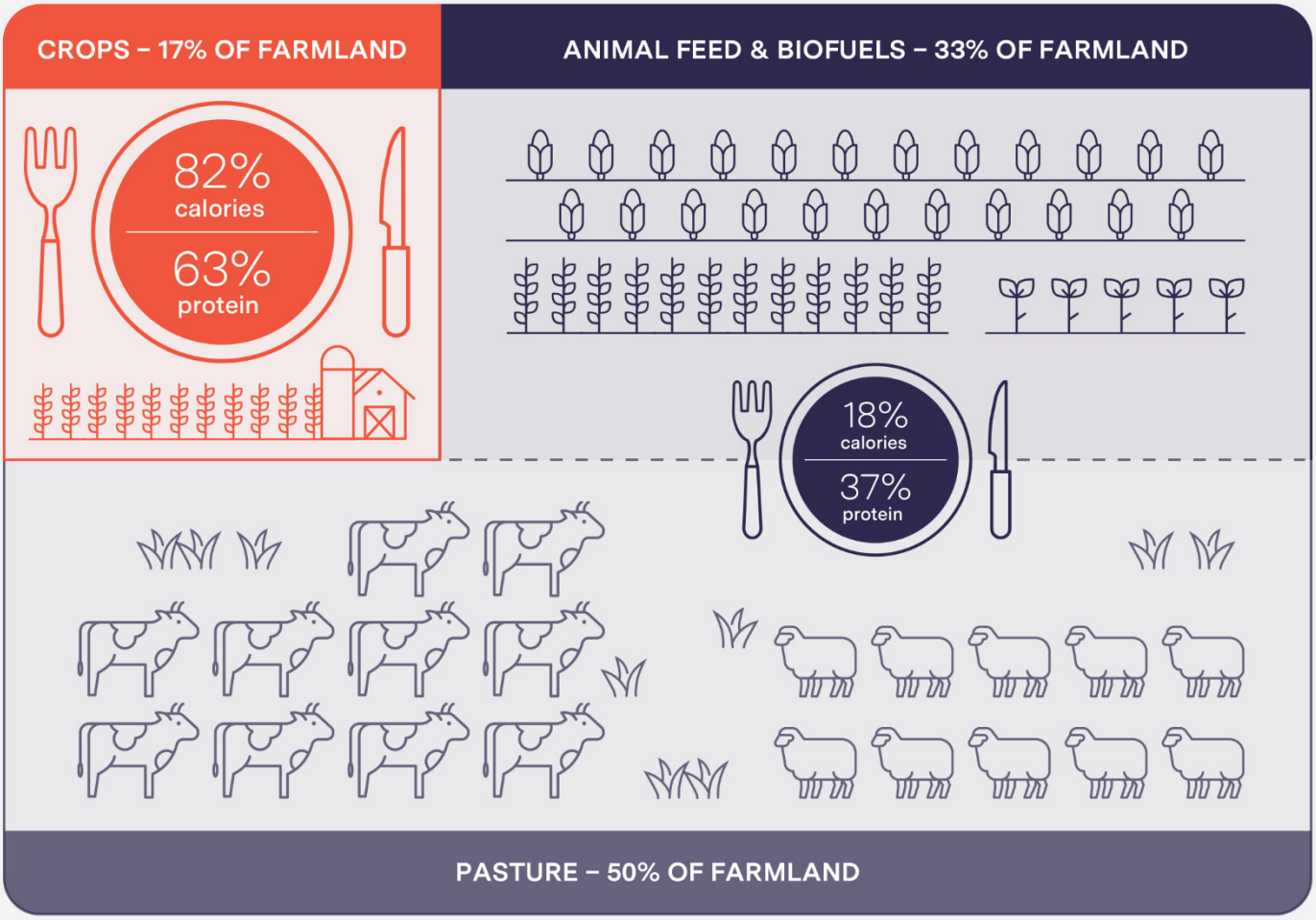
The resource intensity and environmental load associated with meat production is a key stress point, particularly as protein consumption continues to grow with rising affluence.

