circular investment opportunities to build back better

Many voices from governments, businesses, and civil society have been calling for a response to the devastating impacts of the Covid-19 pandemic that does not turn attention away from other global challenges such as climate change, biodiversity loss, and plastic pollution. Yet, solutions from the past will not be up to the problems we face today as the multifaceted nature of the crisis we are experiencing require new thinking and the redesign of our current economic model.

In an unprecedented response to the Covid-19 crisis, trillions in economic stimulus are being unveiled all around the world and in the next stage of their recovery plans, governments will have to decide where these funds will be allocated. The circular economy, as an instrument to decouple economic growth from resource use and environmental impact, opens up the way for a resilient recovery and a next wave of economic prosperity. By fostering innovation and competitiveness, reducing resource dependency and environmental impact, and creating new jobs, the circular economy presents a promising way forward.

Building on research over the past 10 years on circular economy across various sectors and regions, the Ellen MacArthur Foundation identifies 10 attractive circular investment opportunities which address both short- and long-term goals by public and private sectors. This selection of opportunities spread across the five key sectors of built environment, mobility, food, fashion, and plastic packaging. Each sector is independently explored in a series of Insight papers, along with pieces offering perspectives on policy outlook. These can be found at the Ellen MacArthur Foundation page: Policy & investment opportunities shaping a resilient and low-carbon economic recovery.
Food

Two circular investment opportunities towards a resilient low-carbon economic recovery

The pandemic has had mixed impacts on the food industry. On the one hand, there has been a global increase in food expenditure on groceries, as the popularity of cooking from scratch has grown, while obviously spending on eating out and takeaways has decreased. To avoid crowds and travelling far, people have moved to buying their food from smaller retailers closer to where they live, or even ordering food directly from farmers themselves.

In some places, this trend has been supported by the increased adoption of online ordering and home delivery services developed in response to lockdown measures, with the online food delivery segment having experienced an 11.5% increase compared to the previous year in the UK alone. A surge in demand for foods perceived to be safer and healthier has also been detectable in the midst of the pandemic.

On the other hand, panic purchasing and disruptions to the global supply chain following the onset of the pandemic have led to short-term food shortages of certain products in grocery stores. Food security among vulnerable populations has also been strained as food banks have received fewer donations whilst facing increased demand from the newly unemployed. Moreover, when taking into account the entire overall economic impact of the pandemic, a staggering 265 million people around the world are expected to be at risk of facing acute food insecurity in 2020 with the greatest impact to be felt in low-income countries.

Meanwhile, the upstream players in the supply chain, such as farmers, have been challenged with oversupply issues due to a number of factors. Mobility restrictions have created shortages of seasonal migrant agricultural workers in some regions, with exceptional admissions and visa extensions having urgently been put in place for these ‘essential workers’ to ensure food security in host nations is retained. The lockdowns and border closures have also constrained producers in their ability to transport their goods to where they are demanded. Infrastructural shortages and the inflexibility caused by extreme efficiency and specialisation of supply chains, have only further exacerbated oversupply issues. Farmers typically supplying out-of-home eateries have suffered cancelled orders from shut down schools, restaurants and other B2B customers, facing issues in finding alternative markets for their goods and struggling to adjust their production, packaging, and distribution systems to fit the needs of retail consumers. As such, redistribution of these stocks has been difficult, leading to massive post-harvest losses of food.

Many of the trends detected during the pandemic in the food sector are also projected to continue into the future. The health-consciousness of consumers is predicted to rise, increasing the demand for local, healthy and certified organic food that can be traced through the supply chain to its origins to ensure its safety. Increased time spent at home through greater adoption of remote working is expected to encourage the continuance of more at-home cooking...
and eating, while food e-commerce and demand for deliveries from both grocery stores and restaurants are predicted to remain at elevated levels and even continue their growth. Regulation around food safety will also become more stringent whilst consumer concern regarding this heightens. Meanwhile, the expected global population rise to 9.7 billion by 2050 will require food system adaptations to ensure adequate nutrition is provided for everyone. As 80% of the world’s food is projected to be destined for cities by 2050, consumption patterns in urban areas will also have a greater influence upstream, thereby potentially redefining the urban-rural dynamic, for example, through greater focus being placed on connecting with local production.

