COMPASSION in world farming

CLIMATE DOOM LOOP

FACTORY FARMING'S TOLL ON ANIMALS, FARMERS, AND FOOD

CONTENTS

Executive summary..... 03

Introduction..... 05

Increasing climate disasters..... 06

Focusing on farming systems..... 13

Extreme events..... 14

Rising food insecurity..... 20

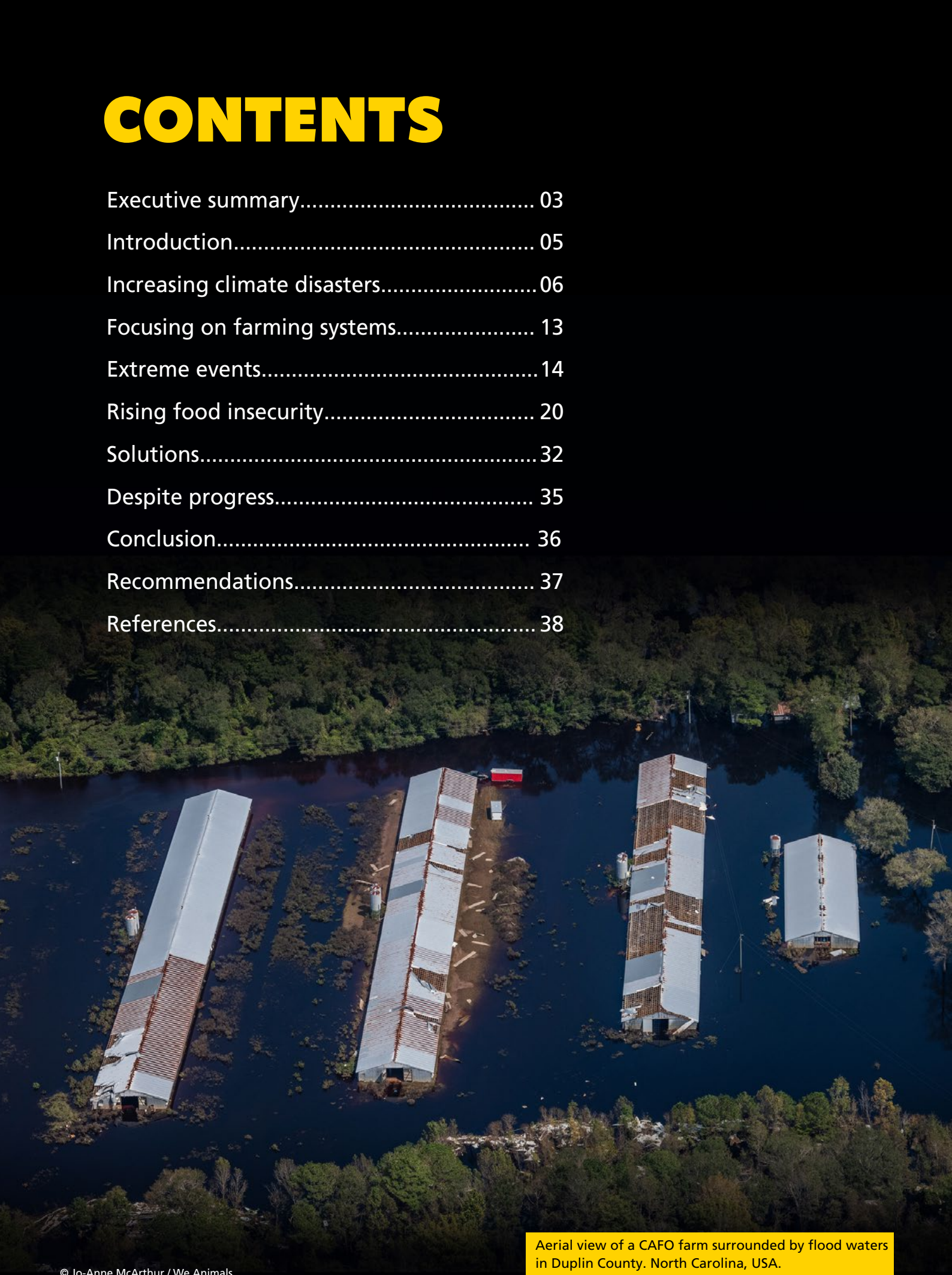
Solutions..... 32

Despite progress..... 35

Conclusion..... 36

Recommendations..... 37

References..... 38



Aerial view of a CAFO farm surrounded by flood waters in Duplin County. North Carolina, USA.

EXECUTIVE SUMMARY

Climate Doom Loop features eleven powerful case studies from countries including Brazil, Nigeria, the USA, Vietnam, and across Europe, that show how industrial animal agriculture is trapped in a climate doom loop, fuelling the very disasters it struggles to withstand. Together, they reveal the immense toll of climate crisis-linked extreme weather on farmed animals, citizens, farmers' livelihoods and food security, leading to global losses of USD143 billion annually (Newman & Noy 2023). Alarmingly, these catastrophic events are becoming increasingly frequent due to climate change, a major driver of which is industrial animal agriculture.

While global figures for the total number of farmed animals affected in these types of incidents are not available, more than 14.8 million animals including poultry, fish, cattle, and pigs were killed in these eleven incidents alone – a tiny fraction of the total number likely to be affected globally every year. Extreme weather events have quadrupled in frequency since the 1970s (FAO, 2023) so without urgent action the toll on farmed animals looks set to significantly increase.

From heatwaves in the UK to hurricanes in the US, flooding in Italy and Brazil and across Europe, Asia and Africa, no part of the world is immune from the effects of extreme weather and the consequences are severe. Climate disasters detailed in this report include:

- **1.2 million commercial poultry, 14,000 beef cattle and 14,000 pigs killed during floods in Brazil in May 2024**
- **18,500 chickens killed by heat stress when transported during a heatwave in the UK in 2022**
- **5.75 million poultry, 44,556 cattle and thousands of pigs killed during a typhoon in Vietnam in 2024**
- **Approximately 750,000 farmed animals died on 126 farms in northern France in July 2022**
- **Around 5 million chickens were killed in one US state alone when Hurricane Helene hit the US in September 2024**
- **An estimated 163,000 farmed animals killed by heat stress in the Netherlands in the summer of 2019.**

It shows that urgent government action is needed to reduce the impact of animal farming on climate change and to veer away from this destructive path. Food system transformation is essential; only a holistic approach that recognises the intrinsic links between animal, human, and planetary health will create a sustainable and humane future. Farmers must be supported to shift away from industrial animal agriculture towards more climate- and nature-friendly practices. Governments need workable food system transformation solutions, based on 'mitigation' and 'adaptation', that can protect people and animals from climate-change disasters and ultimately save our world.

Rethinking our global food system – how we farm animals and what we eat – is not only key to reducing greenhouse gas (GHG) emissions but to achieving the Sustainable Development Goals (SDGs) and global biodiversity targets set by the UN.

Globally, food systems are responsible for one-third of total GHG emissions (Crippa *et al.*, 2021). Compassion in World Farming has shown that the livestock sector – dominated by industrial animal agriculture – involves 95 billion land-based animals and produces more direct GHG emissions than all the world's planes, trains and cars combined.

