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Compassion in World Farming's 25 Year Plan for UK Food and Farming

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The Department for Environment, Food and Rural Affairs (Defra) is preparing a 25 year plan for food and farming. The plan's remit is too narrow, focussing only on factors such as productivity, competitiveness and technology. A food and farming plan should also concern itself with dietary health, the environment and animal welfare.

Defra's plan is in danger of driving food and farming in the wrong direction. Its disregard for nutritional quality is likely to exacerbate Britain's high levels of dietary ill-health which particularly affect the poorest sections of society. Its focus on growth will lead to greater intensification which will further undermine the key natural resources - such as soil and biodiversity - on which farming depends. This will make it difficult for future generations to feed themselves properly.

The plan ignores the major contribution of current diets to climate change. The increased intensification likely to emanate from the plan – together with several projects being funded by Innovate UK - will erode Britain's already fragile standards of animal welfare.

Defra's fixation with production crowds out alternative understandings of what constitutes a good food and farming system.

The problems arise in part from the fact that responsibility for food and farming is spread across several Government departments including the Department for Environment, Food and Rural Affairs (Defra), the Department of Health, the Department for Business, Skills and Innovation which is responsible for Innovate UK and the Department of Energy and Climate Change. This fragmentation is impeding the development of a cohesive plan that integrates objectives regarding health, the environment, farmers' livelihoods and animal welfare.

Compassion in World Farming wishes to present the following alternative, properly integrated 25 year plan for food and farming in England.

Natural resources

Although Defra's plan may lead to short-term increases in productivity, it is likely to erode the natural resources on which farming depends, resulting in medium- and long-term decreases in productivity. Short-term benefits will be paid for by future generations who will find it difficult to produce sufficient nutritious food with impoverished soil, water and biodiversity.

Detrimental impact of intensive farming on natural resources

Farming's environmental damage is well documented. The Natural Capital Committee points out that "farming can produce large external costs to society in the form of greenhouse gas emissions, water pollution, air pollution, habitat destruction, soil erosion and flooding. These costs are not reflected in the price of food. As a result, farming is responsible for net external costs to society that have been valued at £700m per annum."[1]

Soil degradation: The damage that can arise from an ill-judged drive for increased productivity is highlighted by recent studies on soil quality. A UK study concludes that "modern agriculture, in seeking to maximize yields ... has caused loss of soil organic carbon and compaction, impairing critical regulating and supporting ecosystem services".[2] It highlights "the extent to which modern agricultural practices have degraded soil natural capital". It points out that depletion of soil organic carbon "in conventional agricultural fields is now thought to be an important factor constraining productivity as many arable soils have suboptimal concentrations".

Low levels of soil organic carbon reduce fertility and soils' ability to store carbon which mitigates climate change. They also weaken soil's capacity for retaining water; this exacerbates flooding and diminishes plants' ability to withstand droughts. Insufficient organic carbon makes soils vulnerable to erosion which leads to loss of nutrients and hence to eutrophication of rivers and other aquatic ecosystems.

Another study concludes that intensive agriculture has reduced soil biodiversity in southern UK.[3] It stresses: "Given that the loss of soil biodiversity is ultimately linked to a loss of soil functions that underpin ecosystem services, we propose that future agricultural policies need to consider how to halt and/or reverse this loss of soil biodiversity".

A 2015 report by the Committee on Climate Change states: "Some of the most productive agricultural land in England is at risk of becoming unprofitable within a generation due to soil erosion and the loss of organic carbon."[4]

Biodiversity loss: A Defra study shows that by 2013, the UK breeding farmland bird index had fallen by 55% to a level less than half that of 1970. It adds that there has been a statistically significant on-going decline of 10% between 2007 and 2012.[5] Defra's study states that many of the declines in farmland birds "have been caused by land management changes and the intensification of farming".