The circular economy offers many solutions that can leverage these trends and address issues faced by the food industry, including: shifting to regenerative food production methods; developing surplus edible food prevention and redistribution, and by-product collection and valorisation infrastructure; reconnecting with local food production; scaling the adoption of circular indoor urban farming; and diversifying ingredients including protein sources to offer alternatives to industrially produced animal products. These could all contribute to the creation of a better and more resilient future food system, but in the current situation, two especially attractive circular investment opportunities arise:

1. Tools enabling farmers to shift to regenerative agricultural production models
2. Increasing food and by-product collection, redistribution, and valorisation infrastructure

These selected opportunities highlight areas that can help address both short- and long-term goals of the public and private sectors. They offer solutions to key challenges created by the pandemic, while also: meeting governmental priorities for economic recovery (e.g. stimulate growth and innovation, create jobs, meet Sustainable Development Goals (SDGs), climate targets); offering circular economy growth potential (driven by e.g. innovation, policies, and evolving customer preferences); and helping reduce the risk of future shocks (e.g. those relating to climate change and biodiversity loss).
Tools enabling farmers to shift to regenerative agricultural production models to create food systems that allow people and nature to thrive

The pandemic has heightened anxieties around food safety, while highlighting the unhealthy state of the current food system. For the food sector to re-emerge from the pandemic stronger, increasing system resilience and reducing the environmental impacts of the sector will be vital. Investing in a faster and broader shift towards regenerative agriculture could offer attractive opportunities for achieving this vision of a healthier and more resilient food system of the future that benefits natural systems and people alike.

Investing in the acceleration of regenerative agriculture can also create many economic benefits. A recent report by the World Economic Forum indicated that by 2030, 191 million jobs and USD 3.56 trillion in economic opportunities could be created by reforming food, land, and ocean use by, among other things, making greater use of regenerative agricultural practices. In a regenerative system, input costs can also be reduced as enriched soil organic matter and mutually beneficial relationships between different crop and animal species are created, thus reducing agricultural reliance on pesticides and synthetic fertilisers. For instance, a USD 78–116 billion spend on accelerating the adoption of regenerative production through promoting practices such as planting diverse cover crops, no tillage, and multiple crop rotations, has been estimated to yield USD 2.3–3.5 trillion in lifetime operational cost savings.

Diversifying the types of food grown can also lead to greater farmer income diversification, subsequently improving both crop-resilience and the resilience of producers’ livelihoods in the face of external shocks, such as those created by climate change. Moreover, the profitability of regenerative agriculture has in some cases even been found to be higher than that of conventional food production systems. For example, a 2018 study on corn fields found that those managed regeneratively saw a 78% increase in profits compared to the profits of conventionally farmed fields. In addition, the growing demand for healthy food, accelerated since the onset of the global pandemic, is only likely to increase the attractiveness of regenerative agricultural produce, with 72% of Europeans reporting to put more effort into healthier eating in the future.

