environmental investigation agency

Ocean

Cultivating Plastic

Part 1 - Agriplastics and the UK grocery retail supply chain

March 2023

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ACKNOWLEDGEMENTS

This report was written and edited by the Environmental Investigation Agency UK (EIA) with support from John Ellerman Foundation

EIA also wishes to thank its numerous supporters whose long-term commitment to the organisation's mission and values helped make this report possible.

John Ellerman Foundation

ABOUT EIA

We investigate and campaign against environmental crime and abuse.

Our undercover investigations expose transnational wildlife crime, with a focus on elephants and tigers, and forest crimes such as illegal logging and deforestation for cash crops like palm oil. We work to safeguard global marine ecosystems by addressing the threats posed by plastic pollution, bycatch and commercial exploitation of whales, dolphins and porpoises. Finally, we reduce the impact of climate change by strengthening and enforcing regional and international agreements that tackle climate super-pollutants, including ozone depleting substances, hydrofluorocarbons and fossil fuels.

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March 2023

Front cover ©EIA: There is no single solution to this complex material problem; options need to be assessed for each material design and application, location and climate. However, this complexity should not be an excuse for inaction or a lack of engagement.

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Introduction

The use of plastics in agriculture (commonly known as 'agriplastics') only accounts for 3.5 per cent of annual global plastic usage. However, their design, use and the pollution they cause are devasting and extend far beyond farmland.

Despite their proliferation since the 1950s, a period of increased production of single-use plastics and the development of modern-day intensive monoculture agriculture,[1] there has not been a corresponding level of oversight of their impact. EIA first raised the alarm to UK grocery retailers with the publication *Fields of Plastics* in 2018 and since then more awareness and research has been developing both within the UK and globally.

The challenges faced in tackling agriplastics are not that dissimilar to those presented by other, more familiar, plastic products.

For instance, the increased use of plastics in agriculture and the function they provide have been used to both justify and gloss over their impacts on the environment and human health – in reality, their flawed, chemical-ridden and single-use design results in contamination and mismanagement throughout their entire lifecycle.

The volume of waste and their lack of recyclability can result in illegal dumping, burning and export, while the lack of monitoring and reporting of data is used to rationalise their relative absence from regulatory oversight, despite the growing and urgent evidence now available highlighting the need for this.

Above: Many fruit and vegetables are grown using plastic mulch, an example here being strawberries grown under black plastic mulch. Mulch comprise about 40 per cent of the global agriplastic market. Post use they are highly contaminated with soil (and other contaminants). They are thus difficult to recycle, making them more vulnerable to mismanagement.

Alternative single-use biodegradable solutions, perpetuating the linear consumption status quo, are being promoted - despite these alternatives not necessarily being viable, safe or sustainable to be used at similar scales to conventional plastics.

Agriplastics and their problems are unique, however, in that their use is currently deeply embedded within the provision of one of society's most essential services – food production. A significant amount of current agricultural practices have been designed around agriplastics' use, just one aspect of agriculture's global impact on the planet, which also include climate change, food security and other intense forms of environmental degradation.

Agriplastics are also unique in terms of their considerable importance as both a time-sensitive necessity but also as a source of long-term damage. Their use can create essential short-term abundance, but are also creating mid- to long-term scarcity of the very same produce. Disentangling the solutions to all of this will require multiple measures and approaches.

Despite the complexity of terrestrial agriplastic use, urgent action is required. As a consequence, this report series seeks to outline:

- the impact the UK grocery retail sector has on agriplastic use around the world and lack of current action addressing this
- the scale of environmental and human health harm brought about by the use of agriplastics
- how agriplastic use and design results in mismanagement and criminality
- critical issues to consider in the use of alternative agriplastic products and methods.

Taken together, we believe these different elements will provide a solid base on which we can collectively address this, to date, long-overlooked issue.

What are agriplastics?

By their very nature and use, agriplastics pose a significantly high risk of leakage into the environment. This elevated risk and the long-term impact means that understanding and managing applications of these plastics should be a priority.

However, agriplastics have different forms and applications and will therefore need different solutions to address them. Overall, terrestrial agriplastics can be classified as:[2]

- **protective cultivation films** (greenhouses, high/low tunnels, plastic film placed on top of soil aka mulching, nursery films, direct covering and covering vineyards and orchards)
- **nets** (anti-hail, anti-bird, wind-breaking, shading)
- **piping, irrigation/ drainage** (water reservoir, channel lining, irrigation tapes and pipes, drainage pipes, micro-irrigation, drippers)
- **packaging** (fertiliser sacks, agrochemical cans, containers, tanks for liquid storage, crates)
- **fertiliser** (slow-release, protective seed coatings)
- **other** (silage films, fumigation films, bale twines, bale wraps, nursery pots, strings and ropes, boxes, fittings, spray cones, tapes)
- **unintentionally added** (compost, sludge/ slurry).

Above: Irrigation piping is another type of agriplastic product. Some plastic pipes are made out of PVC plastic. PVC contains dangerous chemical additives, including phthalates, which are harmful to human health.

There are two main reasons as to why the function behind the proliferated use of agriplastics since the 1950s[3] has taken place – to either replace traditional agricultural methods, such as replacing plant mulching or, in some regions, to develop new practices (such as localised irrigation in water-scarce regions).[4]

Their origin is typically attributed to Professor Emery Myers Emmert (Professor of Horticulture at the University of Kentucky from 1928-62), who is credited with creating one of the world's first plastic greenhouses in 1948.[5] Initially designed to grow and study tropical plants, he subsequently used plastic film for low tunnels and mulching, given its malleability and cheapness,[6] a development which coincided with the increased use of plastics throughout different sectors at the time.[7]

Agriplastics' ability to boost short-term agricultural productivity in terms of quality, yield of produce and economics can be separated into four main categories:

- general protection (e.g. increasing soil temperature, supressing weed growth),
- efficiency in use of inputs (e.g. herbicides, pesticides) and natural resources (e.g. water),[8]
- reducing the risk from unforeseen climatic events
- extension of localised growing seasons.

These multiple benefits increasing overall short-term crop production come in the form of weed[9] and insect control, fertilising agents,[10] minimising soil erosion, shielding from harsh weather,[11] maximising water retention,[12] optimising germination[13] and extended storage.[14] Plastic tunnel and greenhouse cover, irrigation pipes and mulching are examples of agriplastics that provide such functions for growing fruits and vegetables.

In addition to the intentional use of micro and macro plastics in agriculture, additional microplastics can be found in compost[15] and sewage sludge[16] used on agricultural lands as fertilisers,[17] which thus act as unintentionally added plastics.[18]

The UK food supply chain

Alongside its domestic food production, the UK has a role in global food systems as both an importer and exporter of produce.

It is impossible to ignore the globalised nature of food systems and the influential role companies in one country have on the agricultural practices happening in another, including the use of agriplastics. To that end, it is important to understand the UK food supply chain.

To better articulate this, EIA conducted an analysis of major sourcing regions and trends in the UK food supply chain, comprising UN Comtrade data in addition to UK Government reports, including *Agriculture in the UK 2021*,[19] *UK Food Security Report 2021*[20] and *Horticulture Statistics Report 2021*.[21] This analysis, by proxy, thus infers the UK's influence with regards to agriplastic use across the world.