There has been a marked decline in pollinating insects including bees in the UK.[6] The Parliamentary Office for Science & Technology states that intensive farming has resulted in a significant loss of habitats with the resultant loss of food and nesting resources for pollinators – and the use of pesticides and monocultures – being a leading driver in pollinator declines.[7]

Air pollution: A new study reports that in the UK agriculture contributes up to 48% of the air pollution associated with premature mortality.[8] This largely results from livestock and fertilisers; a substantial proportion of these are used to grow crops for animal feed.

Excess nitrogen in the environment: The use of synthetic nitrogen fertilisers is a key factor leading to environmental pollution.[9] A large proportion of these fertilisers are used to grow crops for animal feed. The European Nitrogen Assessment identifies five key threats associated with excess reactive nitrogen in the environment: damage to water quality, air

quality (and hence human health, in particular respiratory problems and cancers), soil quality (acidification of agricultural soils and loss of soil biodiversity), the greenhouse balance and ecosystems and biodiversity.[10]

The Compassion Plan's Objectives on Natural Resources

- Restore soil quality by increasing organic matter and soil biodiversity
- Re-establish the variety and abundance of farmland birds and pollinators
- Reduce the contribution of agriculture to poor air quality
- Reduce farming's use and pollution of water.

Steps for restoring natural resources

Industrial livestock production should be brought to an end. Its need for huge quantities of cereals as animal feed has fuelled the intensification of crop production which, with its monocultures, fertilisers and pesticides, has led to soil degradation and biodiversity loss. 41% of UK cereal production is used as animal feed.[i] If industrial livestock's need for cereals was much reduced, arable land could be farmed less intensively, allowing soil, water and air quality as well as biodiversity to be restored.

Soil quality could be restored - and the use of synthetic fertilisers reduced - by:

- rotations that include fallow periods and legumes which 'fix' atmospheric nitrogen into biologically available forms of reactive nitrogen
- compost, green manure and animal manure provided that the latter is applied in quantities that can be utilised by the land.

The 'last resort' principle should be applied to the use of pesticides. These should be replaced by *Integrated Pest Management* which primarily relies on nature's own processes to control pests. These include allowing the natural enemies of pest species to thrive (whereas pesticides tend to kill pests' predators), the use of resistant varieties and the development of healthy soil as this promotes strong healthy crops which are better able to withstand disease and pest attack.

Climate change

The Paris Agreement stresses that the emission reductions pledged to date are insufficient to meet the 'well below 2°C' target and that much greater emission reductions will be required in order to hold the increase in temperatures to below 2˚C.

Clearly all sectors must reduce their emissions. However, research shows that on a business-as-usual (BAU) basis globally agriculture's GHG emissions will increase by 2050 by 77%. Even if yield gaps are closed its emissions will rise by 42%.[11] By 2050, on a BAU basis, agriculture alone will take us over the 'well below 2°C' target leaving very little room for other sectors' emissions.[12]

A Chatham House report concludes that technical mitigation measures and increased productivity will be insufficient on their own to prevent an increase in farming's GHG emissions, let alone achieve a reduction.[13] Research shows that only a 50% decrease in food waste and a shift to healthy diets with reduced meat and dairy consumption can produce a fall in agriculture's GHG emissions.[14] Two Chatham House reports stress that it is unlikely

temperature rises can be kept below 2°C without a shift in global meat and dairy consumption.[15] [16]

UK greenhouse gas (GHG) emissions from agriculture have fallen from 60.5 $MtCO_2e$ in 1990 to 49.5 $MtCO_2e$ in 2013, a welcome fall of 18%.[17] The fall in emissions is the result of decreasing animal numbers and fertiliser use, plus expanded forest area and a tendency towards less intensive agriculture.[18]

Worryingly, however, the UK Government's projections show that agriculture's emissions are only expected to fall by a further 0.7 $MtCO_2e$ between 2015 and 2035, a decrease of just 1.4%.[19] The Climate Change Act 2008 commits the UK to reducing emissions in 2050 by at least 80% from 1990 levels. For agriculture to play its part in meeting this target, its emissions would have to be just 12.1 $MtCO_2e$ by 2050 whereas the Government's projections show that they will still be 48.8 $MtCO_2e$ in 2035.