A regenerative food production system can create significant environmental benefits. The current linear industrial agricultural food production system is extremely extractive and degrading of natural systems. In the linear way of cultivating food, increased agricultural yields are linked to the heightened use of synthetic fertilisers and pesticides, the excessive use of which erodes soils, depleting them of their valuable mineral resources and jeopardizing their long-term fertility. As such, the current food system has caused widespread soil degradation, with a 2015 study having estimated that one third of global soils were moderately to highly degraded, threatening food security of the future. To circumvent these issues, a shift to a regenerative food production system is needed. Regenerative food production is aimed at building healthy, biologically active ecosystems: improving, rather than degrading the environment in which the food cultivation or rearing is embedded. These aims can be reached through a variety of practices, such as crop rotations and diversification, no-till farming, and using cover crops, or managed grazing, in the case of regenerative livestock rearing.
With an emphasis on improving the ecosystem in which they are embedded, regenerative food production systems work with nature, rather than against it. A 2017 paper by Farmland LP found that USD 85 million of farmland—which under conventional farming would have generated USD 8.5 million in ecosystem harm—was able to generate USD 12.9 million value in ecosystem services after being regeneratively farmed. As fewer synthetic herbicides and pesticides are used in regenerative production, lower environmental toxicity can be achieved by circumventing harmful leakage, while avoiding the costs associated with its clean-up. The reduced reliance on synthetic fertilisers manufactured using fossil fuels, combined with the adoption of practices such as no-tillage, also means that switching to regenerative production could—conservatively estimating—reduce total agricultural greenhouse gases (GHGs) by a minimum of 17% annually. As food production and agriculture are currently responsible for over one fifth of all GHG emissions, improvements in this area can have significant global impacts. To add to this, regenerative food production has also been found to positively contribute to soil carbon sequestration, thus further increasing its ability to contribute to climate change mitigation. In fact, it has been estimated that in a period of 25 years, soils alone could sequester over 10% of anthropogenic carbon emissions.

Moreover, by applying regenerative methods to the production of animal products, overall food production emissions can be even further reduced. As the current linear intensive livestock rearing practices are switched out for regenerative ones such as integrated crop and livestock operations, the massive GHG contribution of industrial livestock rearing can be addressed and the farm’s carbon sequestration ability improved. These savings may be very impactful given that livestock rearing in the traditional linear model was found to account for approximately two-thirds of the agricultural sector’s total production-related emissions in 2009. To enable this shift, rethinking our food products and menus to diversify protein sources will also be critical.

**Investments in technical tools facilitating farmers’ adoption of regenerative food production methods will be critical in achieving these benefits.** Increasing the availability of specific equipment and non-synthetic inputs—such as biofertilisers, vertical tillage tools that preserve soil structure, and ‘finger weeders’ that can remove unwanted flora without toxins—will support farmers in making the transition. Additionally, emerging digital and technological capabilities are giving way to new tools that provide valuable insight into soil quality, and crop and animal welfare, for instance. Digital farming, i.e. combining data collection, storage, analytics and decision modelling, can also be leveraged by large scale farms by utilising big data and internet-of-things solutions to enable optimal regenerative results. Examples of these solutions are already being tested and used, with the AI mobile app ‘Nuru’ using machine learning to identify plant disease symptoms from photos, and service-based businesses, such as FarmShots and Vine View measuring hydration, health, and disease of crops through aerial and drone footage.

**Investments in training will help ensure the uptake of these technical solutions.** To improve training success and accessibility, both online solutions and in-person agricultural teaching will require investments. Local adaptations to training will be critical in ensuring that effective results and greater farmer acceptance can be achieved. Examples of existing organisations helping farmers transition to regenerative practice, can be found in the Horn Farm Center for Agricultural Education in the United States, and Sustainable Harvest International in Central America, which provide in-person training, while other institutions, such as the Savory Institute and Ecological Farming Association (EcoFarm) provide online courses and links to relevant resources to these ends. To enable a faster and wider farmer transition to regenerative production, more investments will, however, be needed to improve farmer access to these resources.