Insights into sourcing that impact agriplastic use and pollution

Extent of global impact and dependency on imports – According to Government reporting, the UK's food supply primarily relies on domestic production and imports from EU countries. In 2021, these two sourcing regions comprised 81 per cent of the country's food supply (58 per cent and 23 per cent, respectively). The remaining sources of produce are Africa (five per cent), Asia (four per cent), North America (three per cent), South America (four per cent) and the rest of Europe (three per cent), with Australasia at one per cent.

The Government considers this picture to have changed little in the past 10 years. In 2021, the UK had a 'self-sufficiency ratio' of 60 per cent, meaning it is largely self-sufficient in domestic production of grain, some meats, eggs, milk and potatoes, but only produced 54 per cent of the fresh vegetables and 16 per cent of the fruit it consumed in 2021. Defra state that UK food production is driven by market forces rather than aiming to maximise calorie production from available land.

Major sourcing regions – There are some overlaps, namely – Spain, France and the Netherlands – as key sourcing countries, but typically different produce and food, which are all dependent on different types of agriplastic use, have different sourcing regions. As a result, the impact of the UK food supply chain and agriplastic footprint is complex and fragmented; for instance, a significant amount of fruit imported to the UK comes from South America whilst many vegetables imported come from other European countries.

Above: In early 2023, the UK faced some fresh produce shortages in supermarkets. A number of ongoing developments has meant that those who typically provided the UK with certain fresh produce at this time of year are facing difficulties. This includes changing weather patterns brought on by climate change, trade issues brought on by Brexit, market powers, inflation, a cost-of-living crisis, a global energy and fertiliser price crisis and more.

Seasonality and year-round demand – Domestic production of fruit and vegetables is concentrated in the summer months, particularly for higher value crops such as berries, while the UK is more reliant on other countries or regions for specific foodstuffs at different times of the year, in part due to a variety of climates and growing seasons around the world. Year-round access to out-of-season fresh fruit and vegetables (FFV) has increased in the past 20 to 30 years, leading to longer and more complex supply chains.

The UK has year-round FFV production, but winter crops have root vegetables and leafy greens dominating. In winter, the UK is particularly dependent on imports to keep supermarkets stocked with diverse out-of-season FFV such citrus fruits, lettuce and tomatoes. During the past 30 years, consumer preferences have developed, favouring more ingredients which cannot be grown in the UK and thus accessing out-of-season produce throughout the entire year.

Climate and environmental degradation risk to domestic food production – Defra identifies the biggest medium- to long-term risks to the UK's domestic food production as climate change and other environmental pressures including soil degradation, water quality and biodiversity loss. For example, both the *UK Food Security Report* and *AUK 2021* cite the 40 per cent reduction in wheat yields in 2020 due to heavy rainfall and droughts during the growing season. There has been much media reporting on the potential effects on the effects of the drought conditions in the summer of 2022 on UK[22] and rest of European[23] agricultural production and expected changes in trade. If domestic production is threatened by these factors, looking to source affected produce from overseas clearly risks displacing the environmental burden of current production patterns onto other regions, who will also be struggling with the very same risks.

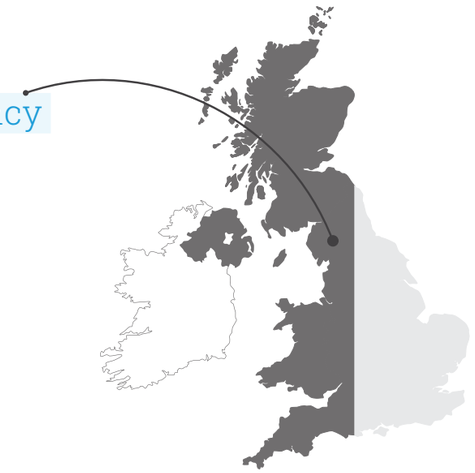
"Indirect" agriplastic use relating to animal feed (silage) and horticulture also have impacts – In the UK, agriculture accounts for 71 per cent of the total land usage. The majority of this is grassland for grazing livestock rather than growing crops. Although livestock rearing doesn't necessarily rely on agriplastics in the same way as fruit and vegetable production, agriplastics used for animal feed is something to bear in mind. Animal feed varies in cost and environmental impact, whether from locally grown hay, grain and silage to imports of grain and soyameal. These types of feed are typically wrapped up in plastic silage for fermentation and storage purposes. Agriplastics are also used significantly in horticulture production.

With regards to agriplastic use and impact of the UK food supply chain, it is also important to not only consider the largest overall sourcing countries by tonnage but also how much of any one country's exports are destined for the UK so as not to underestimate the true impact of the UK on agricultural land around the world – For example, the UK has traditionally been one of Kenya's leading export destination markets, but Kenya is not one of the UK's largest sourcing countries for produce.[24] In 2020, the main exports from Kenya to the UK included tea (38 per cent), vegetables (24 per cent) and cut flowers (16 per cent), all three accounting for 78 per cent of total exports, however Kenya is not one of the largest sourcing countries of either flowers or vegetables to the UK.[25]

Below: Fire on Salisbury Plain, Wiltshire, England, 7th July 2022, during a period of intense heat and drought in the UK. Defra identifies the biggest medium- to long-term risks to the UK's domestic food production as climate change and other environmental pressures including soil degradation, water quality and biodiversity loss. Agriplastic pollution is a driver of soil degradation and water quality.

UK self-sufficiency ratio

In 2021, the UK had a 'self-sufficiency ratio' of 60 per cent, meaning it is largely self-sufficient in domestic production of grain, some meats, eggs, milk and potatoes, but only produced 54 per cent of the fresh vegetables and 16 per cent of the fruit it consumed in 2021.



Top Vegetable Net Imports

Spain	795,081,215 kg
Netherlands	481,055,792 kg
Morocco	139,483,471 kg
Belgium	133,896,738 kg
Poland	131,760,660 kg
USA	98,764,165 kg
Canada	83,727,025 kg
Italy	54,035,408 kg
China	51,312,109 kg
Senegal	41,968,130 kg
Israel	37,612,663 kg
India	5,851,210 kg
Kenya	32,267,915 kg
Cyprus	23,913,393 kg
Hungary	22,567,653 kg

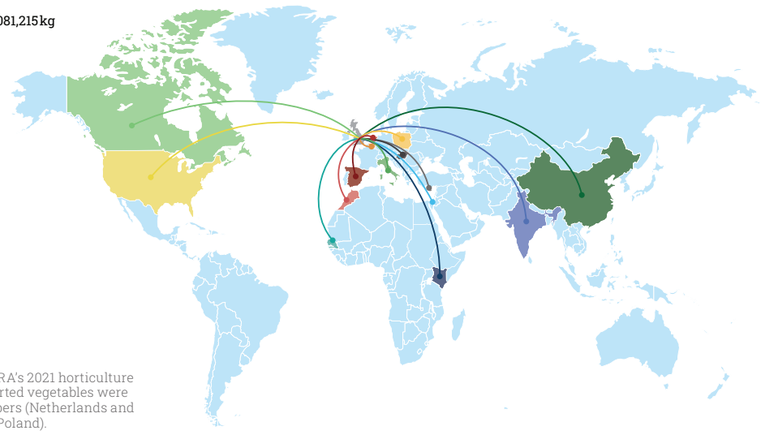


Figure 1: Source: UN Comtrade. Vegetables - DEFRA's 2021 horticulture statistics report indicates that the UK's key imported vegetables were tomatoes (Netherlands and Morocco), sweet peppers (Netherlands and Spain) and mushrooms (Republic of Ireland and Poland).