The Compassion Plan's Objective on Climate Change

In order to be on track to meet the target set by the Climate Change Act for 2050, GHG emissions from UK agriculture should be reduced by around 43% between 2015 and 2035.

Steps for Realising the Objectives on Climate Change

- Mitigation techniques (such as improved manure management) can reduce emissions though care must be taken to ensure that any technique used does not harm animal welfare.
- A shift to healthier diets with reduced meat and dairy consumption. Research estimates that a change from a high meat diet (>100g/day) to a low-meat diet (<50g/day) would produce a 35% reduction in diet-related GHG emissions.[ii]

Measures that will be Helpful in Realising Many of the Plan's Objectives

Public information and education

The Government should develop programmes to increase public awareness of the implications of different livestock farming methods and consumption levels for human health, the environment, food security and animal welfare. Few people are aware of the relationship between meat and dairy consumption and climate change or that diet is now a bigger risk factor for disease in England than tobacco smoke.

Public procurement: taking the lead, setting the standard

Public sector bodies should, when buying meat, dairy products and eggs, use their buying power to augment the market for food produced to high nutritional, environmental and animal welfare standards. Public bodies' commitment to quality food will help change our attitude to food.

Getting prices right - internalising negative externalities

See section below '*Mending our price system'*

Creation of a new food culture

The current food culture gives great weight to factors such as low prices and convenience. There is no part of this culture that invites consumers to think about how low-cost meat, eggs and milk are produced. A new food culture must be created that attaches importance to the nutritional quality of food and values farming methods that protect the environment and animals. Like any social change, this will be a gradual process as we re-assess our values and priorities.

Health

Diets in the UK (and most of the Western world) are often of low nutritional quality. Many people consume excessive amounts of processed foods, meat and dairy as well as salt, sugar and fat. Families spend 51% of their food shopping budget on ultra-processed food.[20] A recent WHO report[21] is the latest in a long line of studies that show that the high levels of consumption of red and processed meat that are common in Western diets increase the risk of heart disease, obesity, diabetes and certain cancers.[22] [23] [24] Poor diet - including high red and processed meat consumption - is now the major contributor to disease in England.[25]

National Statistics show a marked increase in obesity in England in the last 20 years with over 50% of the population being overweight.[26] In addition, less than 30% of people eat five portions of fruit and vegetables per day.[27]

Research shows that in recent years healthy foods have been consistently more expensive than less healthy ones with a growing gap between them.[28] The Faculty of Public Health states that "In the UK, the poorer people are, the worse their diet, and the more diet-related diseases they suffer from".[29] A recent *Lancet* article points out that "nutrient-poor foods tend to be inexpensive, thus saturating low-income neighbourhoods with unhealthy options".[30]

Food policy should ensure that everyone is able to access healthy food irrespective of their income. This will require a proper integration between food and social equity policies. Olivier De Schutter, former UN Special Rapporteur on the right to food, stresses that "any society where a healthy diet is more expensive than an unhealthy diet is a society that must mend its price system."[31] Steps for mending our price system are examined below.

Free-range animals consume fresh forage and have higher activity levels; as a result they often provide meat of higher nutritional quality - with lower levels of fat and higher proportions of the beneficial omega-3 fatty acids - than animals that are reared industrially.[32]

The Compassion Plan's Objectives on Health

- A very high proportion of people eat healthy diets with reduced levels of salt, sugar, red meat, processed meat and saturated fat and increased levels of fruit, vegetables and whole grains.
- The consumption of red meat is reduced by around 50% by 2030 as average consumption of red meat in the UK is around 30kg per person per year; this is almost twice as high as the maximum of 15.6kg recommended by the World Cancer Research Fund[iii]
- The diets of poorer members of society are as nutritious as those of wealthier people
- The contribution of diet to non-communicable diseases is reduced by 85% by 2040
- The routine prophylactic use of antimicrobials in farming is brought to an end by 2020

Steps for Realising the Objectives on Health

- See earlier section on *'Public information and education'* and later section on *'Mending our price system'*
- Provide information regarding the options for healthy eating on a low income
- Legislation to prohibit routine prophylactic use of antimicrobials in farming.