**Investments in tools to help establish a market for food grown using regenerative methods will also be needed.** Digital and technological solutions that can provide timely, cost-effective and accurate measurement data on the impacts of regenerative food production require investment to help producers and companies clearly communicate the benefits of regenerative food to consumers, creating greater demand-side pull for these products. One example of such a

Regenerative food production can contribute to soil carbon sequestration, with a study estimating that in a period of 25 years, soils alone could sequester over 10% of anthropogenic carbon emissions.
solution is the Soil Condition ANalysis System (SCANS) which reliably estimates soil carbon stocks by combining an automated soil-sensing system with advanced statistical modelling and analytics. Blockchain and other technologies enabling better traceability can also be harnessed to build consumer awareness of product origin, farming techniques used, nutritional content and environmental impact, thereby enabling the creation of greater demand for regeneratively produced goods. Additionally, digital commerce platforms can provide enhanced channels for farmers to directly reach consumer markets. For instance, SiembraViva provides training to farmers in Colombia to adopt more regenerative practices and then through its e-commerce platform delivers produce from the farmers directly to urban citizens’ doorsteps. The heightened demand created by the adoption of these solutions can, in turn, attract more farmers to adopting these practices, thus increasing the benefits that can be achieved through regenerative production.

The policy environment is increasingly supportive of investments in a regenerative agriculture system. A number of policies, though not directly related to regenerative agriculture, also benefit the movement towards this production method and strengthen its attractiveness in the future. The Australian government formed an Emissions Reduction Fund, whereby farmers can receive credits for producing goods using lower-emissions methods, and even sell them to others. Meanwhile, the EU’s Farm to Fork Strategy sets out targets to reduce the use of fertilisers by 20% by 2030, and the use of chemical pesticides by 50% by 2050. Though these goals are not yet fixed in any legislation at EU level, the tone set by the strategy is clear and will guide future national implementation measures, notably under the Common Agricultural Policy (CAP) e.g. through supporting more environmentally sound ways of agricultural production. Moreover, given the rising multi-stakeholder advocacy for a more restorative food production system, exemplified by, for instance, the formation of the One Planet Business for Biodiversity cross-sectorial coalition in 2019, policies in support of regenerative food production methods will likely only become more commonplace in the future.
Increasing food collection, redistribution, and valorisation infrastructure to make the most of food and improve food security

Concern over the massive amount of food waste generated around the globe is ever-growing. In their SDGs, the UN has even set a target of halving global food loss and waste by 2030.49 Creating a circular food system where surplus edible food gets redistributed and inedible by-products are collected and transformed into valuable products—rather than discarded as in the current linear model—will be necessary for the value of these streams to be retained in the economy. To attain this vision, critical investments in collection, redistribution, and valorisation infrastructure are needed.

**Investments in food collection, redistribution, and valorisation infrastructure could create a number of economic benefits.** Each year around the world the 1.6 billion tonnes of food wasted amounts to USD 1 trillion of economic costs.50 This lost organic matter consists of edible surplus food and inedible by-products, both of which could be transformed from costly burdens to attractive economic opportunities through enhanced collection, redistribution, and valorisation efforts. In fact, food waste reduction has been found to present an annual economic opportunity between USD 155–405 billion by 2030.51 The edible surplus food could either be redistributed through, for instance, food banks, to help improve food security and fight hunger, or processed to create new food products and revenue streams.52 The latter option could allow food manufacturers to save costs and attract substantial investments. For example, Renewal Mill, a flour-producing venture using the by-products of tofu and soy milk production as inputs, raised USD 2.5 million in 2019 for a seed round.53

Inedible food by-products, in turn, could be valorised to create inputs for agriculture as well as new materials and bio-energy, depending on the mixture of by-products present in the stream and technologies available for processing. Innovative solutions for inedible food by-product valorisation can create new revenue streams for farmers and food businesses generating by-products, and provide them with access to new growing markets. For example, with the global compost market projected to grow with a CAGR of 6.8% from 2019 to 2024, reaching USD 9.2 billion by 2024, investments into valorising inedible food by-products to compost could offer attractive economic returns for food producers and companies.54 In some cases, food by-products are well-suited to be transformed for use in the bioeconomy; for instance, Ananas Anam produces a leather-like material called Piñatex®, from the by-product of existing agriculture, i.e. pineapple leaves that would otherwise be discarded.55