Protesters outside Defra (Department of Environment, Fisheries, and Rural Affairs). London, England, UK.

Pigs stand behind a chain-link fence, trapped in water that flooded an Italian pig farm.

If global demand for meat continues at its current rate, the sector could add nearly 1°C to warming by 2100 (Ivanovich *et al.*, 2023). This makes meeting the UN Paris Agreement target of 1.5°C (Tian *et al*., 2020) almost impossible and the onslaught of climate change-linked disasters ever more likely. It also threatens crossing planetary boundaries.

Extreme weather events, including floods, extreme heat, droughts and cyclones, severely affect the livelihoods and food security of millions of people annually. They devastate crops and kill and inflict serious injury and disease on farmed animals.

Our report briefly explores some of the different approaches that are interlinked and are urgently needed to tackle the climate crisis – mitigation, transforming our food system, and adaptation.

Mitigation tackles climate change at its roots. The UN Environment Programme (UNEP) asserts that one of the most cost-effective ways to avoid 0.3°C of global warming is to concentrate on reducing methane.

Transforming our food systems requires an integrated *One Health* approach to address the inter-dependence of human health and wellbeing, animal health and welfare, and the environment including safe bio-physical conditions necessary for life on Earth.

We will see in the report that the food industry is pushing 'sustainable intensification' as a solution, yet these systems do not work and further risk food security, animal welfare, the environment, and human health. Transforming food systems must be recognised as a core pillar of global climate action. Low-carbon farming practices such as agroforestry, regeneration, and silvopasture systems are not only better for animal welfare, they also improve biodiversity, are better for the environment and are more resilient to extreme weather.

Adaptation involves adjusting what we do to cope with the expected effects of climate change. It can involve simple and often localised strategies such as providing extensively farmed animals in heat-stricken areas with more shade, water, and housing with better ventilation. On a larger scale it can involve regenerative farming practices which also help mitigate climate change.

Climate Doom Loop presents how reducing meat consumption – particularly in the Global North – will have the most impact in lowering animal agriculture GHG emissions. More plant-based, healthier diets are critical in protecting people and our planet. Through the global adoption of regenerative farming practices, up to ten billion people can be fed.

As countries assess their contributions to reaching climate targets and work towards food systems change, they must commit to ambitious, measurable food-related actions. These should reflect the critical role of food systems in achieving climate, nature, and health goals.

Without such commitments we are likely to see the Paris Agreement fail and planetary boundaries crossed. This will result in more severe and frequent climate disasters and put even more people, animals, and our planet's biodiversity at risk.

INTRODUCTION

Climate change-linked disasters are increasing and destroying our world. Every year, cyclones, floods, wildfires, extreme heat, and droughts relentlessly kill thousands of people and millions of farmed animals. These events displace communities, threaten biodiversity, and disrupt food production systems. They highlight the fragile interdependence between animal welfare, farmers' livelihoods, and food security.

While the climate crisis jeopardises the stability of food systems, the livestock sector contributes significantly to emissions (Crippa *et al.*, 2021). Globally, agriculture is responsible for one-third of total greenhouse gas (GHG) emissions. And the animal farming sector – dominated by industrial animal agriculture – produces more direct GHG emissions than all the world's planes, trains, and cars combined.

The planetary boundaries framework, initially proposed in 2009, highlights how human pressures can affect the stability of the earth system. In 2023, six out of the nine boundaries had already been crossed – leading to irreversible environmental changes (Richardson *et al.*, 2023). The livestock sector is a key driver in pushing these planetary boundary limits. For example, farmed animals for food production receive 73% of all antibiotics globally, ocean acidification because of farmed animal emissions, and livestock are responsible for 41% of deforestation, 33.6% of fresh water use and are the primary driver of habitat destruction (FAIRR, 2024). To remain within these planetary boundaries, a reduction in animal-sourced foods is needed. If left unchecked, intensive farming will threaten these planetary boundaries by 2030 (Li *et al.*, 2024) and 2050 (Bowles *et al.*, 2019).

Meanwhile global demand for animal-sourced proteins continues to rise, driven by population growth and shifting diets. This dual pressure underscores the need to address both adaptation to climate impacts and mitigation of GHG emissions. However, current government policies often fall short.

While major animal farming regions such as the EU, UK, and Brazil have recently reaffirmed or strengthened their commitments to net-zero emissions, progress must go beyond ambition. Achieving climate goals requires urgent and concrete actions to transform food systems.

While nations with high levels of animal farming have set ambitious climate targets, these remain out of reach without urgent interventions cutting emissions from food and farming. A rapid shift toward agroecological, low-emission, and animal welfare-centred farming is essential – not only to meet climate goals, but to build resilience for people, animals, and ecosystems.

To succeed, this transformation must be supported by policies, finance, and capacity-building that prioritise vulnerable communities and frontline food producers.

Agricultural burning releases $C0_2$ emissions and other greenhouse gasses (GHG) that contribute to climate change.

© iStockphoto

INCREASING CLIMATE DISASTERS

At the UN Climate Change Conference in Paris in 2015, 194 world leaders pledged to prevent global temperatures rising by more than 2°C, preferably 1.5°C, above late 19th century pre-industrial levels. To date, progress on the Paris Agreement remains inadequate.

At COP28 in Dubai, 134 leaders acknowledged that climate impacts are already undermining the resilience of agriculture and food systems. These impacts threaten the ability of communities – especially the most vulnerable in the Global South – to produce and access food when they are already facing increasing hunger, malnutrition, and economic strain.

Chances of achieving the temperature goals of the Paris Agreement are rapidly decreasing. This is partly due to ever-rising GHG emissions. In 2023, atmospheric concentrations of methane (CH_4), nitrous oxide (N_2O) and carbon dioxide (CO_2), reached their highest ever levels in 800,000 years and are expected to continue to rise (WMO 2025).

The rise in global temperatures caused by GHG emissions has contributed to more severe and frequent extreme weather events around the world (IPCC, 2022). Climate disasters include heatwaves, floods, droughts and storms which can cause significant impacts; and losses and damages to nature and people (IPCC, 2022). It was first shown in 2004 by leading scientists that human influence had at least doubled the risk of an extreme heatwave occurring (Stott *et al*., 2004) – this is known as extreme event attribution. Extreme event attribution calculates how much, or even if, climate change affects the frequency and intensity of climate disasters. From 750 extreme weather events, 74% have been made worse as a direct result of humans releasing GHG emissions (Carbon Brief, 2024).

The evidence is stark. From 1993 to 2022, around 9,400 extreme weather events caused 765,000 deaths. There was also a direct economic loss of around USD 4.2 trillion (Adil *et al*., 2025).

Huge wildfires in farm fields. Essex Ongar drone aerial view.

Malnourished cows walking on dry cracked earth looking for fresh water during drought.

© iStockphoto

Such extreme events are no longer rare occurrences, quadrupling since the 1970s and costing USD 3.6 trillion of lost livestock and crops over the last 30 years (FAO, 2023). During 2024 alone, the UK and countries across Europe, Asia and the USA experienced record-breaking heat, floods, and storms. United Nations Secretary-General, António Guterres, addressed the World Leaders Climate Action Summit during COP29. He described 2024 as "a masterclass in climate destruction", highlighting the intensifying impacts of human-induced climate change.