At the same time, available arable land for cultivation continues to decline, highlighting the need to develop protein alternatives with lower ecological impact. Plant-based proteins in, for example, soybean, wheat and rice currently provide the majority of protein consumed globally, yet are sourced from a fraction of the land devoted to livestock production.

Greenhouse emissions also vary significantly across different food types. Meat and dairy alone are estimated to generate about 14.5% of global emissions, with beef accounting for a significant proportion of the total due to high methane emissions (a highly potent GHG).[7]

Most food and protein is produced from cropland

Animal production currently requires the bulk of global farmland area



Source: Regnan 2020

[7] https://interactive.carbonbrief.org/what-is-the-climate-impact-of-eating-meat-and-dairy/

The conversion of land for beef production and animal feed is also a leading cause of deforestation in many tropical regions, including in the Amazon, where a recent spike in forest fires and clearing has been linked to cattle ranching.

This implies that meeting the global goal of limiting climate change to "well below" 2°C will require some degree of diet shift toward plant-based protein alternatives, which generally generate a fraction of the GHG emissions associated with ruminant livestock.

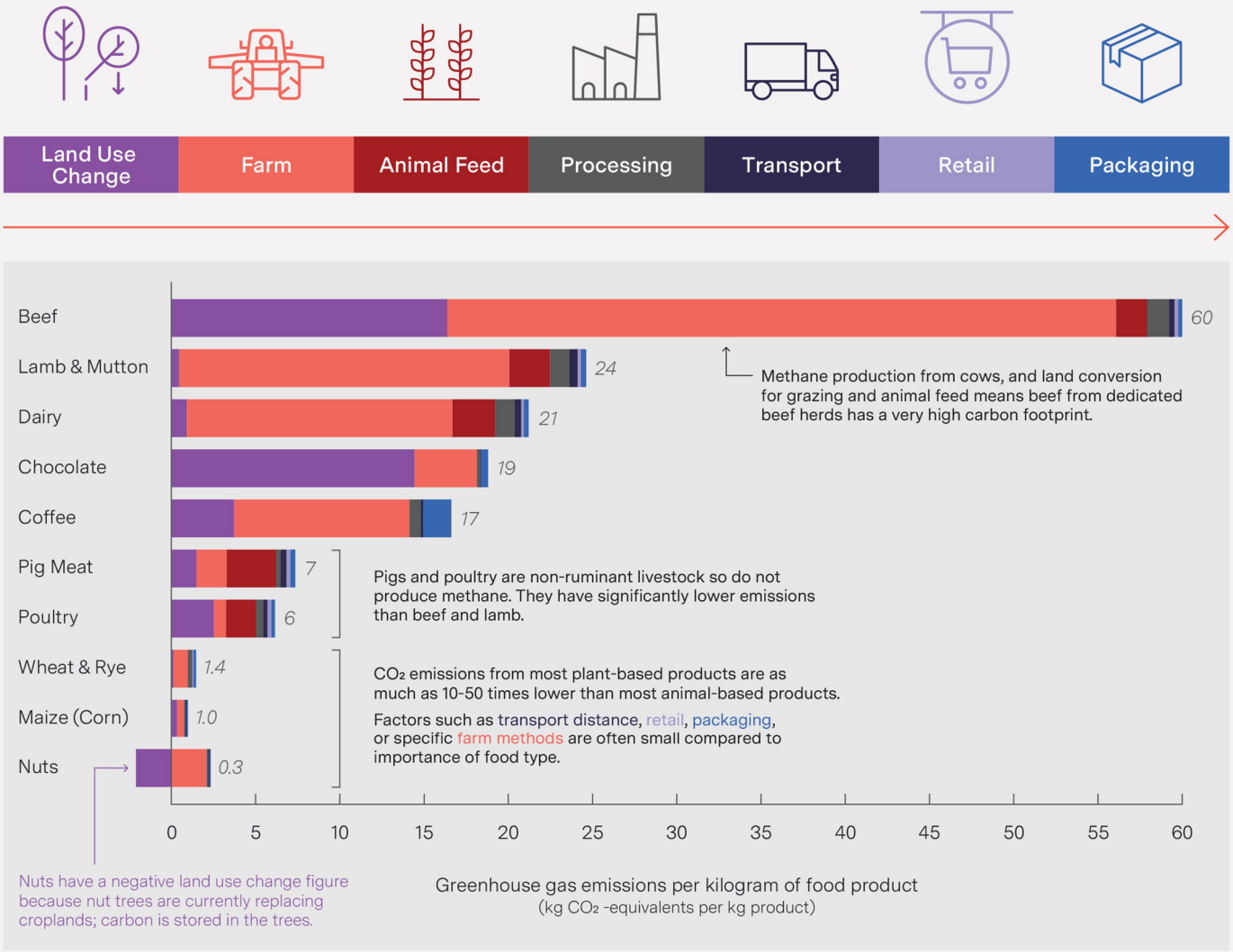
Tree grown nuts actually have a negative GHG footprint, for example, as carbon is sequestered from the atmosphere into biomass.