This infrastructure will also play a critical role in unlocking a variety of environmental benefits for the food system. Currently, every year, one third of all food produced globally is wasted.56 Moreover, barely any of this waste is retained and valorised; in Europe only 16% of food waste is captured,57 while globally less than 2% of all valuable nutrients present in urban food waste and by-products get valorised.58 As a result, the energy and resources used to grow, harvest, transport and package these wasted goods is also lost, which, when combined with the methane produced from landfilling some of this waste, creates substantial GHG emissions.59 In fact, food waste has been found to account for approximately 8% of the annual anthropogenic GHG emissions.60 If, instead, circular solutions were employed to prevent the wasting of, and instead redistribute, edible food surplus, while increasing the valorisation of unavoidable by-products and green waste through composting, 1.7 billion tonnes of CO2 could be saved annually.61 Furthermore, some of
the USD 700 billion in environmental costs caused by the current system could be avoided by increasing the collection, redistribution, and valorisation of food surplus and inedible by-products. With food waste volumes surging during the pandemic as a result of farmers’ inability to get their produce to the market, the need for circular solutions that capture, redistribute and valorise surplus food and inedible food by-products will become increasingly important for easing the environmental strain placed on food production systems.

**Reaping these benefits will require investment in physical infrastructure in low income countries, such as cold chains that enable the storage, processing, and distribution of edible food.** In low income countries, most of the food loss occurs immediately after the harvesting stage, due to insufficient infrastructure to store or process excess food. In India, for instance, deficiencies in cold chain, distribution, and transport infrastructure are hindering industry growth. With vast lockdowns and food flow being significantly disrupted during the pandemic, these issues have only been compounded. For instance, in Africa, the border closures preventing produce transport resulted in mountains of rotting crops in depots. Increasing the availability of cold chain or specific food processing infrastructure could then extend the shelf life of food while addressing the main cause of food waste in these areas. Using freeze-drying infrastructure to process food, for example, allows it to be kept from spoiling before reaching consumers, while also retaining up to 98% of the food’s nutritional value.

**In high income countries, infrastructure facilitating the redistribution of edible food surplus will be needed.** In contrast to the situation in low income countries, high income countries generate the majority of their food waste at the post-consumer stage. A 2011 FAO study found that 95–111 kg of food waste per capita was generated annually by European and North American consumers, while the corresponding number for sub-Saharan African and South/Southeast Asian consumers was a mere 6–11 kg. A lot of this wasted food is still edible, but due to factors, such as confusing labelling or aesthetic issues, these items get unduly discarded. In order to prevent this edible food from going to waste, investments in redistribution systems that allow retailers, restaurants, and consumers to redirect their surplus food, will have to be made. Many examples of such systems that could be widely adopted and further developed already exist, such as the FareShare FoodCloud platform connecting large retailers with surplus food to local charities, the Danish WeFood supermarket selling produce past its sell-by date at strong discounts, and the mobile app Karma showcasing the unsold restaurant meals that consumers can buy at half-price nearby.

**Processing infrastructure to collect and valorise discarded inedible food by-products will also be critical.** Door-to-door collection systems, for instance, may offer attractive opportunities for municipal organic waste valorisation. Although initially more costly, these systems have been found to generate purer and higher quality by-product streams at greater volumes, thereby lowering treatment costs and rejection rates further down the value chain. The greater stream purity can, in turn, allow for greater returns on the valorised content, as it can more easily be used for higher value applications, such as the manufacture of various bio-based materials. For example, Orange Fiber, a fabric creating company, uses citrus juice by-products (i.e. peels) for the production of their material.

However, investments into processing infrastructure and reverse logistics will be needed at the same time in order for these collected streams to be valorised. Large structures like anaerobic digesters that produce biogas and biofertilizer, bio-refineries that create protein feed, biofertilizers and biochemicals; composting facilities that generate valuable compost or biogas; and other innovative processing solutions that use, for instance, insects to convert organic waste streams to valuable products, such as AgriProtein, will need to be developed and distributed, ensuring their accessibility so that their benefits may be achieved. At the same time, smaller scale distributed systems that can be used on-site, such as the anaerobic digester Waste Transformer, can also offer attractive solutions for valorisation of smaller localised inedible food by-product and waste streams.