Routine prophylactic use of antimicrobials in intensive livestock sector

The over-use of antimicrobials in human medicine is the main driver of antimicrobial resistance. However, both the European Medicines Agency and the World Health Organisation stress that the regular prophylactic use of antimicrobials in farming contributes to the transfer of resistant bacteria to people.[33] [34]

The Review on Antimicrobial Resistance established by the UK Government published a paper in December 2015 entitled *Antimicrobials in Agriculture and the Environment*. This reports a clear link in the scientific literature between antimicrobial consumption in farm animals and resistance in humans. It calls for a two thirds reduction in antimicrobial use in EU farming.[35]

The therapeutic treatment of individual sick animals with antimicrobials is often essential. However, antimicrobials are frequently routinely given to whole herds or flocks of intensively farmed animals to prevent the diseases that are inevitable when large numbers of animals are kept in crowded, stressful conditions. The report *Antimicrobials in Agriculture and the Environment* states that prophylactic use is "particularly prevalent in intensive agriculture, where animals are kept in confined conditions". The routine prophylactic use of antimicrobials should be brought to an end.

The link between intensive farming and high levels of antimicrobials use is highlighted by the fact that the Veterinary Medicines Directorate's data show that around 90% of all UK farm antibiotic sales are for pigs and poultry, the two most intensively farmed species.[36]

Developing health-orientated systems for rearing of animals:
The *Lancet Infectious Diseases Commission* has stressed that instead of relying on routine use of antimicrobials, we need to develop "health-orientated systems for rearing of animals".[iv] Such systems would build improved immunity by reducing stress (e.g. by enabling animals to perform natural behaviours), avoiding overcrowding and excessive group size, minimising mixing and ending early weaning in pigs. This approach would prevent disease through good hygiene, husbandry and housing; it would produce healthy animals that do not need to be routinely given antimicrobials.

Resource inefficiency of intensive livestock production

In a world of finite resources and rising populations, resource-efficiency is crucial. And yet we have created a livestock system which, as will be seen below, experts describe as "staggeringly inefficient", "colossally inefficient" and "a very inefficient use of land to produce food".

The source of this inefficiency is the dependence of industrial livestock production on feeding to livestock cereals that could instead be used for direct human consumption. This matters because the nutritional value consumed by animals in eating a given quantity of cereals is much greater than that delivered for humans by the resultant meat and milk.

Studies show that for every 100 calories fed to animals in the form of human-edible crops, we receive on average just 17-30 calories in the form of meat and milk.[37] [38] One paper indicates that the efficiency rates may be even lower for chicken, pork and beef.[39]

The UN Food and Agriculture Organisation (FAO) has said "When livestock are raised in intensive systems, they convert carbohydrates and protein that might otherwise be eaten directly by humans and use them to produce a smaller quantity of energy and protein. In these situations, livestock can be said to reduce the food balance".[40] The FAO warns that further use of cereals as animal feed could threaten food security by reducing the grain available for human consumption.[41]

Chatham House states that the feeding of cereals to animals is "staggeringly inefficient."[42] The International Institute for Environment and Development stresses that using cropland to produce corn, soybeans and other crops for animal feed rather than to grow food for direct human consumption is "a colossally inefficient" use of resources.[43]

Redefining the role of livestock

Research funded by the FAO argues that the role of livestock should be transformed. Rather than being fed on human-edible grain, their role should be "to use resources that cannot be otherwise used for food production".[44]

This research shows that the environmental pressures from livestock production could be reduced by focusing on grassland-based ruminant production and by reducing the amount of cereals fed to farm animals; this would entail a move away from intensive pig and poultry production and grain-based cattle. This would allow arable land to be farmed less intensively thereby enabling soils and biodiversity to be restored.