In 2022, the United Nations Intergovernmental Panel on Climate Change (IPCC) noted that climate change "will increasingly put pressure on food production, especially in vulnerable regions, undermining food security and nutrition". The agriculture sector is particularly vulnerable to such extremes. Animals are killed and injured – often in their millions when kept as industrial animal agriculture – crops are wiped out, livelihoods are lost, and food security threatened.

Limiting global warming to 1.5°C instead of 2°C could significantly reduce damage and suffering caused by extreme weather (IPCC, 2018). Transforming the global food system is key to this.

According to the United Nations Food and Agriculture Organization (FAO), animal farming production accounts for approximately 14.5% of all anthropogenic GHG emissions, equating to about 7.1 gigatonnes of CO_2 equivalent annually.

Rapid reduction of GHG emissions from the global food system is necessary to meet global temperature targets (Clark *et al.*, 2020) – notably the Paris Agreement.

CASE STUDY

Country: Brazil[1]

FACING THE FLYING RIVERS OF CLIMATE CHANGE

©GRAD Brasil

Cattle found dead on the roadside following the floods of May 2024.

Brazil plays a leading role in the global food system. It is one of the main producers of livestock and crops for animal feed, such as soy and corn. In early 2024, extreme flooding in the southern state of Rio Grande do Sul left a trail of devastation, displacing communities, destroying infrastructure, and leading to the death of more than one million farmed animals. The floods severely disrupted food production and rural livelihoods, highlighting the fragility of intensive agricultural systems in the face of escalating climate impacts. As Brazil continues to expand industrial livestock and feed production, this case underscores the urgent need for a more resilient food system, one that can withstand climate shocks while protecting people, animals, and the environment.

"There has been an increase in the intensity and frequency of extreme [weather] events in Rio Grande do Sul over the last two decades, and especially in the last five years. It's likely to increase due to climate change."

Francisco Aquino, climatologist, Federal University of Rio Grande do Sul, *Financial Times*

Between 2023 and 2024, Brazil's Rio Grande do Sul state endured a chain of extreme weather events that killed people, animals, and displaced whole communities. These climate change-linked events include the cyclone of June 2023[2]; floods in September 2023[3], and the most extensive climate disaster Brazil has known – the floods of May 2024.

These catastrophic floods were caused when a rare combination of higher-than-average temperatures, high humidity and strong winds – also known as flying rivers – generated extraordinary rainfall. The highest volume of rain since 1910 was recorded in May 2024 – it represented 455% of the historical monthly average. During the unrelenting deluge, rivers burst their banks, dams and bridges collapsed, roads were destroyed.

Rio Grande do Sul is Brazil's fourth largest economy, and agriculture totals 15% of the state's R$580bn GDP. The floods caused severe losses in the livestock sector – approximately 1.2 million birds, 14,806 beef cattle and 2,451 dairy cattle were killed. Surviving animals were left at great risk of disease from contaminated waters and starvation.

Vulnerable communities had their homes and livelihoods washed away. These communities included smallscale farmers, agrarian reform settlers, subsistence farmers, indigenous communities and Quilombos – communities founded by people of African origin fleeing slavery in Brazil.

Overall, 2.4 million people were directly affected in 96% of Rio Grande do Sul's 497 municipalities. There were 183 confirmed deaths, 806 injured, 27 missing, and 580,000 people displaced.

THREATENING FOOD SECURITY

"I can't think about the future. That belongs to God," said Edite de Almeida, an agrarian reform settler in Eldorado do Sul. She lost most of her 60 laying hens and the fields growing wheat, rice, and grazing for her dairy cows. "I don't expect to have again what I had before. We're starting over."

The Rio Grande do Sul livestock sector suffered a loss of production of around R$1.2 billion and indirect damage estimated at more than R$709.6 million. There were also additional costs for soil recovery – soil throughout the region and its fertility was severely eroded by the water.

Food insecurity in the region increased. Of Rio Grande do Sul's population, 47% has experienced some level of food insecurity since 2022. This was largely due to the COVID-19 pandemic, but the situation greatly deteriorated during the May 2024 floods.

RESPONDING TO THE DISASTER

Brazil's federal government set out to lead a comprehensive mobilisation effort, coordinating with ministries, the armed forces, civil defence, and partnering state and municipal authorities. Operation Taquari 2 was launched involving more than 15,000 military personnel, police officers, and agents. The operation's logistics also allowed for the mobilisation of 42 aircraft, 243 vessels, 2,500 vehicles and engineering equipment, but more than 158 blocked roads made access difficult.

Given the scale of the catastrophe the state was unprepared, and the available personnel were not enough to deal with the people in need. First aid came mainly from neighbours and family members. Donors from inside and outside the state sent large volumes of donations and emergency aid.

The estimated global financial cost of the floods in May 2024 was approximately R$90billion, covering damages, losses and additional costs. The federal government supported almost all of the R$90bn billion during the rest of the year. Help included cancelling debts with the federal government, donations of food baskets, health care for indigenous communities and financial aid for artisanal fishermen. Family farmers were granted subsidies and debt extensions, lines of financing, and non-repayable funds for infrastructure reconstruction.

PREVENTING AND PREPARING FOR FUTURE CLIMATE CRISES

Brazil is the world's sixth-largest GHG emitter. Change in land use and forests (including deforestation and wildfires) is the main source of GHGs in Brazil. This is followed closely by agricultural production which focuses largely on industrial animal agriculture. Millions of animals are farmed every year, while large swathes of forest are destroyed annually – illegally and legally – to grow the soy and grain fed to industrially-farmed animals worldwide.

Following COP28 (the 2024 UN Climate Conference), Brazil committed to reducing GHG emissions by 48% by 2025 and by 53% by 2030, compared to 2005 emissions. The government is offering incentives – funding and resources – for low-carbon agriculture. The ABC+ Plan, and the National Programme for the Conversion of Degraded Pastures into Production Systems (PNCPC) are among the most significant recent initiatives.

The government continues to face demands from people living in extreme weather affected areas. They are calling for resettlement, land regularisation to prevent deforestation and the structural support urgently needed to prevent future social-climate disasters. Analysis by scientific publications and social scientists show that the effects of the disaster were made worse by the lack of preventative measures and early warning systems.

[1] Relatório de perdas referente às chuvas e cheias extremas no Rio Grande do Sul – Maio de 2024 – Emater/RS-Ascar.
[2] During the "June Cyclone 2023" weather event, 58 cities were affected by heavy rainfall, torrential downpours, flooding and waterlogging.
The municipalities covered are those affected by the heavy rains caused by the cyclone and which have had a decree of emergency or calamity approved by the state government. In this phase of the programme, 1,776 families were assisted and the total value of the payments reached R$4.4 million. State of Rio Grande do Sul (2023). *Volta por Cima Programme*.
[3] The climatic event "Floods of September 2023", which occurred between 2 and 6 September 2023, produced a series of "floods, intense rainfall, cyclones, hailstorms, floods, torrents and windstorms", in 83 cities (RS State Decree No. 57,197 of 15 September 2023). In this phase of the programme, 2,611 families were assisted and the total value of payments reached R$5.2 million. State of Rio Grande do Sul (2023). Volta por Cima Programme.