Top Fruit Net Imports

Spain	560,988,411 kg
South Africa	420,402,512 kg
Costa Rica	385,510,219 kg
Colombia	298,050,069 kg
Brazil	185,284,112 kg
Peru	13,5622,093 kg
Netherlands	134,649,378 kg
Egypt	111,709,204 kg
Chile	107,059,008 kg
Türkiye	104,646,489 kg
Morocco	104,491,521 kg
Dom. Rep.	102,753,170 kg
Italy	97,671,086 kg
Ecuador	95,897,505 kg
France	79,612,800 kg

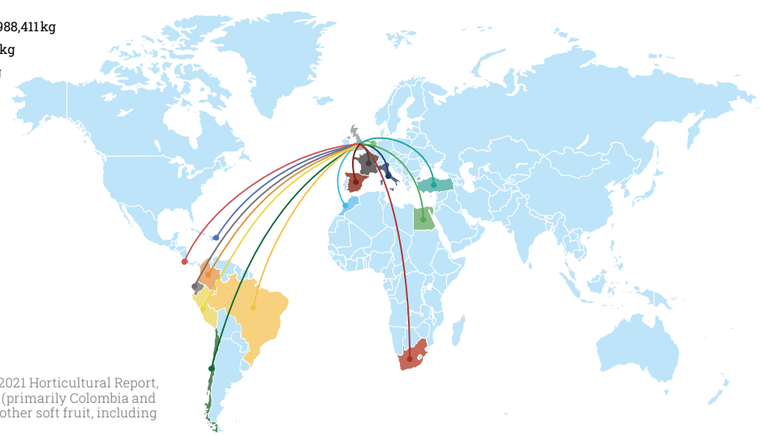


Figure 2: Source UN Comtrade. According to the 2021 Horticultural Report, the UK's three key imported fruits were bananas (primarily Colombia and Costa Rica), grapes (South Africa and Spain) and other soft fruit, including citrus fruit (Spain and Chile).

Top Meat Net Imports

Ireland	180,042,154 kg
Denmark	153,070,668 kg
Poland	137,319,038 kg
Germany	94,806,209 kg
Netherlands	82,005,024 kg
Brazil	62,605,915 kg
Spain	40,273,689 kg
New Zealand	37,630,215 kg
Italy	18,587,189 kg
Belgium	12,077,574 kg
Australia	7,789,100 kg
Hungary	5,851,210 kg
Thailand	4,564,208 kg
Argentina	2,998,276 kg
Uruguay	2,743,813 kg

Figure 3: Source: UN Comtrade. The UK is largely self-sufficient in terms of meat production. For example, it produces 97 per cent of its poultry consumed domestically and over 80 per cent of its domestic beef consumption. The UK mainly imports pork and beef.

Top Cereal Net Imports

Canada	900,170,987 kg
France	738,548,970 kg
Ukraine	685,625,516 kg
Denmark	419,842,081 kg
Poland	414,813,314 kg
Germany	318,460,761 kg
Ireland	215,957,102 kg
Argentina	208,543,902 kg
India	178,974,494 kg
Pakistan	127,411,520 kg
Estonia	113,800,994 kg
Brazil	88,024,524 kg
Latvia	67,557,272 kg
Serbia	67,410,900 kg
Russian Fed.	63,954,425 kg

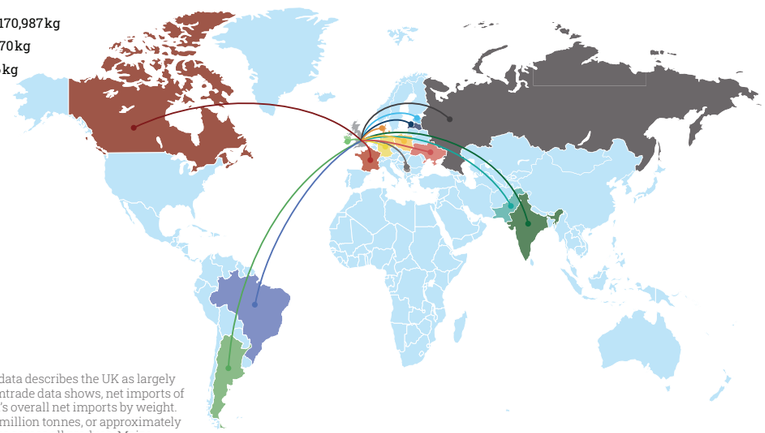


Figure 4: Source: UN Comtrade. Cereals - Government data describes the UK as largely self-sufficient in grain production. Saying that, UN Comtrade data shows, net imports of grains still comprise a significant proportion of the UK's overall net imports by weight. The UK's net imports of grains in 2021 comprised 4.43 million tonnes, or approximately 25 per cent of its total net imports of 17.45 million tonnes across all produce. Maize comprised almost 60 per cent of these net imports at 2.6 million tonnes.

Top Horticulture Net Imports

Netherlands	250,202,298 kg
Ireland	29,947,955 kg
Kenya	25,437,852 kg
Italy	15,456,023 kg
Colombia	14,054,168 kg
Belgium	13,045,243 kg
Germany	12,243,176 kg
Spain	11,419,611 kg
France	7,424,681 kg
Denmark	7,254,309 kg
Türkiye	2,532,627 kg
Ethiopia	2,090,49 kg
China	1,639,214 kg
Morocco	1,334,907 kg
Poland	984,686 kg

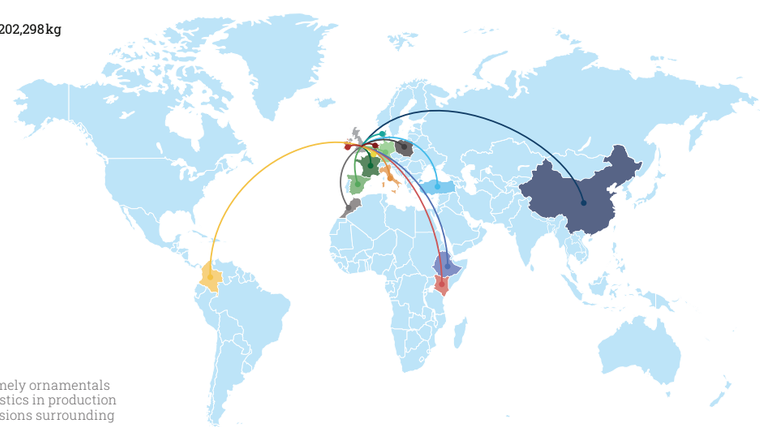


Figure 5: Source: UN Comtrade. Horticulture, namely ornamentals such as flowers, can also be grown using agriplastics in production and should be considered with regards to discussions surrounding the impacts of agriplastic use.