Plant-based proteins are emerging as ecologically-friendly alternatives to animal proteins, with a number of companies active in this space.

Impossible Foods[8] is a leading player, with products covering meat, dairy and fish alternatives. The core offering includes products that simulate animal proteins, but are produced with a substantially lower footprint relative to actual animal product. The company claims that, compared to beef, its Impossible Burger has an 89% smaller carbon footprint, uses 87% less water, 96% less land and reduces water contamination by 92%.

Food: greenhouse gas emissions across the supply chain

Emissions are dominated by land conversion and methane from livestock



Source: Poore & Nemecek (2018), Regnan 2020

[8] This is a point in time analysis. As such, Regnan may not hold all of the companies featured in this report, but may do so in the future.

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Food waste adds to ecological load

The enormous quantity of waste generated by global food systems is another key stress point, estimated to be close to 1/3 of all food produced annually. The global economic, environmental and social cost of food wastage is estimated at US$2.6 trillion, which is nearly equal to the GDP of France.[9]

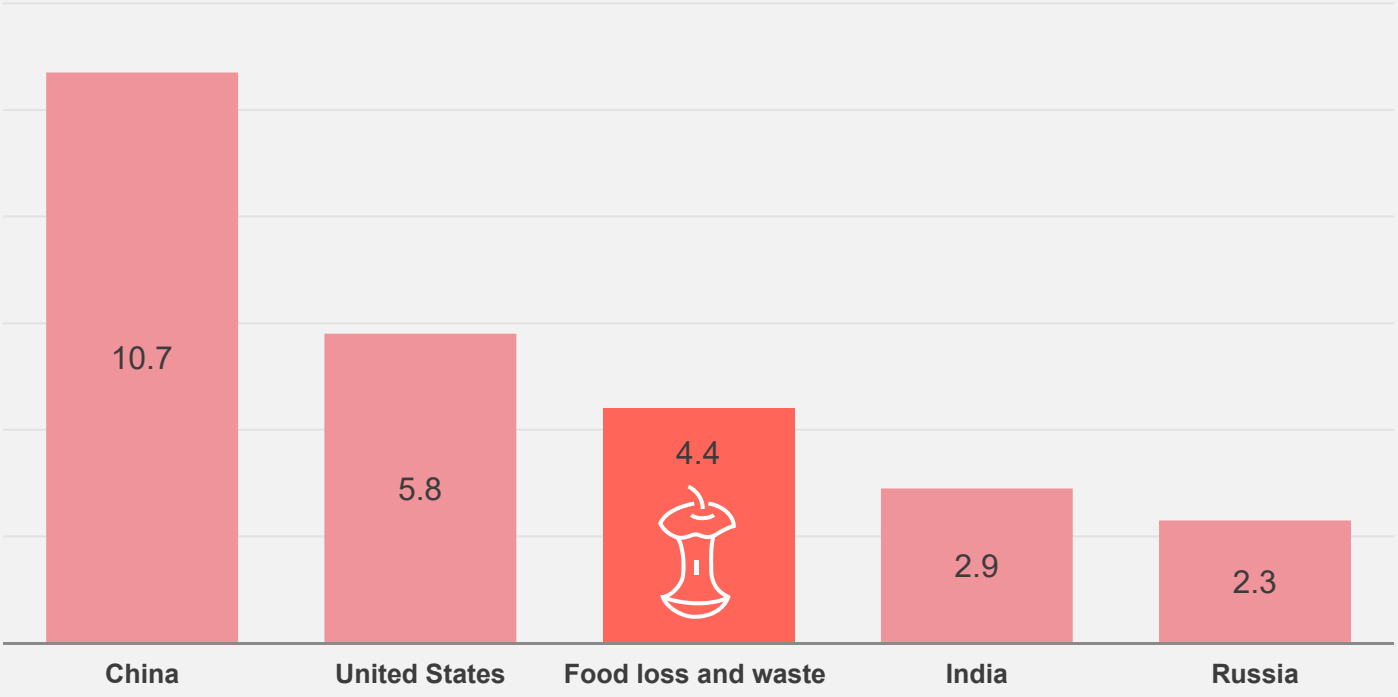
Production inefficiencies across food system value chains add proportionally to social and ecological impact through the greater land area and additional resources required to make up for food losses – food that never reaches consumers.