**Digital infrastructure, particularly food flow mapping technologies, will play a key role in the emergence of thriving food networks.** Currently, very little information is available for consumers about where food comes from, and for producers about where food ends up. Some initial attempts of food flow mapping have been made, such as the regional efforts under the FAO’s City Regions Food System (CRFS), which tested rapid food flow mapping in seven cities across the world. Similarly, in the US, the first map of the country’s food supply chain was just created in 2019. However, with the global nature of the food supply chain, more investments are needed to develop global food flow maps that can help create clarity around the highly complex system. The national food flow map of the US alone revealed 9.5 million links between value chain players across the
country’s counties. As such, the number of linkages between global food value chain players must be staggering. However, having access to this data will also enable much more effective use of resources and can improve system resilience. Increased transparency around where food comes from (taking into account all the steps of the value chain), will enable consumers to make even more informed decisions about their purchases, in line with consumer demands. Meanwhile, regenerative food producers can benefit from being more easily identifiable as such, thus enabling the streamlining of supply chains to better connect these farmers directly to buyers interested in their produce. Food waste streams can also be more easily identified and potentially even circumvented through mapping, while the ease of redirecting unavoidable waste for redistribution or valorisation can be increased.

Digital technologies will play a major role in enabling this greater traceability, and as such require investments. Blockchain technologies allow for real-time traceability, thereby improving consumer confidence in food safety, a factor of great importance following the pandemic. Internet-of-things solutions, combined with food sensing technologies that automatically capture and report data on the status of food whilst in transport, for instance, can also be used to help determine whether unsold food items can be redistributed, or ought to be valorised in other ways.

The policy environment is increasingly supportive of investments in food circulation and valorisation. Policymakers everywhere are becoming more aware of the detrimental economic and environmental impacts of food waste, while also starting to see opportunities in its valorisation. As such, numerous initiatives and regulations are, and have been, sprouting around the world. Japan introduced the Food Waste Recycling Law in 2001 that improved the recycling rates of food-related businesses. In 2017, the Australian government released its National Food Waste Strategy aiming at halving the country’s food waste produced by 2030. Meanwhile, the EU’s Farm to Fork Strategy of 2020 set out to create legally binding targets on food waste reduction for each member state, in order for them to achieve their goal of halving per capita food waste by 2030. With more innovations for food waste revalorisation popping up, and a growing concern over the issues surrounding food waste, it is likely policies around this matter will also become more commonplace and potentially more welcomed by citizens in the future.
With the wide-scale disruptions to global supply chains and people’s lives, the pandemic has both exposed the vulnerabilities of the current food system and ignited people’s interest in reconnecting with their food. In the midst of the health crisis, the value placed on nutritious food that benefits rather than degrades nature has grown, strengthening the case for shifting towards regenerative food production. Meanwhile, as both over-supply and shortages have plagued the value chain due to unprecedented disruptions, the necessity for improved food collection, redistribution, and valorisation systems has become glaringly obvious. Therefore, circular investments in ‘tools for farmers that enable their shift towards regenerative food production’ and ‘increasing food collection, redistribution, and valorisation infrastructure’ will be key to building back a more resilient and healthy food system that enables greater food security while allowing both people and nature to thrive.
Endnotes

1. World Economic Forum, These charts show how COVID-19 has changed consumer spending around the world (2nd May 2020); Time, Our diets are changing because of the coronavirus pandemic. Is it for the better? (28th April 2020); Business Insider, Yeast and flour makers are ‘cranking out product like you wouldn’t believe’ to meet surging demand as isolated Americans turn to baking amid the pandemic (31st March 2020)

2. Politico, Coronavirus has more Americans turning directly to farms for food (31st March 2020); Food Navigator, Coronavirus boosts demand for local and functional foods in France: market study (20th May 2020)