Agriplastics use

The data on global production, use, flows and final destinations for agriplastics are also very limited and don't necessarily come from Government sources.

Agriplastics use in the UK

The picture of agriplastics use in the UK is piecemeal at best. There are no mandatory reporting measures in place and Government data is currently outdated[26] and does not provide the level of detail required to extrapolate potential estimates. Furthermore, different industry sources have different estimates when it comes to terrestrial agriplastic use;[27] the Chartered Institution of Wastes Management (CIWM) has estimated about 135,500 tonnes of terrestrial agricultural plastic waste are produced each year, the majority being non-packaging plastics (including contamination, such as soil),[28] but this only provides an insight into macro-agriplastics and is a far from complete picture.

Agriplastics use throughout the rest of the UK supply chain

The data on global production, use, flows and final destinations for agriplastics are also very limited and don't necessarily come from Government sources.[29] According to the UN Food and Agriculture Organisation's (FAO) latest estimates, 12.5 million tonnes of agriplastic products are used globally every year in production, including 10.2 million tonnes for crops and livestock, 0.2 million tonnes for forestry and 2.1 million tonnes for fisheries, in total the equivalent of 3.5 per cent of annual global plastic production.[30] In terms of terrestrial agriplastics, modern agriculture particularly depends on film mulches, which comprise about 40 per cent of the global agriplastic market.[31]

Table 1: *FAO global estimates of Agriplastic use per annum*

Region	Estimated agricultural plastics	Notes
Asia	6 million tonnes	Asia is considered the largest user of agriplastics, accounting for almost 70 per cent of the global use of film[32] and almost 50 per cent of the total use of agriplastics, amounting to six million tonnes annually.[33] A significant proportion of the use of these agriplastics specifically occur in China.
Europe[i]	1.74 million tonnes	In Europe, approximately 1.74 million tonnes of plastics were used in 2018 for the agricultural sector.[34]
North America	490,000 tonnes	Data on the quantities of agricultural plastics used in North and South America are few and inconsistent; 490,000 tonnes of plastic films (greenhouse, mulching, silage and storage) are estimated to be used in North America annually, while 240,00 tonnes of plastic films are estimated to be used in Latin America annually
South America	240,000 tonnes	
Australia	82,800 tonnes	In Australia, the agricultural sector uses almost 82,800 tonnes of plastic products
Africa	No data available	A specific assessment regarding the quantity and types of agricultural plastics used in the African continent was not available, data was available for a few specific countries including South Africa which is estimated to use 152,000 tonnes per annum (10 per cent of total plastic consumption).

[i] (European Union + UK + Norway + Switzerland)

Impacts of agriplastic use

Published literature to date clearly outlines the widespread severity of this form of pollution as a result of agriplastic use and application to mismanagement at end of life.

Environmental and human health impacts – Peer-reviewed research on the impacts of agriplastics is still in relative infancy. But, despite this, the published literature to date clearly outlines the widespread severity of this form of pollution as a result of agriplastic use and application to mismanagement at end of life. Another critical facet is the impact such pollution can have on human health, especially those of workers in close contact with agriplastics at end-of-life.

Agriplastic leakage into the environment causes physical, chemical and biological harm to soil, terrestrial, aquatic and marine life, ecosystems and ultimately – through trophic transfer – human health.[35] The effects are often combined. Some examples of these impacts include agriplastic contamination negatively impacting soil quality,[36] soil-dwelling organisms,[37] plant health and reducing crop yield.[38]

However, the impacts of agriplastic extend far beyond farmland – with negative impacts of contamination and pollution also documented in grazing terrestrial animals,[39] the atmosphere[40] and drinking water[41] as well as aquatic and marine environments, ecosystems and wildlife.[42]

Mismanagement and criminality of agriplastic waste – A major driver of the environmental impacts of agriplastics is their fundamental lack of recyclability and lack of collection and recycling capacity. In the absence of clear routes for disposal and recycling, agriplastics are then mismanaged, with demonstrable examples of agriplastics used throughout the UK food supply chain being dumped,[43] burnt[44] or illegally exported[45] (and then likely dumped, landfilled or incinerated in recipient countries). Mismanagement and criminality of agriplastic waste further compounds the environmental and human health impacts they have.

Potential agriplastic alternatives and caution – As awareness of the issues around agriplastics use are growing, so too is the search for and adoption of alternative products or agricultural methods. However, certain solutions are not without their own environmental impacts and these issues must be addressed before widespread uptake occurs to mitigate the sector locking in further harmful production models. These include the still-legal use of oxo-degradable mulches within England, Scotland and Northern Ireland[46] (despite a lack of degradability which has resulted in them being banning in the EU),[47] the poor certification standard requirements currently in place for biodegradable mulches and the lack of adequate regulations and practice to remove microplastics from sludge prior to it being used as organic fertiliser on farmland.[48]

Above: The open burning of agriplastic waste releases contaminants into the atmosphere, which also harm the environment and human health. This includes persistent organic pollutants like polychlorinated dibenzodioxins and dibenzofurans (PCDD/Fs), whose release have been shown to be particularly high in the burning of PVC-based agricultural plastic waste.

Current policy frameworks

Although farmers and growers have the operational expertise to develop alternative cultivation and storage practices, it is the UK Government and grocery retailers that have the regulatory and market power and responsibility to drive action to protect the environment – but to date neither has done so adequately.

Global

There is currently no global regulatory framework to coordinate efforts to manage agricultural plastics across their lifecycle.

In response to the lack of coordination and complexity of the issue, FAO released an assessment of agricultural plastics and their sustainability in 2021. Following a decision at the 2022 Committee on Agriculture, FAO is now developing a new soft-law instrument, a voluntary code of conduct for the sustainable management of agricultural plastics, which would provide guidelines for governments and the private sector on the sustainable use of agriplastics.

To compliment this, the ongoing negotiations for a new Global Plastics Treaty, initiated by resolution 5/14 of the United Nations Environment Assembly (UNEA), offer a chance to effectively manage agriplastics at the global level. It is essential that within any new global governance framework on plastics there are provisions to allow dedicated programmes of work on specific and complex sources of plastic pollution, such as agriplastics, allowing stakeholders and rights holders across the value chain to input into future policy decisions.

The development of the voluntary code of conduct by the FAO will likely come well in advance of international legally binding measures and could provide useful signposting for potential approaches that the new plastics treaty could operationalise, such as mandatory reporting on plastics production and use in agriculture, the restrictions of certain problematic and hazardous plastics for use in agriculture, robust eco-criteria for alternatives and substitutes and Extended Producer Responsibility (EPR) schemes for certain agriplastics, as just a few examples.

UK policy

The plastic pollution emergency is now firmly rooted within UK and global public consciousness and thus political fora.