In the US alone, for example, it's estimated that a 20% reduction in food waste over the next 10 years would recover 1.8 billion meals per year, save over 1.6 trillion gallons of water annually, and avoid almost 18 million tonnes of GHG emissions annually – equivalent to removing about 4 million cars from the road.[10]

Reducing food loss and waste can help close the gap between food available today and food needed by 2050.

GHG emissions associated with global food waste relative to world's highest emitters at country level

GT CO_2-e (2011/12)



Source: Food wastage footprint; Full-cost accounting, Food and Agriculture Organization of the United Nations, 2014

[9] Food wastage footprint: Full-cost accounting, Food and Agriculture Organization of the United Nations, 2014
[10] https://www.refed.com/about

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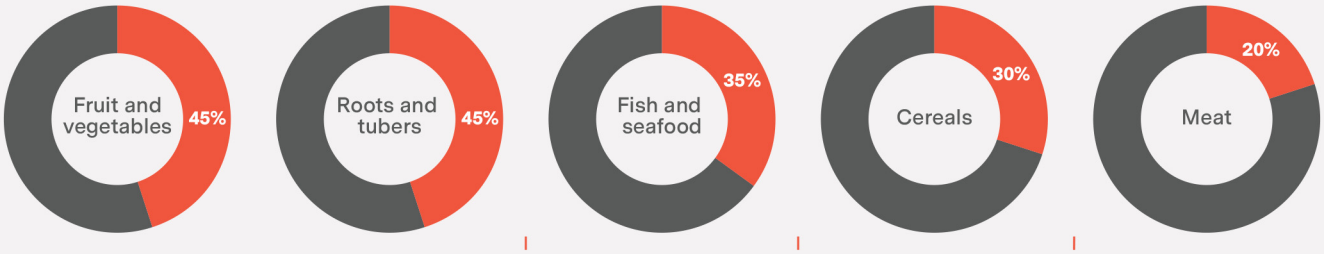
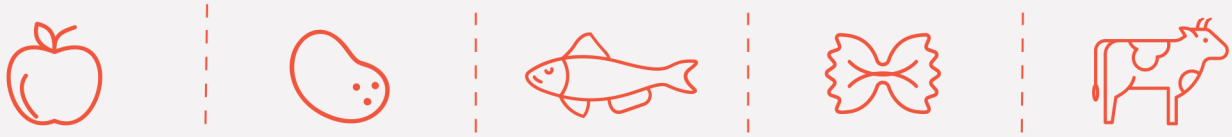
Waste occurs along the entire food value chain:

The commodity groups with the highest proportion of waste:



Per year, this waste is equivalent to:



3.7 trillion	1 billion	3 billion	763 billion	75 million
Apples	Bags of potatoes	Atlantic salmon	Boxes of pasta	Cows

Source: FAO 2011, Regnan 2020

Targeting investment solutions

Applying a broader analytic frame to agriculture and food production systems, Regnan has sought to identify key stress points and, by doing so, identify investment opportunities to catalyse positive changes. In addition to solutions aimed directly at transforming how food is grown, both opportunities related to low ecological impact food types and minimisation of food waste are incorporated into the range of solutions considered.

Within these broad solution areas, Regnan identifies specific solution sets, both established and emerging, where capital can be most effectively directed to bring about transformation of food systems aligned to the SDGs.