CASE STUDY

Country: UK

HUMAN-INDUCED CLIMATE CHANGE CAUSED MASS FARMED ANIMALS FATALITIES

© Martin Usborne/CIWF

Industrially farmed chickens in sheds are at risk from heat stress, as well as other welfare issues.

"Millions of factory farm chickens died during the record-breaking heatwave as industry whistle-blowers claimed little was done to protect them from the lethal temperatures. The birds – confined to industrial farm sheds – suffered in temperatures of up to 45°C and died slowly of heat exhaustion."

Anna Isaac, Jane Dalton, *The Independent*

In the summer of 2022, the UK experienced five separate heatwave periods, with the hottest day ever recorded on 19 July, when temperatures reached 40.3°C. The Government declared a national emergency following the Met Office's first ever issuance of a red 'extreme heat' warning. This was a 1-in-1,000 year event, made 10 times more likely due to anthropogenic climate change.

The UK is inexperienced in mitigating extreme heat and "the conditions led to widespread suffering". There were 2,985 excess human deaths and 24,316 wildfires, leading to ecological consequences and wildlife habitat destruction. Almost 20 houses were destroyed by the huge grass fire on 19 July - the hottest day ever recorded in the UK.

Industrial farmed animals were severely impacted. The UK Government refused to publish the total number but confirmed mass fatalities. A news report stated that: "Millions of factory farm chickens died during the record-breaking heatwave as industry whistle-blowers claimed little was done to protect them from the lethal temperatures. The birds – confined to industrial farm sheds – suffered in temperatures of up to 45°C and died slowly of heat exhaustion". Many birds were panting and flapping as they died. A worker described the scene as "carnage", saying "they were experiencing flashbacks from the sheer scale and stink of the dead bodies" of the chickens that died during the heatwave.

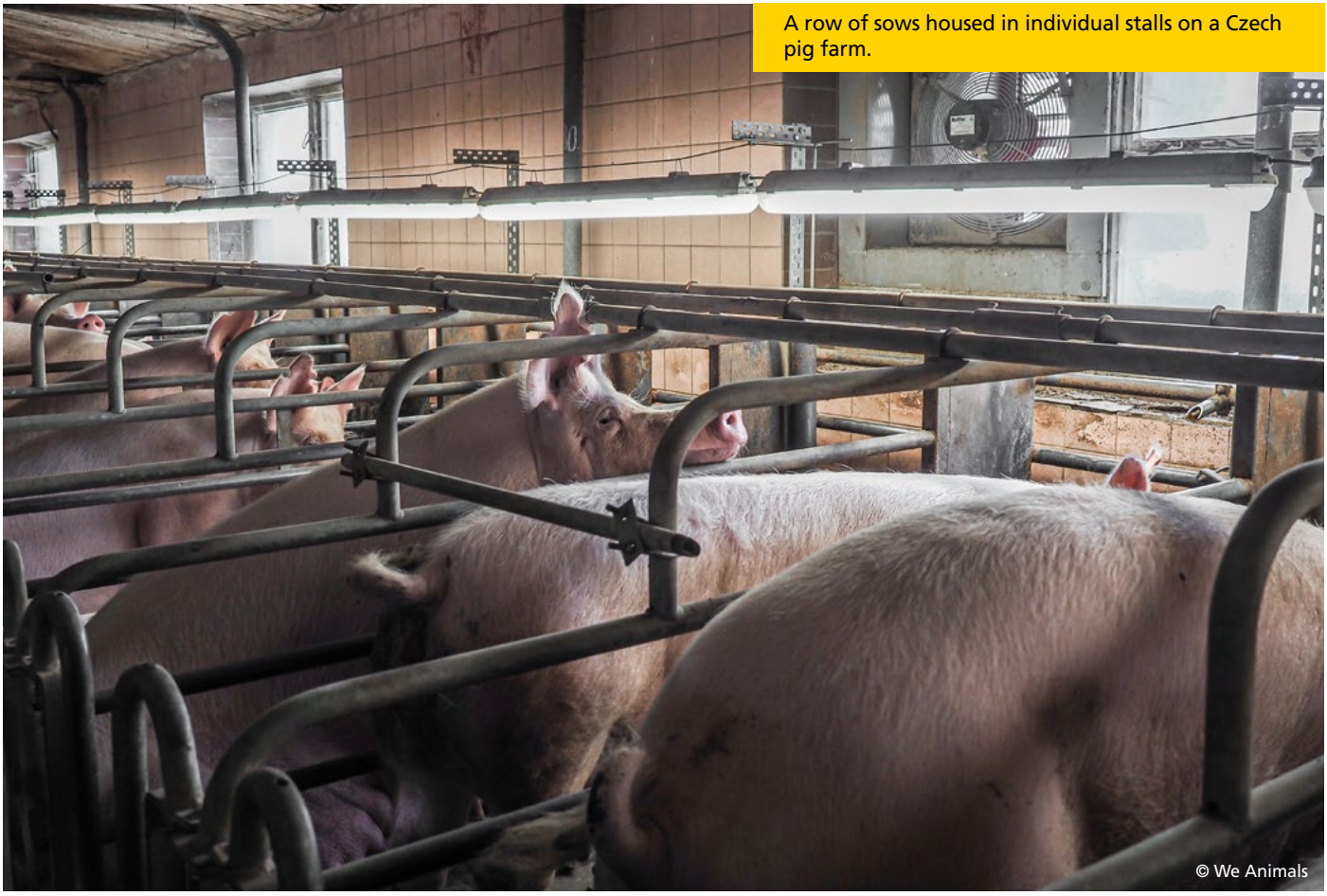
It was confirmed that 18,500 chickens died in transport due to heat stress. On the day temperatures reached 40°C, 9,640 chickens died

en route to slaughter. United Kingdom chicken meat production was 9% lower in July 2022 than July 2021. Records also show that more than 25% of sites that kept cattle experienced heat stress, and the pig population was reduced by 10% due to the impact on pig fertility, farmers leaving the industry and negative farm profit margins.

In response to the July heatwave, the Animal and Plant Health Agency (APHA) issued livestock guidance that animals should not be transported in temperatures over 30°C, must travel early in the morning or overnight where possible, and during a journey the stocking density should be reduced by at least 30%. For journeys over 8 hours, legislation specifies that the vehicle must maintain a temperature of under 30°C. For journeys of 8 hours or under there is no mandated welfare legislation. There is no legal requirement to provide water for journeys. The APHA reiterated that it is the responsibility of livestock keepers and transporters to ensure the animals' welfare.

In response to the mass fatalities, the 2022 FSA Animal Welfare Report noted that heat stress and dead-on-arrival at slaughterhouses caused substantial animal suffering. Information from these was a "lesson learnt" and the FSA developed internal guidance to formalise reporting procedures for animal welfare during extreme weather events.