During the past few years, there have been a number of new and revised policies aimed at addressing plastic pollution in the UK, although the majority have been delayed and watered down; examples include the Plastic Packaging Tax, Single-Use Carrier Bag Charges, Producer Responsibility for packaging, Deposit Return Scheme for beverage containers, the Waste Prevention Programme for England, Consistent Collections for recycling and Commonly Littered Single-Use Plastic Items.[49]

As of 2005/06, all devolved national Waste Management Regulations apply to agricultural waste and, as of 2019, Scotland (and previously England and Wales) have a ban on burning and burying agricultural plastic; farms are now required to dispose of this waste through recycling and reprocessing routes.[50] Other than this one, albeit unsupported measure given a lack of recycling infrastructure, UK policy specifically addressing agriplastic use and pollution is distinctly lacking.

Worse still, cognisant of agriplastic-related regulations being created elsewhere in the world, the UK has actively decided not to pursue current best practice policies. It decided not to pursue a mandatory EPR scheme for non-packaging agriplastics in 2010,[51] despite such measures being mandatory in many other countries, and ensuring better collection and recycling rates.[52] Moreover, England, Scotland and Northern Ireland[53] have yet to enact an oxo-degradable plastic ban, such as the EU,[54] despite this type of polymer being highly damaging and used as an alternative type of mulch. Even the simplest of product requirements, namely enforcing mandatory mulch thickness guidelines to reduce breakage and soil contamination as is now the case in China,[55] are not readily available.

The lack of political appetite to tackle agriplastic pollution, or even clear knowledge of the issue involved, serves only to worsen agriplastic pollution effects in terms of ongoing policy development. One such instance was the unforeseen inclusion (and now removal)[56] of silage within the UK plastics packaging tax, which would have potentially destroyed the (to date voluntary) agriplastic waste EPR schemes in place in the UK. Another is payments to farmers applying sludge, potentially highly contaminated with microplastics, to their farmland under Defra's sustainable farming initiative[57] while current policy fails to meaningfully address the issues surrounding microplastics and heavy metal content in sludge in the first place.

Voluntary action

Despite the UK Government's decision in 2010 to not put in place a mandatory EPR scheme, producer responsibility is necessary.

As such, and in an attempt to address the difficulty in recycling these types of plastics, voluntary initiatives and collection and recycling schemes have been created in the UK.. These include the launch of Agriculture, Plastic & Environment UK (APE UK) in March 2020.[58] This initiative seeks to provide farmers with a sustainable solution to the environmentally responsible management of non-packaging agricultural plastics and to increase the quantity and quality of plastics collected. Additionally, there is the voluntary collection scheme the Green Tractor Scheme,[59] which states it collected up to 24,149 tonnes of agriplastic waste in 2019.

Some farmers and growers around the world, including the UK, are also taking the initiative to reduce their environmental impact and strengthen highly depleted soil by changing agricultural practices. However, farmers and growers are also dependent on market demands and pressures. The UK's food supply chain is a complex system, encompassing, at times competing, primary producers from across the world (e.g., farming, fishing), food manufacturing, logistics, wholesale and retail, as well as food services (e.g. restaurants).[60]

The food and drink retailing sector (i.e. UK supermarkets) is by far the main final distributor of food to the public[61] and the largest buyer of produce in the UK. Its purchasing and market power, and subsequent responsibility, means that its sourcing and product requirements can either hinder or enable agricultural practices which could reduce agriplastic use and pollution.

Above: Sludge, also referred to as slurry, is a type of fertiliser derived from waste-water treatment plants. It can be highly contaminated in microplastics and thus its application on farmland can contaminate soils, and surrounding environments, with microplastics.

EIA grocery retailer agriplastics survey

Since 2018, EIA, in partnership with Greenpeace UK, has been surveying the plastic footprints of the top 10 grocery retailers in the UK, including actions taken across their supply chains with regards to agriplastics.

Between 2018 and 2020, for the EIA and Greenpeace UK *Checking Out on Plastics* reports, supermarkets were asked whether they were working with fruit and vegetable suppliers on the reduction and responsible management of agriplastics, including those generated through greenhouses, polytunnels, agricultural mulch films and polystyrene. The survey questions related to actions undertaken the previous year. Iceland has since withdrawn from participation, so the data provided reflects the remaining nine major grocery retailers in the UK.

A summary of those initiatives, in short:

- **In the 2018 report**, the majority of supermarkets were exploring avenues as to what could be done, mainly citing the future development of guidance to suppliers. One supermarket required fruit and vegetable suppliers to adhere to global GAP certification standards, while three others encouraged the sharing of best practice or encouraged recycling of agriplastic waste.
- **In the 2019 report**, while a number of supermarkets were still within their exploration phase, more were requiring some produce suppliers to adhere to certain certification standards which require better management of agriplastic waste. This includes three supermarkets requiring GAP certification requirements for certain suppliers and one of these supermarkets also requiring UK suppliers to adhere to the Red Tractor certification scheme. One supermarket also required some suppliers to follow Arla UK's 360 standard. There is also investment in research, including a PhD scholarship, some engagement with regards to the adoption of alternative farming methods by suppliers and increased examples of engagement of the issue across their supply chains.
- **In the 2020 report**, we saw three supermarkets were still requiring some suppliers to follow more than one different certification standard with agriplastic waste objectives. Notably, there was an increase in the number of trials, with five supermarkets involved in addressing the issue of agriplastic use across different produce categories.

Over the course of these surveys, there has been a noticeable increase in awareness of the issues of agriplastics, including more retailers requiring suppliers to follow certain certification standards, an uptake of trials and some engagement with suppliers on the issue. Despite this, collective, measurable and timebound retailer-specific targets on agriplastic use and waste reduction have not materialised. Furthermore, many of the trials and supermarket-level engagements that took place occurred with UK suppliers and therefore didn't account for the outsized impact of UK sourcing practices in the regions and countries identified in this report. This domestic focus therefore didn't address high impact agriplastics categories, typically fruit and vegetable imports on which the UK relies, nor the localised context and solutions in these sourcing regions.

Following a hiatus in our survey during the COVID-19 pandemic, in our 2023 survey, EIA sought to gain a deeper understanding on the initiatives in place related to agriplastics and reached out to retailers with an expanded range of questions covering this area. A summary of their responses can be found in Figures 6 to 13. The responses relate to actions taken in the calendar year 2022 or nearest 12-month reporting period.

Above: Agriplastic waste mound in Spain, a key UK sourcing country for produce. Mismanagement, including dumping, of agriplastic waste has been documented in Spain. This is due to high recycling costs and insufficient recycling capacity.