The Regnan 'top down' approach provides a framework to identify current investable solutions, but also a basis for studying and tracking emerging solutions that may lead to attractive investment opportunities as technologies and markets develop and adoption rates grow. This is achieved via the Regnan SDG Taxonomy, the first stage of the structured investment process which underpins the Regnan Global Equity Impact Solutions Strategy.

The sustainable agriculture and food production space is spawning a multitude of new technologies and business models, many of which are at early stages of development. Through the Regnan SDG Taxonomy we monitor developing technologies, while maintaining a critical eye on new innovations that show potential to contribute to our solution areas and provide pathways to achieving the SDGs.

For example, technologies are emerging in controlled farming and smart greenhouse applications to improve yields while minimising ecological impact.

An advantage of the Regnan approach is the additional insight it provides into technology areas that, if misdirected, could lead to suboptimal outcomes. An example is the ability to differentiate the raft of crop analytic/artificial intelligence (AI) and precision agriculture (PA) technologies emerging. While such technologies offer scope to improve farm efficiency and food production, a significant portion of current commercial activity in this space is directed toward large-scale agribusiness models. However, as described above, Regnan believes investment is best directed to solution areas that have the greatest potential to shift food systems to sustainable pathways.

The solution sets Regnan applies provide scope to identify specific AI and PA technology opportunities that have application to our solution areas. For example, AI and PA have potential application in organic and regenerative farming, water management, soil health management, and management of land to minimise impacts of farming on local ecosystems. Commercial applications in these areas appear to offer potential to enhance the future success of these agricultural models.

The figure on the following page sets out our four solution areas, which Regnan applies to identify investible solutions – currently 15 unique solutions are included in the Sustainable Agriculture and Food theme.

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Regnan Sustainable Agriculture and Food Production Solutions

Regenerative/ organic farming

Farming methods seek to optimise the interactions between plants, animals, humans and the environment, and to capture carbon in soils and above ground biomass. Farming methods emphasise soil conservation and use of biological rather than chemical inputs.

Controlled/ vertical farming

Primarily suited to land-constrained locations near urban areas. Involves highly intensive, chemical free, indoor farming, and typically, application of sophisticated monitoring and sensing technologies to optimise plant growth and yield.

Circular food systems

Food system interventions involving redesign of processes to eliminate or minimise waste across value chains through infrastructure improvements, storage and handling improvements, by-product reuse, waste repurposing and distribution improvements.

Sustainable food products

Food products that act to reduce or replace resource-intensive products, seek to improve health outcomes, and/or provide nutritional, affordable foods.

Investment Opportunities

- Organic farmland
- Geospatial technologies
- Microbiome technologies
- Bio crop protection

- Smart greenhouse IoT
- Precision irrigation
- Greenhouse sensors
- Planting mediums

- Food waste minimalisation
- Waste management platforms
- Bio food preservation
- Intelligent food logistics

- Plant based proteins
- Organic food ingredients
- Sustainable aquaculture

Source: Regnan

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Structured investment approach: the Regnan SDG Taxonomy

Regnan has developed a structured approach to identify solutions across our thematic investment areas, such as sustainable agriculture, building from the UN Sustainable Development Goals (SDG). The taxonomy provides a framework to identify specific sustainability issues to be resolved with respect to the relevant SDG, drawing on corresponding SDG targets.

Research is then conducted to define solution areas which assist identification of appropriate investment opportunities. Identification of 'impact risks' - risks to consider when assessing potential solutions - is a central feature of the taxonomy. A worked through taxonomy example is provided below for one of Regnan's solution areas, soil carbon sequestration.

Taxonomy example | Soil carbon sequestration

Sustainable Development Goal

SDG Target 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.

Issue statement

Commodification of agricultural production has resulted in the decline of local food production in many global growing regions in both developed and emerging markets and contributed to declining health, rural job losses/economic insecurity and urban migration. The combined effect of gradual conversion of local farming systems toward commodity agricultural products/cash crops and unsustainable agricultural practices (depletion of soil, overuse of water, reliance on chemical inputs), and greater climate variability/extremes are key factors contributing to reduced food security for the poor and rural stakeholders.