3. Food Navigator, Online food delivery ‘one of the only winners’ in coronavirus outbreak (19th March 2020)

4. Food Navigator, Organic food’s coronavirus boost: ‘health crises have a long-term impact on consumer demand’ (6th May 2020); Food Navigator, Coronavirus boosts demand for local and functional foods in France: market study (20th May 2020)


6. United Nations World Food Programme, COVID-19 will double number of people facing food crises unless swift action is taken (21st April 2020)

7. International Food Policy Research Institute, How COVID-19 may disrupt food supply chains in developing countries (2nd April 2020)


10. Reuters, U.S. food banks run short on staples as hunger soars (24th April 2020)

11. CNBC, Why coronavirus is causing a massive amount of food waste (19th May 2020)

12. Forbes, Five ways that coronavirus will change the way we eat (31st March 2020)

13. Harvard Business Review, 3 behavioral trends that will reshape our post-Covid world (26th May 2020); Deloitte, How COVID-19 is accelerating the food transformation (2020)


15. United Nations Department of Economic and Social Affairs, Growing at a slower pace, world population is expected to reach 9.7 billion in 2050 and could peak at nearly 11 billion around 2100 (17th June 2019); Harvard Business Review, Global demand for food is rising. Can we meet it? (7th April 2016)


17. United Nations, World food safety day: from planting to your plate, everyone has a role to play (7th June 2020)

18. International Monetary Fund Blog, Why sustainable food systems are needed in a post-COVID world (14th July 2020)


20. Project Drawdown, Regenerative Annual Cropping


22. LaCanne, C. and Lundgren, J., Regenerative agriculture: merging farming and natural resource conservation profitably (26th February 2018)

23. Food Navigator, Is coronavirus changing how we eat? (11th May 2020)


26. World Resources Institute, Regenerative agriculture: good for soil health, but limited potential to mitigate climate change (22nd May 2020); Fast Company, Is it possible to raise a carbon-neutral cow? (24th July 2019)

27. Farmland LP, Valuing the ecosystem service benefits from regenerative agriculture practices (2017)

28. Rhodes, C., Feeding and healing the world: through regenerative agriculture and permaculture (December 2012); Conservation Finance Network, The state of regenerative agriculture: growing with room to grow more (24th March 2020)

29. The IPM Practitioner, Regenerative agriculture can reduce global warming (February 2018)


31. Food and Agriculture Organization of the United Nations, Soils help to combat and adapt to climate change - by playing a key role in the carbon cycle (2015)

69 RESET, *Global food waste and its environmental impact* (September 2018)

70 FareShare, *FareShare FoodCloud celebrate 5 million meals with Tesco* (26th January 2017); DCA actalliance, *WeFood – Denmark’s first-ever surplus food supermarket*; Karma, *Eat out on a budget and protect the planet* (2020)

71 European Commission, Copenhagen Resource Institute and Bipro, *Assessment of separate collection schemes in the 28 capitals of the EU* (13th November 2015)

72 Orange Fiber, *About – Who we are*

73 AgriProtein, *Repairing the future*

74 European Commission, *Farm to fork strategy – for a fair, healthy and environmentally-friendly food system* (2020); European Bioplastics, *Composting*

75 The Waste Transformers, *We are The Waste Transformers - turning your food waste into value* (2020)

76 Food and Agriculture Organization of the United Nations, *City region food systems programme – reinforcing rural-urban linkages for resilient food systems* (2020)

77 Lin et al., *Food flows between counties in the United States* (26th July 2019)

78 Lin et al., *Food flows between counties in the United States* (26th July 2019)


81 Deloitte, *Food waste has gone viral* (2020)


83 Premakumara, *Food recycling law in Japan and its implementation, progress and challenges* (24th October 2018)


85 European Commission, *Farm to fork strategy – for a fair, healthy and environmentally-friendly food system* (2020)