A 2014 paper takes a similar approach. It identifies grazing on pasture and use of crop residues and processing co-products as efficient forms of feed. It says that "together these support about 30% of current [global] livestock production; the remaining 70% has to be seen as a very inefficient use of land to produce food".[45]

The great strength of extensively reared cattle and sheep is that they convert grass into food that we can eat and are able to use land that is generally not suitable for other forms of food production. Extensive pastures can support biodiversity; they provide a diverse environment, rich in plants and invertebrates and beneficial to a variety of birds. In addition, they store carbon and can reduce the use of nitrogen fertilisers by the incorporation into pasture of legumes (e.g. clover) which fix atmospheric nitrogen in the soil.

The belief has grown up that even outdoor cattle and sheep need a proportion of cereals in their diet. However, members of the *Pasture-Fed Livestock Association* have shown that producing beef and lamb on 100% pasture and forage crops is feasible and profitable.[46] By avoiding cereals they have lower input costs which is a crucial element of their business.

Rotational integrated crop-livestock farming is also highly efficient. Such systems are in line with circular economy principles. The waste products of one component serve as a resource for the other: animals are fed on crop residues and their manure, rather than being a pollutant, fertilises the land.

The Compassion Plan's Objectives on the Role of Livestock and Animal Feed

- A 33% reduction by 2025 – and a 50% reduction by 2035 – in use of human-edible crops to feed farm animals
- The role of livestock is transformed. They are no longer used to convert human-edible crops into meat and milk as this is profoundly inefficient. Their proper role is now recognised as being the conversion of materials that humans cannot eat into meat and milk
- With its plentiful pastures the UK becomes a world leader in pasture-fed livestock and the skilful management of such systems
- 50% of cattle and sheep are fed on pasture and forage crops alone by 2025; that figure has increased to 80% by 2035
- Due to the reliance on grain of today's pig and poultry systems, these sectors are likely to contract. By 2030 most pigs and poultry are kept outdoors on pasture or in agro-forestry systems with at least 15% of their feed coming from foraging and 25% from unavoidable food waste such as cull vegetables and bakery waste.

The multiple benefits of reducing meat and dairy consumption

Defra's thinking focuses almost exclusively on production. However, an integrated plan will consider the symbiotic relationship between production and consumption. Reduced consumption of meat and dairy production would not only benefit people's health and enable climate change targets to be met. It would also allow production pressures to be eased. Fewer livestock would be needed; animals could be farmed extensively to high welfare standards. Fewer cereals would be required for animal feed; arable land could be farmed less intensively. Monocultures could be replaced by rotations; fertiliser and pesticide use could be reduced; soil quality and biodiversity could be restored.

Studies show that a substantial reduction in meat and dairy consumption in the EU would provide important environmental benefits. These are shown in Table 1.

TABLE 1: Positive environmental impacts of a 50% reduction in EU consumption of meat, dairy and eggs

Factor affected by reduction in meat consumption	% reduction from current levels
Soybean use as animal feed	75%
Use and pollution of surface- and ground-water *	20%
Cropland use	23%
Nitrogen emissions	37-42%
Greenhouse Gas emissions	25-40%

* In this case the figure in column 2 refers to a 45% reduction in meat consumption
Sources [47]

The Compassion Plan's Objectives regarding meat and dairy consumption

A 33% reduction in meat and dairy consumption by 2025 – and a 50% reduction by 2035.

Steps for encouraging a reduction in meat and dairy consumption

When this subject is raised, policy makers often respond: 'We cannot tell people what to eat'. No-one is suggesting that people be told what to eat. However, Government could take the lead in informing consumers of the benefits entailed in reducing meat and dairy consumption.

A Chatham House report stresses that "Governments must lead" in encouraging a change in diets "towards more sustainable, plant-based sources of protein".[v] The report refers to focus groups conducted during research across four countries - including the UK - with varying political, economic and cultural conditions; all demonstrated a general belief that it is the role of government to spearhead efforts to address unsustainable consumption of meat.