Solution

Soil restoration, woodland regeneration, no till farming, cover crops and more efficient grazing, water conservation and nutrient management can increase the soil carbon pool. This in turn can improve water retention (for each 1% increase in soil organic matter water retention increases by 20,000 gallons per acre), reducing the need for chemical nitrogen inputs increasing crop yields, for example 20-40 kg/ha improvement for wheat, and offsetting GHG emissions, with studies suggesting potential in the range of 0.4 – 1.2 gigatons of carbon p.a.

Impact risks

- **Stakeholder participation risks**

  Lack of affordability for farmers would reduce the breadth of positive impacts.

- **Evidence risks**

  Information on actual efficiency/productivity gains at farm level is likely to be difficult to obtain. Would require independent studies to determine application success.

- **Execution risks**

  Risk that the benefits of reduced resource usage may not be achieved by farmers in the absence of complementary farm management information (e.g. water needs of specific crops).

- **Unexpected impact risk**

  Financial over-commitment of farmers to obtain technologies if economic benefits are not also achieved, particularly if pricing arrangements are not sufficiently aligned to gains.

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Solution Providers

In the section we highlight companies offering innovative products and business models within Regnan's four solution areas for sustainable agriculture and food production, which are embedded in the Regnan SDG taxonomy.

Many of the promising new technologies and business model innovations in sustainable agriculture and food production are emerging in private companies. Tracking these developments keeps the team informed of nascent investment opportunities through, for example, public listings.

Additionally, Regnan maintains a watch list of public companies offering impactful solutions where markets for these products and services may need further time to develop.

This is a point in time analysis. As such, Regnan may not hold all of the companies featured in this report, but may do so in the future.

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Company examples

Indigo Agriculture

Solution area – regenerative farming

2 ZERO HUNGER

SDG Target 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.

Unmet need

The loss of the world's fertile soil poses a key risk to the future of global agricultural production and hence food security. According to soil scientists, at current rates of soil destruction from soil carbon loss, erosion, desertification and chemical pollution, we will no longer have enough topsoil to feed ourselves. About one-third of the world's topsoil is already degraded and the United Nations estimates a complete degradation within 60 years if current agricultural practices continue.

Intentionality

Alongside growers and buyers, Indigo Ag is seeking to build a system responsive to demands for high quality and sustainably produced food and fibre, with focus on soil microbiome upon which agricultural production systems are sustained. Its business revolves around microbial and digital technologies that increase the planet's capacity to produce food in a sustainable and responsible manner that complements and gradually replaces the ecologically problematic technologies that are responsible for much of the yield gains achieved since the 1950s.

Implementation

Indigo has developed an innovative business model, which spans the full agricultural value chain. The company provides agricultural advisory services based on preserving and enhancing soil health through the reintroduction of beneficial microbes into soils depleted by chemical based farming – essentially recreating the plant's natural microbial makeup. To reintroduce beneficial microbes back into crops, Indigo Ag has created seed coatings that provide a path for microbes to return to their native habitat.

The company offers a geospatial data platform capable of characterising localised soil conditions, and discerning subtle differences in crop health across a region. Indigo Ag also provides services to give farmers access to carbon credits through programmes that quantify and verify improvements to soil carbon.

Impact

Beneficial microbes protect crops from abiotic stress – from extreme temperatures and water scarcity, through to nutrient-deficient soils. By shielding plants from stressed conditions and enhancing their use of resources such as water, microbes have the potential to improve yields and increase farm revenue. Microbes have been tested on nine different crops on three continents in four separate growing regions, showing yield benefits consistently above 10% in crops grown in targeted stress conditions.

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Company examples

Ecolab

Solution area – circular food systems

2 ZERO HUNGER

SDG Target 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.

3 GOOD HEALTH AND WELL-BEING

SDG Target 3.3

By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases.

6 CLEAN WATER AND SANITATION

SDG Target 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 use globally.

Unmet need

Food waste is generated at every stage across food production chains – growers, packers, processors, distributors and retailers. Failure to control food pathogens is a key cause of food waste at each of these stages, leading to unnecessary disposal. Minimising pathogens across the food system value chain translates to waste minimisation by reducing contamination of foods that would otherwise be disposed.