While the UK Government is implementing measures to bolster future resilience in livestock farming with the 2023 National Adaptation Programme, it must also introduce policies to help reduce emissions from intensive animal farming by switching to more climate- and nature-friendly practices to reduce emissions. In 2024, it introduced a legal requirement for large pig and poultry units to produce a climate change risk assessment. This should identify risks and propose mitigation strategies such as installing additional cooling systems. Poultry farmers should also consider reducing stock density. The Farming Equipment and Technology Fund provides grants, however, animal welfare organisations say more effective legislation is required.



A row of sows housed in individual stalls on a Czech pig farm.

CASE STUDY

Country: Pakistan

FUTURES WIPED OUT BY FARMED ANIMAL DEATHS IN CLIMATE CHANGE FLOODS

© iStockphoto

Floods destroy agriculture fields in Pakistan.

From June to October 2022, monsoon rains and glacial melt led to catastrophic flooding that submerged approximately one-third of Pakistan. The most severe rain spells were in August, the wettest in more than 60 years, recording 3.4 times as much rain as the national average.

The devastation affected 33 million people; 8 million were displaced, and more than 1.1 million livestock were reported killed. This includes around 500,000 in Balochistan Province, more than 428,000 in Sindh Province and over 205,000 livestock in Punjab. Furthermore, the Food and Agriculture Organization of the UN (FAO) assessed that some 3,804,045 hectares (9.4m acres) of crop area in Pakistan were destroyed in August alone.

The effects of losing animals in these largely rural communities can be devastating to people's lives and futures. As well as being a food source, many households rely on livestock and animals for their livelihoods. Farmed animals can be used not only for food, but as collateral for loans, for example to finance the purchase of seeds for growing crops. Consequently, their loss results in severe economic and food security repercussions.

Overall, the floods resulted in around USD 30 billion in damage and economic loss.

Mobile vet camps and aid for livestock were limited, and animals remained vulnerable to disease, starvation and death in the aftermath.

NGOs including IFAW and Brooke (which focuses on equines) provided emergency aid, assisting more than 60,000 people and animals with food, shelter and veterinary care.

Despite its very low carbon footprint, Pakistan is globally one of the 10 countries most affected by extreme weather events, according to the Global Climate Risk Index 2021 and Climate Watch.

Pakistan launched a National Climate Change Policy in 2012 recognising the effects of global climate change in Pakistan. These include melting and receding glaciers, increased droughts, flooding and erratic weather behaviour, changes in agricultural patterns, reduction in fresh water supply, and loss of biodiversity.

Some progress has been made regarding adaptations and mitigations, but is largely limited by lack of funding, political instability and lack of public awareness.

Government work underway includes reforestation projects, investing in renewable energy to achieve 60% of total energy needs through renewables by 2030, and encouraging sustainable farming techniques. To protect livestock, USD 17.91 million is needed to ensure food security and livelihoods are protected, including the provision of animal feed and vaccinations which are integral to safeguard animal welfare and food security of the most vulnerable groups.

FOCUSING ON FARMING SYSTEMS

Global meat consumption is projected to rise by 73% by 2050 (FAO, 2011). Increases in meat consumption are driven mostly by the rate of urbanisation and income per capita (Milford *et al*., 2019).

Industrial animal farming condemns most of the 95 billion land animals farmed globally to unnaturally close confinement, where they endure intense stress and suffering. Its impact can create 11% of global GHG emissions (World Animal Protection, 2023) through producing high volumes of methane. Farmed animals contribute 41% beef, 20% dairy, 9% pigs, 9% broilers (chickens reared for meat production) and 8% egg layers to the sector's emissions (Gerber *et al*., 2013).

If global demand for meat continues at its current rate, it could add nearly 1°C to global warming by 2100 (Ivanovich *et al.*, 2023). This makes meeting the Paris Agreement of 1.5 °C (Tian *et al*., 2020) almost impossible. Such demand would create 49% of the emission budget by 2030 and 80% by 2050 (Harwatt, 2018).

Rethinking our global food system – particularly the way we farm animals and what we eat – is key to meeting the Paris Agreement target of 1.5˚C and keeping within planetary boundaries.

Newborn calves are removed from their mother and housed individually for the first 8 weeks of life.

EXTREME EVENTS – THE IMPACT ON ANIMAL WELFARE

Animal welfare is an important consideration when exploring the impacts of extreme weather and climate disasters. Poor animal welfare threatens the livelihoods and food security of communities globally. The case studies featured throughout this report highlight how climate disasters affect vast numbers of farmed animals inflicting death, disease, injury, and stress.

EXTREME HEAT

Our case studies from the Netherlands, Poland, UK and Czech Republic show how farmed animals are increasingly exposed to extreme heat which can lead to heat stress. Heat stress is responsible for a range of health and welfare problems, including increased respiration rates and changes in cardiac function. It can also cause dehydration, weaken immunity, hinder animals' reproductive performance, decrease milk production and, in severe cases, cause death.

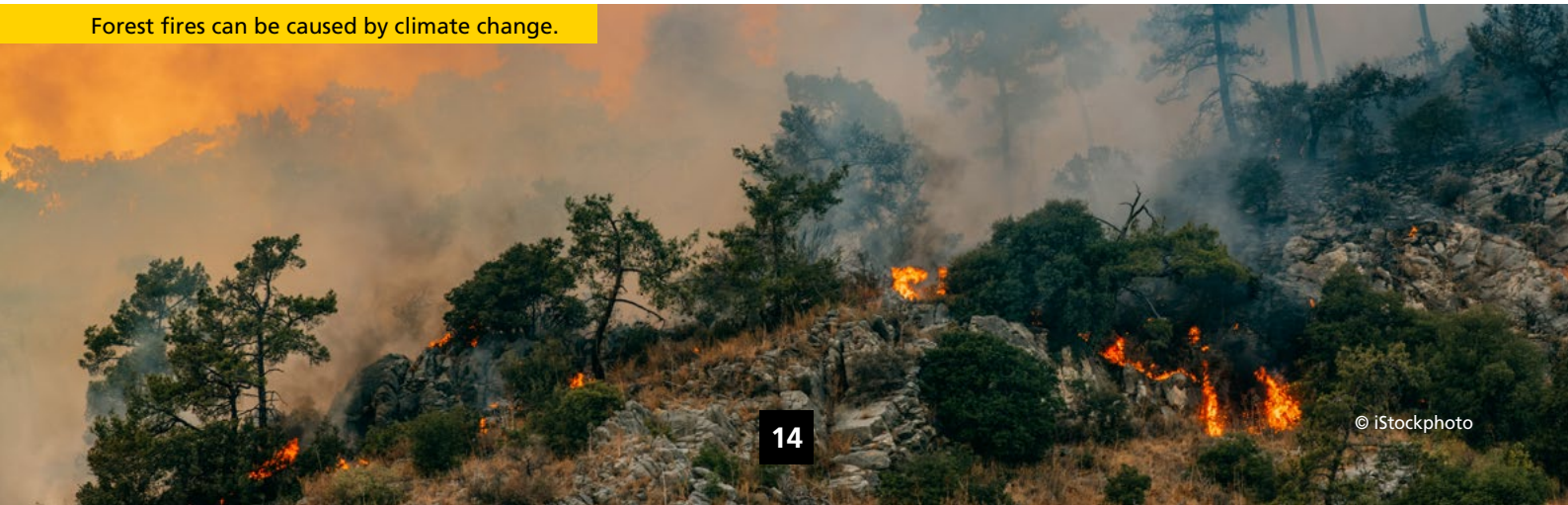
Suppression of feed intake is also common (Das *et al*., 2016) as extreme heat makes animals eat less. In temperatures above 30°C, cattle, sheep, goats, pigs and chickens reduce their feed intake by 3-5% for each degree centigrade increase (Thornton *et al*., 2015).