Livestock farmers must be able to earn decent livelihoods

The three most intensive livestock sectors – pigs, broilers and dairy – are those that most regularly experience poor prices with very low margins or even losses stemming from a failure to cover production costs. Clearly intensive livestock production is not working for either the farmers or the animals.

This problem stems from a range of factors including cheaper imports that in some cases are produced to lower animal welfare standards and the fact that farmers receive a very low share of the value generated by the food chain. Government data show that livestock farmers generally receive half or less of the retail price paid for their products.[48] For chicken and milk they receive just 39% while for pork they get 40%. In the case of chicken, pork, beef and lamb, the share farmers receive has declined substantially in the last 26 years.

The problem is compounded by the fact that farmers have been swamped by other parts of the food chain. In 2013, the UK agri-food sector contributed £103 billion to the economy. Within this, manufacturing, retailing and catering accounted for around one quarter each. Food wholesaling covered 10.4% of the sector and agriculture made the smallest contribution at 9.2%.[49]

The Compassion Plan's Objectives regarding livestock farmers

Farmers should obtain a greater proportion of the retail price for their products. They should receive a proper price for their food that provides them with a decent living, enables them to invest in their business and achieve good environmental and animal welfare standards.

Steps for securing a decent living for livestock farmers

- Unfettered market economics are producing damaging undesired results in undermining farmers' livelihoods, natural resources and animal welfare. Government must encourage food businesses to pay farmers prices that are commensurate with their production costs and allow farmers to provide good environmental and animal welfare standards. If encouragement proves to be insufficient, Government should introduce regulatory measures.
- Short, simple supply chains must be encouraged as this will enable farmers to obtain a greater share of the income generated by the food chain.
- Government at UK and EU levels should take a less fearful view of the WTO rules. WTO case law suggests that when the UK or EU prohibits a particular farming practice on strong scientific grounds, it may impose a ban on sales that would extend to both domestically produced and imported products provided that the ban is absolutely non-discriminatory. This only applies to imports from outside the EU.

Mending our price system

Olivier De Schutter, former UN Special Rapporteur on the right to food, stresses that "any society where a healthy diet is more expensive than an unhealthy diet is a society that must mend its price system." [50] This applies equally to a society, such as our own, where environmentally damaging, low animal welfare food is cheaper than food that respects natural resources and animals' well-being.

"In many countries there is a worrying disconnect between the retail price of food and the true cost of its production. As a consequence, food produced at great environmental cost in the form of greenhouse gas emissions, water pollution, air pollution, and habitat destruction, can appear to be cheaper than more sustainably produced alternatives".

FAO Report, 2015: Natural Capital Impacts in Agriculture

At the heart of our inefficient price system is its failure to take certain costs into account i.e. farming's negative externalities such as its damaging impact on health, natural resources and animal welfare. This results in market failure, in particular in the production of unwanted outcomes, mainly in the public sphere. It also leads to private gains being viewed as more important than public losses.

The costs associated with farming's negative externalities are borne by third parties or society as a whole, for example taxpayers funding the NHS costs of treating diet-related ill-health. In some cases the costs are borne by no-one and key resources such as soil and biodiversity are allowed to deteriorate, undermining the ability of future generations to feed themselves.

The Foresight report stressed: "There needs to be much greater realisation that market failures exist in the food system that, if not corrected, will lead to irreversible environmental damage and long term threats to the viability of the food system. Moves to internalise the costs of these negative environmental externalities are critical to provide incentives for their reduction."[51]

The Compassion Plan's Objectives regarding mending our price system

Food that is healthy and respects natural resources and animals' well-being should be cheaper than unhealthy, poor quality food

Steps for mending our price system

A wide range of mechanisms will be needed to mend our price system. These include much better public information about the consequences of today's farming, mandatory labelling as to farming method, supportive public procurement (these are all detailed elsewhere in this paper). Fiscal measures will be of particular importance. The CAP must be reformed. The distinction between Pillars 1 and 2 must be removed. All its funds should be used to support positive externalities i.e. as payments for environmental services and high standards of animal welfare for which there is no, or only a partial, market.