Prevention of pathogens across food system value chains has direct benefits to human health. In the US, for example, the Center for Disease Control and Prevention estimates there are about 48 million cases of foodborne illness annually.

Intentionality

Ecolab provides leading antimicrobial water additive products to reduce foodborne pathogens. The company also provides water and sanitation solutions, delivering clean water to its customers, while reducing water use and waste.

Ecolab has set goals to help customers provide high-quality and safe food to 1.8 billion people by 2030 and to prevent 11 million foodborne illnesses. Ecolab's purpose is to "make the world cleaner, safer, and healthier – helping businesses succeed while protecting people and vital resources".

Implementation

Ecolab applies an integrated framework to assess the sustainability of its products – "Impacts That Matter". The framework uses best in class scientific standards as criteria to optimise product attributes, helping customers to make choices - "positive outcomes for people and the planet throughout the product lifecycle".

Ecolab's antimicrobial water additive products reduce foodborne pathogens (e.g.. E.coli, Salmonella) and help to control spoilage of processed fruit and vegetables. Products are currently applied across food processing chains, food services and food retail businesses, each of which are sources of potential pathogens and food waste.

Ecolab also uses data monitoring and real-time, actionable insights to protect against food sanitation challenges.

Impact

In 2019, Ecolab's food safety products were used across more than 36% of the world's packaged food and 44% of the global milk supply. In the restaurant sector, Ecolab's products supports clean kitchens serving 58 billion meals (preventing 7.5 million foodborne illnesses per year).

Regnan

Company examples

Iroquois Valley Farmland REIT

Solution area - regenerative agriculture

2 ZERO HUNGER

SDG Target 2.4

SDG Target 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.

Unmet Need

Conventional farmland ownership and financing in the United States creates barriers to adoption of regenerative agriculture due to the high cost of farmland and lack of availability of long-term leases, which run counter to the economics that drive regenerative practices. For example, farmers are less likely to plant cover crops on land they rent. Additionally, farmland is typically transferred from retiring farmers incentivised to sell to developers or large consolidated farm owners.

Intentionality

Iroquois Valley Farmland REIT is an organic farmland company established to improve land access to the next generation of organic farmers through offer of farmer-friendly leases and mortgages, as an alternative to conventional finance. The company's goal is to make organic agriculture the norm, not the exception in America to benefit the health of the soil and of future generations.

The company's guiding principles include supporting the next generation of young farmers to positively impact world health; farm with healthy, humane and organic practices; keep farmers on the land; and to protect farmland.

Implementation

Iroquois Valley's farmers use natural processes and materials to manage their operations, consistent with both the Organic Standard and the Soil Health Principles for Organic Production to guide their management decisions. Farmers see soil health as a continuous improvement process and part of an overall system of management. These practices facilitate transition to an organic system that more closely mimics nature to improve soil health.

Impact

Soils on Iroquois Valley organic farms can average 19% higher total soil organic carbon, a central component of soil organic matter which is a critical climate change mitigation strategy. Organic farms can decrease soil erosion by 30% over conventional farming.

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Company examples

Tomra

Solution area - circular food systems

2 ZERO HUNGER

SDG Target 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.

SDG Target 2.4

By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production and that strengthen capacity for adaptation to climate change.

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

SDG Target 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.

Unmet need

Food waste is a significant challenge, both in terms of value lost and food security. About 1.3bn tonnes of food is currently lost annually, including 45% of all fruit and vegetables, 30% of cereals and 20% of all meat. Waste occurs across food production systems, from growers, through to processors, distributors and retailers. Food wasted is additional food that will need to be produced to feed the world, adding to ecological load.

Intentionality

Tomra is a leading provider of sorting technologies, including for food, and integrated post-harvest solutions for the food industry. It has stated commitments to assist customers across the value chain to directly reduce food waste; help to improve yields; maximise food resource productivity; and accelerate technology through innovation.

Implementation

Tomra's sensor-based sorting solutions inspect millions of pieces of produce (from fresh to processed foods), helping to divert this material from going to waste, hence positively impacting yields. The company's sorting machines are also more energy-efficient and cost-effective than alternative methods.