All animals farmed in both intensive and extensive (mostly outside) systems are at risk of heat stress. However, those kept in intensive systems in large numbers are more reliant on the housing system – ventilation systems, structures, and stocking numbers within – to cope with the extreme temperatures.

Several management strategies such as sprinklers, shade and provision of water can be deployed to reduce the severity of heat stress, but under extreme conditions these systems will not be able to cope and therefore cannot protect the animals against heat stress – impacting their health and welfare (Morgado *et al*., 2023).

Extreme heat can also severely affect the welfare of animals during transport where they can experience collapse and exhaustion, and even die (EFSA, 2011). Animals already undergo distress when they are transported due to cramped conditions with high stocking densities, poor ventilation systems and long journey times. In these conditions, animals may already experience higher temperatures within the transporter. In the EU, animals' temperatures must be maintained within a range of 5˚C to 30˚C with a tolerance of +/- 5˚C. However, to reduce heat stress, the European Food Safety Authority (EFSA) has indicated that the temperature should not exceed the animals' upper critical temperature inside the vehicle, which for some species is 25˚C, much lower than the legislative range (EFSA, 2022). Transporting animals during extreme heat should be avoided at all costs to prevent further suffering.

Forest fires can be caused by climate change.



Flooding affecting homes and belongings in an African community.

FLOODING

In Pakistan, Italy, Brazil, and elsewhere, animals are increasingly exposed to flooding which can have profound impact on their welfare, including severe injury and death.

Surviving animals in flood-afflicted areas may also starve to death through lack of food in the immediate aftermath and can become ill because the only water available is contaminated. For example, after a flood, dairy cows are more prone to mastitis, lameness, injuries, reproductive efficiency, and even death (Gaviglio *et al*., 2021).

Animals kept in both intensive and extensive farming systems are at risk from floods. Those farmed intensively have a high risk of drowning when trapped by the structures that confine them as the flood waters rise.

When these flood waters recede, the disaster continues. Long-term flood damage to agricultural areas can result in such destruction of the soil that it can no longer be used to grow food for either animals or people.

DROUGHT

Animals mostly farmed extensively in drought conditions can suffer from heat stress, starvation and no access to shelter. Drought can affect extensive systems – land and animals – over time.

Initially, lack of precipitation leads to grassland degradation and feedstuff reduction, which affects livestock production (Bai *et al*., 2018). Increased heat and drought conditions also affect the quality of animal forage – grasses, hay, legumes and other plants – which in turn can affect animal health and production.

It is clear that extreme weather events are likely to get worse as GHG emissions rise and will result in more devastation inflicted on animals and people. For example, it is expected that approximately 48% of the global cattle population will be exposed to severe heat stress by 2100. This will potentially threaten the food security and livelihoods of smallscale farmers even more than they are threatened today (Carvajal *et al*., 2021).

CASE STUDY

Country: Poland

KILLER HEATWAVE HIGHLIGHTS FACTORY FARMING WEAKNESSES

© Andrew Skowron/We Animals

Sows look out from sow stalls at an industrial farm in Poland.

"On the evening of 10 July, I closed the pigsty and made my rounds. I always pay attention to the following: electricity, air conditioning, ventilation, the most important elements. We turned on the alarms and went to sleep. What I saw when I opened the pigsty in the morning was shocking. I wouldn't wish such sights on anyone. All our effort, all our work, was ruined."

Hanna Szypryt, farmer, Bydgoszcz, central Poland

In the summer of 2023, Poland experienced an intense heatwave. This was part of a series of extreme temperature events across Europe attributed to climate change which caused more than 47,000 deaths. The Polish Government Security Centre issued heat warnings with Legionowo, near Warsaw, recording 35.5˚C in August.

Extreme weather costs Poland €1.3 billion annually. Animal farming in Poland, dominated by industrial scale operations, is significantly impacted by climate change, implying a 'notable risk in animal welfare' and reduced production. The repeated drought led to reduced access to both water and feed, resulting in lower production levels – maize production decreased by 39% in 2006 and 2015.

Maintaining appropriate temperatures in industrial animal agriculture is a significant issue. In July 2023, 1,000 pigs on a farm in Bydgoszcz, central Poland, died when the ventilation system failed. The pigs suffocated after an error in the system meant that oxygen was not filtered into the unit, and the intense heat placed extra strain on the cooling system.

Farmer Hanna Szypryt said: "On the evening of 10 July, I closed the pigsty and made my rounds. I always pay attention to the following: electricity, air conditioning, ventilation, the most important elements. We turned on the alarms and went to sleep. What I saw when I opened the pigsty in the morning was shocking. I wouldn't wish such sights on anyone. All our effort, all our work, was ruined". The farmer's insurance did not cover

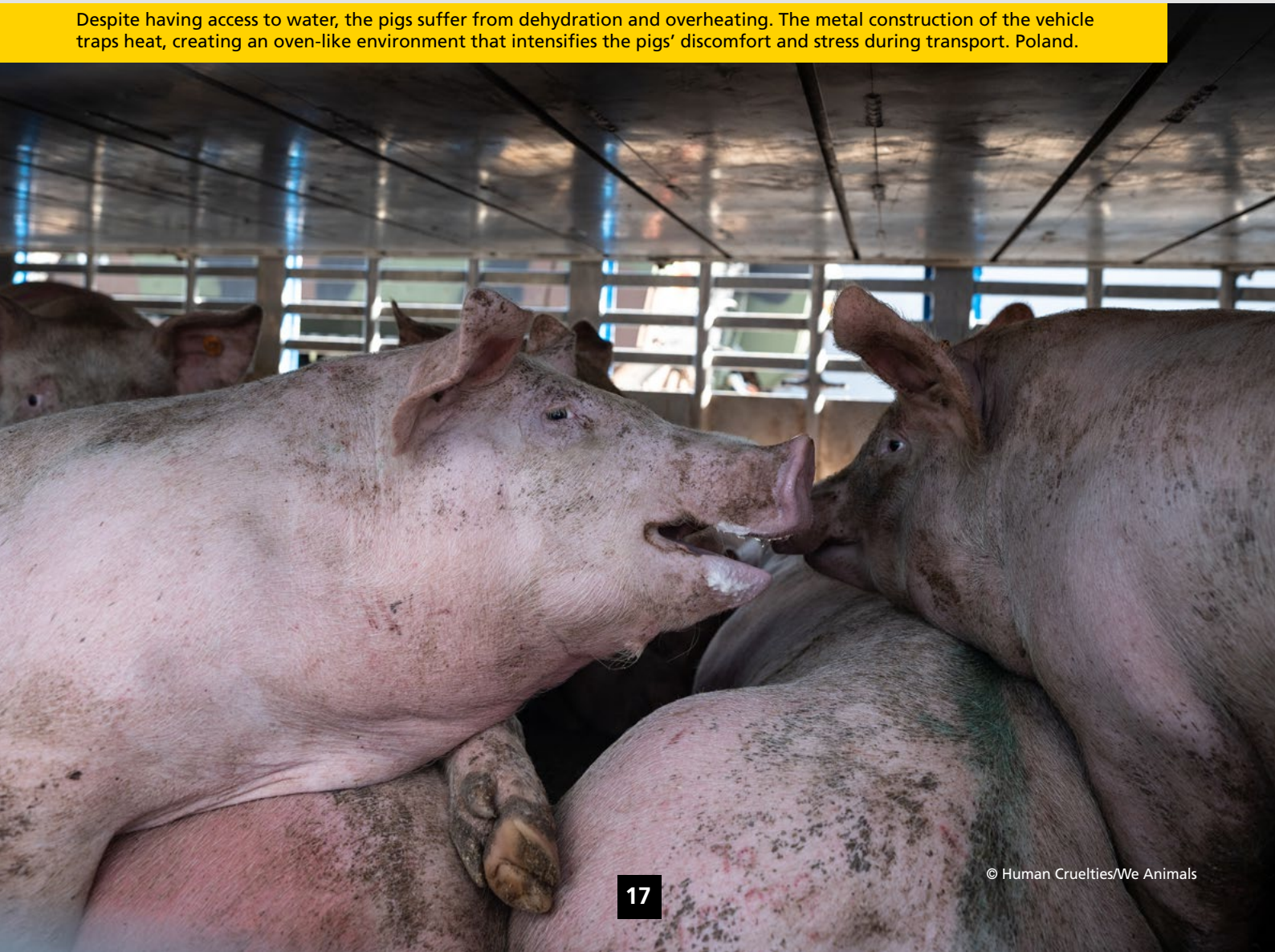
the losses, so the local community launched a donation appeal to help the farm.