Taxation should entail two intertwined approaches. Taxes can be levied equal to a particular negative externality; this will very precisely internalise them. Taxes should also be used to positively lower the cost of quality food and farming for both farmers and consumers. Farmers adopting high standards could be given generous capital allowances or an extra tranche of tax-free income.

The cost of high quality food could be reduced for consumers in two ways. Income generated by taxes levied to internalise negative externalities could be used to subsidise quality food such as meat raised to high welfare standards, fruit and vegetables. UK policy on charging VAT on food is inconsistent. However, where VAT is charged, a low or zero rate should be placed on healthy food that respects the environment and animal welfare.

Horticulture

The UK produces just 11% and 58% respectively of the fruit and vegetables that we consume.[52] Imports of fruit and vegetables are the largest item in our food import bill.[53] We devote 3.1 million hectares to cereal production[54], 41% of which is fed to animals.[55] However, just 291,000 hectares are used to grow fruit and vegetables.[56] Just halving the use of cereals as animal feed would provide enough land for the UK to grow the fruit and vegetables it imports (apart from those for which our climate is not suited). This would produce healthier food and contribute to lowering the UK's food trade gap.

The Compassion Plan's Objectives regarding Horticulture

A 33% expansion in horticulture production by 2025 – and a 50% expansion by 2035.

Animal welfare

Defra states that the UK has the highest standards of animal welfare in the world. This is not the case but even if it were it would not detract from the fact that UK welfare standards do need to be improved. Some farmers achieve high standards, but others fail to do so. For example, 52% of UK laying hens are kept in enriched cages; these have a low potential for delivering good welfare outcomes.[57] Most UK broiler chickens are farmed intensively; scientific research shows that such systems involve a range of serious welfare problems.[58]

A proportion of UK pig farmers flout the legislation that bans routine tail docking and requires enrichment materials to be given to pigs. Zero-grazing is becoming more common in the UK dairy sector even though research shows that this entails a higher incidence of poor welfare than pasture-based systems.[59]

Now, more than ever, machines: It is just over fifty years since Ruth Harrison published *Animal Machines*. But now the transformation of animals into machines has gone much further. They are fine-tuned for maximum productivity, minimum emissions and utmost efficiency in converting feed into meat or milk. Technicians pore over their blueprints trying to find a further gram of growth or an extra piglet per litter. And now new technologies – cloning, genetic engineering, gene editing and agri-tech - are poised to usher in a ruthless new generation of factory farming.

The Compassion Plan's Objectives regarding Animal Welfare

By 2025:

- All farm animals are either kept in well-designed and well-managed free-range systems or, if they are indoors, they are housed in large well-ventilated barns with ample space, plenty of straw as well as natural light.
- Husbandry systems enable animals to express their natural behaviours;
- Genetic selection for fast growth or high yields is avoided where this results in compromised welfare such as ill-health, pain or limits on behavioural expression;
- Systems that require routine mutilations are not used.

Cloning, genetic engineering and gene editing of farm animals should be prohibited.

Agri-tech is being primarily used to entrench industrial livestock production which generally has a detrimental impact on animal welfare. Innovate UK, a public body, provides funding for agri-tech. Innovate UK should not provide funding for agri-tech in the livestock sector except when there is clear evidence that the project concerned will not harm animal welfare and is not designed simply to shore up industrial systems with inherently poor welfare standards.

Steps for Improving Animal Welfare

- Legislation at UK or EU levels together with industry voluntary initiatives will be needed.
- Consumers must be empowered to drive welfare improvements. At present industry and Government conspire to keep consumers in the dark. Mandatory labelling of meat and milk as to farming method should be introduced so that consumers can make informed choices.

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