Sensor-based sorting machines can determine product quality to a pre-specified level and, rather than consigning it to waste, the majority of the product can be reworked until it's ready to be used. Its technologies also sort food from impurities and hazardous or contaminated foreign objects, hence also improving food quality control. Tomra continues to innovate new sorting technologies, working closely with the food industry to tackle the growing food waste problem.

Impact

Tomra sorting technologies help to divert 5-10% of produce form going to waste. Across its global customer applications, waste diverted is approximately equivalent to 25,000 trucks worth of potatoes per year.

Sorting technologies cover a wide range of food products from fruit and vegetables, to grains, seeds, nuts and meat products.

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Where to from here

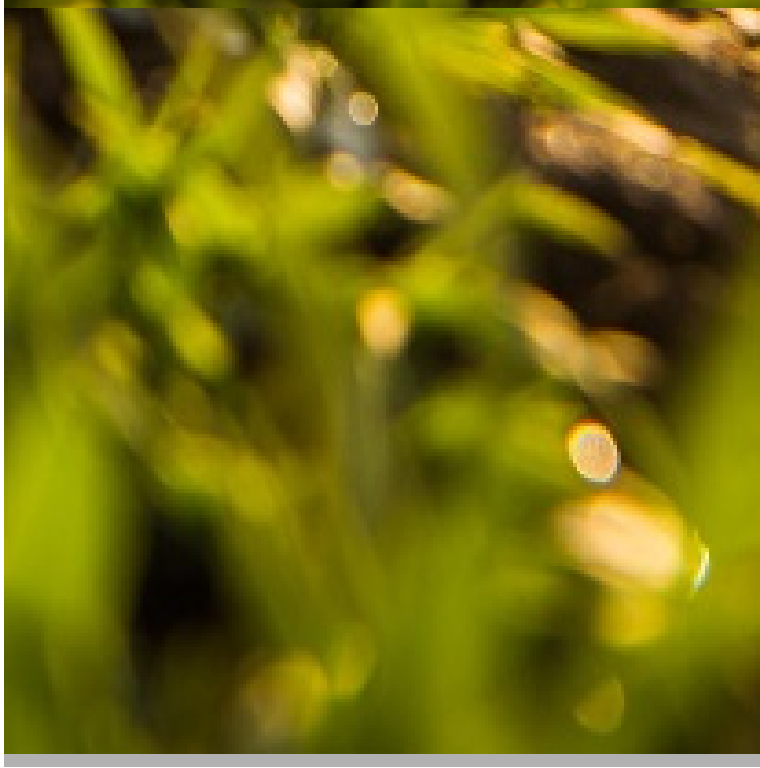
This report has sought to outline the challenges ahead for global agriculture and food production in the face of rapidly increasing global population and growing pressure on the biosphere. While these challenges are great, strategies and solutions are emerging across many fronts that offer new pathways to feed the world while preserving and protecting our natural resources, and through regenerative practices, to even repair essential farmland and related ecosystems.

This report has also outlined Regnan's analytic approach to understand and structure the wide array of solutions emerging. Importantly, we've sought to highlight where some responses could exacerbate sustainability issues without careful scrutiny.

Going forward, Regnan is in a strong position to identify innovative and scalable solutions that offer the greatest opportunity to transition agriculture and food production systems to sustainable pathways. Not only does the Regnan SDG Taxonomy identify the solutions to underserved needs, but also the companies on a mission to solve the challenges increasingly faced by our environment and society.

Ultimately, these challenges represent demand for a product or service, so companies that are able to fulfil these needs are well-positioned for growth in the future.

We will continue to assess the most promising solutions as the investable universe evolves to reflect a constantly changing world through our Regnan SDG Taxonomy, an essential component of our process for impact investing.



Impact investing with integrity in equities is both essential and feasible

To conclude, the world needs impact investing in public equities, in order to deliver on the SDGs, but investors in this field must preserve the core tenets of impact investing. We are on a mission to do two things. We want to preserve these concepts and the integrity that gave birth to impact investing. At the same time, we offer a solution that allows for additional positive impacts to be delivered at scale, through a platform accessible to any investor.

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