Figure 6: *Responses to question about whether supermarkets have enough information about the impact and risks of agriplastic pollution on environmental and human health*

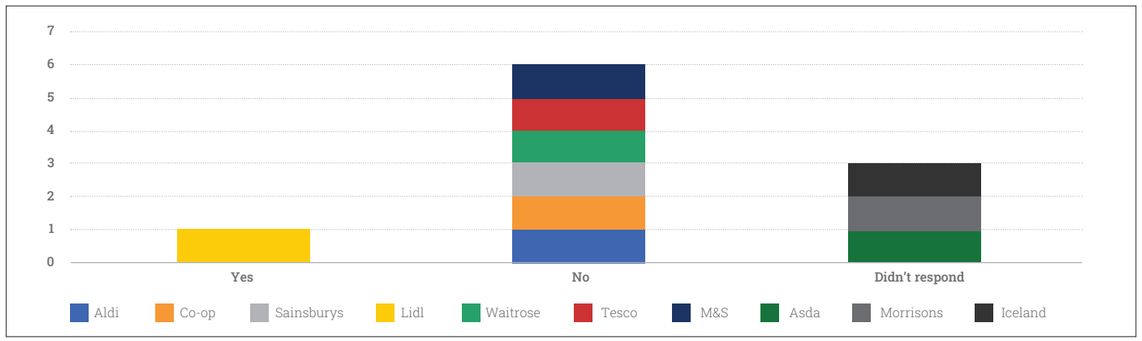


Figure 7: *Responses to question on whether there is a need for a sector-wide initiative dedicated to agriplastic pollution*

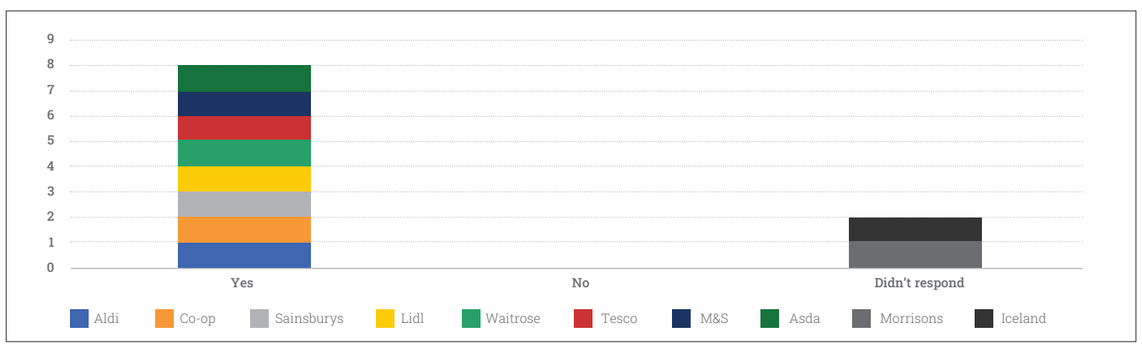


Figure 8: *Responses to question on how concerned their business is about agriplastic pollution in the grocery retail supply chain*

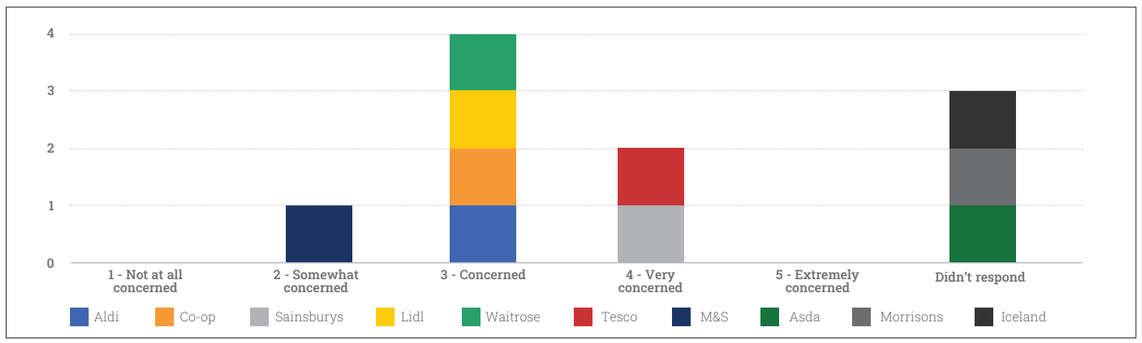


Figure 9: *Table showing responses related to work with suppliers on the reduction and responsible management of agriplastics, including those generated through greenhouses, polytunnels, agricultural mulch films and polystyrene*

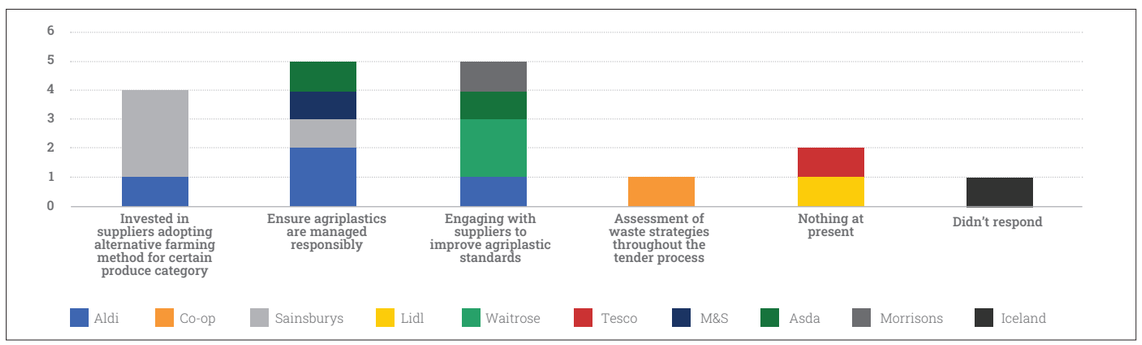


Figure 10: *Grocery retailer membership of any third-party initiatives, schemes or certification standards dedicated to reducing agriplastic pollution (in this case, waste management) that certain suppliers are then required to follow*

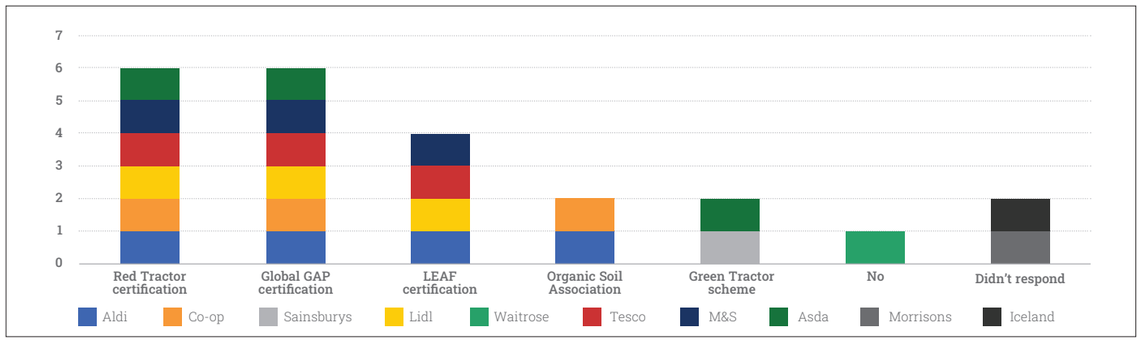


Figure 11: *Responses to question about whether supermarkets have a sourcing policy related to addressing agriplastic pollution in their supply chain*