Poland is bound by EU law with regards to animal welfare, and the Ministry of Agriculture and Rural Development (MARD) recognises the increased frequency of extreme weather events on livestock. Regional guidelines from the Polish Agricultural Advisory Centre include basic advice for farmers on providing shade, water and restricting transportation, as do the agricultural media, industry and District Veterinary offices, some of which also alert farmers to high temperatures. However, a national strategy appears absent.

MARD is working on climate change mitigations by aligning with the EU Green Deal. Poland benefits from EU funds through the Common Agricultural Policy which includes INVEST subsidies for pig and cattle farmers for the installation of smart ventilation systems, and outside access, as well as shelters to reduce heat stress.

An additional guiding framework is the Polish National Strategy for Adaptation to Climate Change by 2020 which aims to ensure sustainable development under changing climate conditions. Mitigations in livestock farming include establishing systems to monitor climate change impacts on animals and production, providing early warnings, and improving shelter designs to protect livestock from extreme weather events. However, these measures alone are insufficient. A more holistic approach is needed that includes a move away from industrial animal agriculture to more resilient, climate- and nature-friendly practices, and targets to reduce the overconsumption of animal sourced foods.

Despite having access to water, the pigs suffer from dehydration and overheating. The metal construction of the vehicle traps heat, creating an oven-like environment that intensifies the pigs' discomfort and stress during transport. Poland.



CASE STUDY

Country: Italy

FACTORY FARMED ANIMALS LEFT TO DIE IN FLOOD DISASTER

© Stefano Belacchi/Essere Animali/We Animals

Trapped pigs stand in water that reaches past their bellies in the flooded yard of an Italian pig farm.

In May 2023, the Emilia-Romagna Region of northern Italy experienced unprecedented rain that led to severe flooding and landslides. The Department of Civil Protection issued a Red Alert on 2 May. Six months of rain fell in two days. Twenty-three rivers, as well as drainage systems, burst, submerging infrastructure in towns including Bologna, Ravenna and Rimini.

Research suggests that the region's flood risk is changing due to climate change and uncontrolled urbanisation. Italy is one of Europe's climate risk hotspots.

A State of Emergency was declared and 17 people were killed. There were more than 2,000 mudslides, 36,000 people were evacuated and 700 roads were closed. The former president of Emilia-Romagna, Stefano Bonaccini, described the floods as a "catastrophic event". The Italian government approved €2 billion for recovery and the Civil Protection Department, Italian military, and volunteers were deployed. The cost of damage was estimated at €9 billion.

Emilia-Romagna is a major livestock farming region, producing Parmigiano cheese and Parma ham. The flooding had a severe impact on farmed animals, the majority of whom are confined in industrial units. Units were abandoned by evacuated workers, and the animals were trapped in cages and sheds as water levels rose, or were crushed by landslides. More than 5,000 farms were submerged in water and approximately 250,000 cattle, sheep, goats, and pigs, along with around 400 poultry farms, and 45,000 beehives were impacted.

In San Lorenzo, more than 60,000 hens died when their sheds flooded.

In Bertinoro, as witnessed by animal protection organisation Essere Animali, an industrial unit holding thousands of pigs was flooded. Witnesses saw piles of hundreds of dead pigs. At another in Bagnacavallo, pigs were swimming inside and outside the pens. Direct damage to the livestock sector was estimated at €300-400 million. The extreme weather also caused widespread loss of crops. Confagricoltura Ravenna estimated damages of €1.5 billion.

The Regional Breeders Association of Emilia-Romagna provided front line emergency assistance including rescue of animals and feed donations. The Civil Protection also assessed damages to equipment, infrastructure and livestock. The government approved an emergency aid package of €175 million to support the agricultural sector, and in October, the EU approved €1 billion in aid for farmers. However, there has been frustration regarding insufficient financial assistance.

Whilst many international guidelines for risk prevention exist, including the EU Floods Directive, according to research, those paying specific attention to farmed animals in Italy are limited. Whilst the Ministry of Agriculture has implemented measures to assist livestock farmers in extreme weather, critics say insufficient climate adaptation measures were a contributing factor to the disaster's severity.

Workers gather up surviving hens at an Italian egg-production factory farm destroyed by flood waters.

There was a lack of early warning systems during the Emilia-Romagna floods, specifically for the farming communities, and a lack of agency collaboration. Damaged roads meant farmers were unable to access livestock, there were difficulties disposing of drowned animals, and supply shortages of food and water, as well as the risk of environmental contamination due to livestock waste spillage. Along with other nations, Italy must take action to reduce climate impacts by building a resilient and sustainable food system based on climate- and nature-friendly practices. A collaborative approach with experts in farm animal care is also required to mitigate future extreme weather events.

Dead grower pigs after the floods.

RISING FOOD INSECURITY

The scale of food insecurity – people's inability to access regular food – is huge. During 2023 an estimated 2.33 billion people (28.9% of the global population) were either moderately or severely food insecure. Their plight was worsened by the increased impacts of climate change and extreme weather (FAO, IFAD, UNICEF, WFP, and WHO, 2024).

Climate disasters destroy crops, kill people and farmed animals, resulting in poor animal production. These combine to cause breakdowns in food systems and disruptions to food distribution which directly, and indirectly, affect food security. An estimated 582 million people are expected to become chronically undernourished by the end of the decade (FAO, IFAD, UNICEF, WFP, and WHO, 2024).