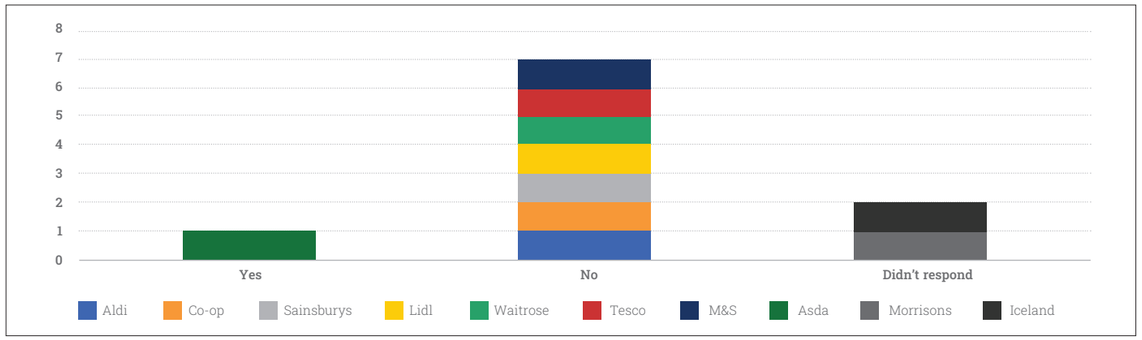


Figure 12: *Types of trials the supermarkets are undertaking with suppliers focused on reducing agriplastic pollution*

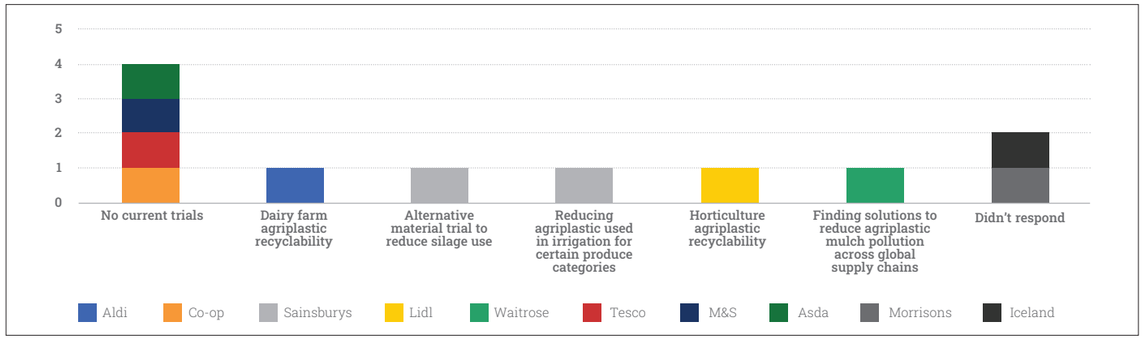
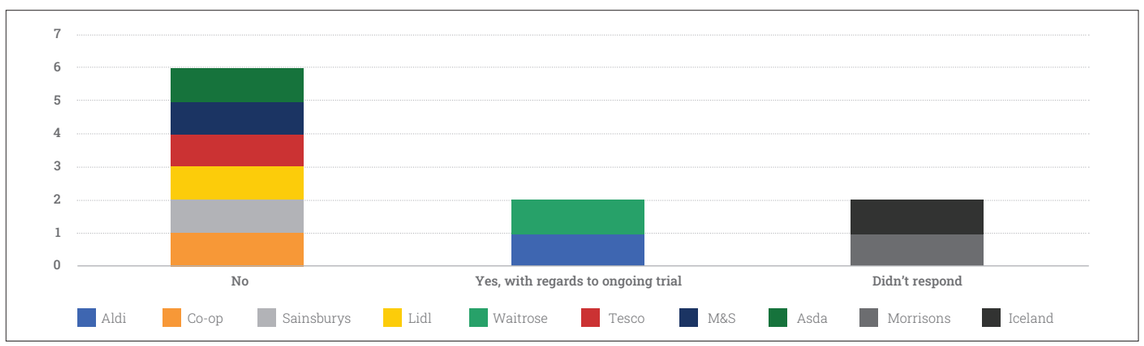


Figure 13: *Responses to question about whether supermarkets are funding any projects that seek to reduce agriplastic pollution*



Key takeaways from the survey conducted in 2023

- Six of the seven supermarkets which responded to the question whether they have enough information about the impact and risks of agriplastic pollution on environmental and human health **do not think they have enough information**.

- **100 per cent of supermarkets which responded to the question as to whether there is a need for a sector-wide initiative dedicated to agriplastic pollution agree that there is a need**.

- On average, **supermarkets which responded are concerned about agriplastic pollution** in the grocery retail supply chain, with two supermarkets being very concerned and one being somewhat concerned.

- Seven supermarkets are currently working in some capacity with suppliers on the reduction and responsible management of agriplastics, with four supermarkets having more than one project underway in certain produce or product categories. However, as per supermarket responses, **no work or project undertaken was coupled with any measurable or timebound targets**.

- Since 2019, there has been an expansion in the number supermarkets which are members of, or which require suppliers to adhere to, certification standards and voluntary schemes that have direct or indirect agriplastic waste requirements.

- Crucially, **all but one supermarket which took part in the survey didn't have company-level sourcing policies related to addressing terrestrial agriplastic pollution in their supply chains**.

- Four of the supermarkets which responded to the survey were undertaking trials in 2022, across a variety of produce categories and agriplastic products. However, **no supermarket provided measurable objectives or timelines for these trials**.

- **Only 20 per cent of the top 10 UK supermarkets are known to be currently funding any projects seeking to reduce agriplastic pollution**. The two supermarkets that were providing funding are doing so in relation to trials in which they were involved.

Above: Agriplastics are not just used in growing fruit and vegetables. For the livestock sector, plastics are materials used to facilitate the fermentation of grasses for animal fodder through the usage of silage films.

As of 2022, measurable objectives, supermarket-led sourcing policies and adequate funding for scaling solutions are yet to be established by the UK grocery retail sector. However, all supermarkets surveyed recognised the need for a sector-wide initiative dedicated to agriplastic pollution and, overall, more supermarkets require certain suppliers to follow third-party certification standards or voluntary schemes compared to when we first surveyed them.

While there has been a measurable shift in awareness, projects and trials, these are not matched by concrete action nor supported by enabling Government policy frameworks.

Supermarkets have much to gain through a collective approach to the issue of agriplastic pollution across the material lifecycle and throughout their international supply chains. For instance, a unified approach would result in farmers and growers being equally supported and would mitigate any potential market risks for individual retailers pursuing sustainability initiatives.

Additionally, although not detailed in this report, those supermarket trials that have occurred since 2017 have focused on a range of different agriplastic products and produce categories, so the sharing and application of learnings to date would facilitate and promote expansion and replication of such information.

Conclusions and recommendations

Grocery retailers may be profit-making entities, but their primary function is to deliver food to communities while working with their supply chains to ensure secure, sustainable and safe produce is delivered to market. Government policy should provide adequate safeguards with regards to agriculture ensuring the same.

The nature of this essential service means the environmental impact of its production must not endanger human and environmental health or the resilience of food production for current and future generations. It is clearly understood that food production, humanity; and all industries and businesses that stem from it are reliant on a healthy and functioning environment and ecosystems. The short-term gains from agriplastic use are therefore no justification for current and long-term negative impacts from agriplastic use leading to scarcity not only within farmland but other environmental compartments.

We must act:

- **for farmers, growers and agricultural workers** who operate in an agricultural system that drives the contamination and degradation of the very land and ecosystem services on which they depend for their livelihoods, in addition to putting their health at risk

- **for society**, to no longer ignore the potential long-term toxicity and barrenness we are creating, given the deceptive convenience of agriplastics

- **for the environment and others living within it** who are clearly negatively impacted by the production and use of agriplastics (and, more generally, plastics).

The current lack of global-level detailed data or policy across the agriplastics lifecycle is not a proxy for the lack seriousness of this issue. Agriplastics, from production, use to end of life, have a plethora of documented and potential negative impacts. Neither policy nor industry action is yet addressing this adequately.

There is no single solution to this complex material problem; options need to be assessed for each material design and application, location and climate. However, this complexity should not be an excuse for inaction or a lack of engagement.

Agriplastics are a collective problem, and so collective methods and solutions are necessary. Farmers and growers are primary stakeholders and should be included in any discussions facilitated by both business and policymakers.

There are both practical and radical solutions which could be put into operation immediately. However, financial support and an enabling policy environment is required to develop safe and sustainable alternatives and the waste hierarchy – starting with prevention and reduction - should be strictly followed.

Furthermore, immediate and urgent action on the most damaging agriplastics (i.e., microplastic applications and mulch films) is needed. For high leakage agriplastics in general, simply materially substituting their use with another product with the same function, but also with documented negative or unknown impacts, is a false solution.

Despite there being no single solution to agriplastic use and pollution, EIA has identified a number of fundamental practices and recommendations that can act as a foundation for policy and practice.

Recommendations

FOR THE UK GOVERNMENT

Address knowledge gaps

- Introduce mandatory reporting on agricultural plastic products placed on the market throughout the entire value chain, from their production, sales (including import and export), use and end of life treatment and ensure effective Government capacity to monitor this.
- Invest in research programmes that seek to answer current knowledge gaps, such as the lifecycle assessments (inclusive of consideration of health as well as environment) on benefits and trade-offs and identification of potential alternative processes or materials

Approach agricultural policy holistically

- Nature-based farming policy initiatives are key and should take into account intentional and unintentional agriplastic use.
- Invest in facilitating the uptake of agroecology/ permaculture in UK farms to allow for a reduction in agriplastic use.
- Consequences and drivers of agriplastic use should also be assessed and accounted for within policy developments, including, for example, food waste, soil removal from mulch use, worker safety and rights.
- The creation of a network of regional working groups comprising key stakeholders are created to help steer specific policy solutions for the variety of agricultural practices and systems across the UK food supply chain

Provide adequate policy in terms of agriplastic use

- Put in place eco-product requirements for all agriplastic products, including regulating the chemical content of plastics which are directly applied to the land, in particular biodegradable mulches, and ensure related certification standards are adequate.
- Put in place a mandatory agriplastic waste extended producer responsibility scheme, that does not result in farmers and growers facing highly increased costs for collection, recycling and reprocessing of agriplastic waste.
- Eliminate problematic agriplastics – ban oxo-degradable mulches, restrict polyvinyl chloride (PVC) use and phase out intentionally added microplastic applications
- Ensure adequate waste-water regulation and requirements so that sludge is not a microplastic contaminant.
- Engage in the negotiations for the new plastics treaty and the FAO voluntary code of conduct on agriplastics to ensure that the lifecycle impacts of agriplastics are accounted for in global policy.

Close loopholes enabling agriplastic waste mismanagement

- Support the creation of accessible and affordable environmentally sound recycling infrastructure.
- Ban all plastic waste exports to OECD and non-OECD countries.
- Resource the relevant Government agencies, such as the Environment Agency, so they can adequately monitor and enforce illicit waste trafficking and mismanagement both within the UK and abroad (i.e., enforcing burning and export bans).
- Ensure that penalties and prosecutions with regards to illegal waste management are sufficiently deterrent.

FOR THE GROCERY RETAIL SECTOR

Review sourcing policies and sustainability plans

- Integrate and resource addressing the impact of agriplastic use within sustainability plans and create measurable and timebound targets for prevention and reduction both domestically and from international suppliers.
- Incorporate the impact of agriplastic use within investor and shareholder discussions, as well as other stores abroad.
- Address how non-regulatory and non-essential sourcing and produce requirements (i.e., aesthetic vs. nutritional and caloric content) can act as a driver for agriplastic use.
- Identify major sourcing regions for the business and those areas highly impacted by such sourcing to ensure action is targeted to regions where most effort is required.
- Reflect the impact of agriplastic use in sourcing policies and request all suppliers are signed up to current best practice standards and undertaking internal assessments on agriplastics use, management and end-of-life treatment using commonly agreed criteria.

Educate customers on the issue

- Keeping supply chain resilience in mind, advertise and stress the importance of seasonality with customers though awareness-raising initiatives in-store and through advertising

Work in unison across the sector

- Retailers need to work collaboratively with each other, Government and agriculture industry organisations to establish best practices. This includes standard setters ensuring that criteria are robust in order to level the playing field, alongside embedding environmental and workers' rights standards to protect farmers and growers from competitive disadvantage if they undertake best practice measures. Examples include:
  - GLOBAL G.A.P. and other certifications to prompt the inclusion of more robust criteria covering agriplastics
  - engage with fruit and vegetable suppliers about reducing single-use agriplastics, considering redesign options which phase out the most problematic and non-recyclable polymers if not possible
  - encourage and resource the innovation and development of alternative sustainable designs, with a focus on reusable initiatives and recyclability (including adequate infrastructure)
  - engage with suppliers about replacing polymer-coated nutrient prills (granules) with alternative fertiliser techniques, such as nitrification inhibitors or cellulose beads, support research into other alternative methods and work with suppliers and Government to urgently phase out the use of microplastics in agricultural applications, whether intentional or unintentional
  - conduct routine spot checks to ensure criteria are being met
- Engage with governments with regard to introducing supportive policy measures enabling considered use and better management of agriplastics and, in the interim, work with existing voluntary schemes to ensure effective implementation

FOR FARMERS AND GROWERS

- Immediately end the practice of burning, burying, dumping, or disposal of agriplastic waste.
- Take all steps possible to ensure that agriplastic waste collection and treatment is legal and advocate for improved facilities where they are not available
- Leverage relevant unions to advocate for Government policy that protects farmers and growers from the drivers and consequences of agriplastic use, ensuring alternatives are sufficiently supported both through Government policy and retailer sourcing requirements.

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9. Mulching film reduce herbicide use due to their use preventing weed growth

10. Plastic coated fertilisers and pesticides reduce input amounts due to the subsequent slow release of these chemicals.

11. Greenhouses, including those made from plastic, extended the growing season and protect crops from extreme cold and sunlight, increasing crop yields due to disconnecting crop growth from seasonality (especially if heated)

12. Agriplastics facilitate water retention in different ways, for instance: mulching films reduce evaporative losses from soil whilst irrigation systems (tubes and driplines) grant more precise and direct water distribution

13. Including the use of seedling trays and pots, tree-guards, protecting plants at the early stages of their growth whilst plastic coating on seeds improve germination and survival of seedlings

14. For the livestock sector, plastics are key materials used to facilitate the fermentation of grasses for animal fodder through the usage of silage films. Agriplastics can also help reduce food losses, with their use as transport packaging helping reduce damage through protective products and maintaining the quality of fresh products

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