Climate disasters can affect all countries. Adil *et al*., (2025) showed in 2022, seven out of ten of the most affected countries were High Income Countries which included Italy, USA, Spain, and Portugal. However, this is likely to change as more Global South countries become increasingly at risk from climate disasters. Our report covers four of the top ten most at-risk countries including Pakistan, Nigeria, USA, and Italy.

Child and boat on dried lake bed due to climate change.

Climate disasters such as floods destroy crops and contribute to global food insecurity.

Food insecurity negatively affects rural populations more than urban area populations (except in Northern America and Europe) (FAO, FAD, UNICEF, WFP and WHO, 2024). Every year, billions of dollars' worth of farmed animals and crops are lost, due to climate disasters and affects both the development gains and livelihoods of farmers (FAO, 2023).

Nigeria is experiencing acute food insecurity, with one million people affected. A further 38 million people suffer moderate food insecurity. Several factors have contributed to this including devalued currency, conflict, and persistent extreme weather events (WFP and FAO, 2024).

When climate disasters cause irreversible damage, the impact is defined as 'loss and damage'. Climate disasters leading to loss and damage often affect the most vulnerable communities, the worst, causing economic damage, loss of life and destruction of houses, infrastructure or farms.

Newman & Noy (2023) found that the cost of climate disasters was USD 143 billion per year. Climate disasters are becoming more frequent, with around 100 climate disasters per year in the 1970s to 400 climate disasters per year over the last 20 years as identified by the FAO (2023). This has caused USD 3.8 trillion worth of losses to livestock and crops over the last 30 years.

Countries affected by climate disasters need money to help pay for damages, and to recover. Governments pledge help, but such pledges are a far cry from what is needed, with a shortfall of USD 9.2 billion (WRI, 2025).

Loss and damage and food insecurity can only be reduced if GHG emissions fall and adaptation practices to deal with the effects of climate change are implemented. The situation will only get worse if no action is taken. Solutions are available, but more needs to be done.

CASE STUDY

Country: Nigeria

SUFFERING CRITICAL CLIMATE CHANGE CONSEQUENCES

Chickens raised for meat live tightly packed together, cramped inside a massive shed on an industrial broiler chicken farm in Sub-Saharan Africa.

Nigeria in West Africa has experienced multiple periods of extreme heat. In February 2024, the Nigerian Meteorological Agency issued urgent warnings of a prolonged heatwave with temperatures up to 44.8°C and a heat index of 50°C. Africa is disproportionately affected by climate change, however, threats, including deaths, are under reported.

Nigeria's agriculture plays a central role in the nation's economy, representing 21% of GDP. It is predominantly rain-fed, making it vulnerable to climate variability. Degradation of grazing through desertification, drought, and reduced crop yield are all disrupting farming. In 2022, flooding caused the destruction of over 675,000 hectares of farmland. 17 million people are critically food insecure and in 2023, President Tinubu declared a state of emergency to tackle food costs and shortages. In April 2024, more than 500,000 bird deaths were reported in the Federal Capital Territory (FCT) region during the ongoing heatwave. In Lagos, the Poultry Association of Nigeria (PAN) predicted a 50% poultry mortality, urging farmers to feed birds in cooler times of day and maintain access to cool water.

The Chair of PAN was reported as saying the heat stops the birds eating: "They just continue drinking water, and when the heat persists, they refuse to drink water due to the hotness of the water. The birds begin panting … and raise their wings to conserve air… but that does not solve the problem. Due to the low feed, the birds' energy depletes, and sometimes the eggs get stuck in their anus, which in turn causes prolapse and ultimately death."

The Nigerian Federal Ministry of Agriculture and Rural Development (FMARD) acknowledges the challenges posed by heat stress, however, a national plan appears absent. Worryingly, industrial animal agriculture is increasing in Nigeria with 54% of the poultry flock confined in intensive or semi-intensive systems and many poultry farms, including the 46% extensive systems, do not have adequate ventilation systems. Government-run projects include The Nigeria Livestock Roadmap for Productivity Improvement and Resilience which seeks to enhance resilience against threats, including heat stress, with strategies such as adopting relevant climate-smart livestock systems. This has reported successes, benefitting 223,097 farmers across 17 states, however, the project aims to increase the intensification of farming, a move that will increase animal suffering and is not considered by leading climate scientists to be an effective way to reduce emissions.

CASE STUDY

Country: France

CLIMATE CRISIS TRIGGERS ANIMAL DEATHS, DROUGHT, AND FIRES

Soil cracked during period of drought. Drome, France.

In 2022, three extreme heatwaves hit France with temperatures exceeding 40°C in June, July and August. According to the government health agency, Santé Publique France (SPF), there was an excess of 2,816 deaths. It was the second hottest French summer since the beginning of the 20th century. French authorities opened cooling centres, issued public advisories and, in 2023, issued a 15-step plan to deal with future heatwaves.

On 18 July, when the temperature reached 37.6°C, an estimated 750,000 animals died on 126 farms in Brittany, mainly from suffocation and exhaustion. 83% of broiler chickens in France do not have outdoor access and so can't express natural coolant behaviours, like flapping their wings. The number of animal deaths was not recorded by the government.

In response to the extreme heat, the French government set up a Crisis Task Force and the National Drought Committee convened a meeting to address the agricultural impact. The Ministry concentrated on preserving water, animal feed challenges, and established the monitoring of agricultural drought conditions. The government implemented a ban on the transport of animals between 1pm and 6pm, following on from a 2019 decree restricting the movement of animals during orange or red heat alerts. However, according to a welfare report, these regulations are regularly breached and legislation is insufficient.

The impact on farmers included financial losses and mental health issues. The government had previously allocated €400 million to farmers facing difficulties buying animal feed due to drought. A coalition of breeders appealed to the government to compensate farmers who had lost between €2-4 billion, however, livestock mortality is not covered by government aid and the government faced criticism for not sufficiently supporting farmers.

The 2020 launch of the Météo-France heatwave alert system, triggers the dispatch of emails containing technical advice to farmers on thermal comfort for animals. In 2023, the French Ministry of Agriculture introduced a National Heatwave Plan, including awareness raising and guidance for livestock farmers.

In 2025, the government published PNACC3/National Climate Change Adaption Programme which further advises on climate mitigation measures. However, it has a narrow approach which fails to address fundamental issues such as the need to such the need to switch away from industrial animal agriculture and set to targets to reduce consumption of animal-sourced foods. In addition, many recommendations are not mandated in law and the French High Council has stated the government is ill-prepared for the effects of climate change.

CASE STUDY

Country: USA

HURRICANE HELENE – 5 MILLION CHICKEN DEATHS EXPOSE CLIMATE VULNERABILITY

© Kelly Guerin/We Animals

Pigs who survived Hurricane Florence wade through flood waters on a flooded highway. Duplin County, North Carolina, 2018.

"We never expected anything like this in a lifetime. I've lost USD 2 million worth of value and USD 400,000 income. I've been through a lot of tragedy in my life, but nothing like this. It's totally gone. I've lost my all."

Vann Wooten, Georgia poultry farmer, WTOC

In September 2024, Hurricane Helene struck the east coast of America. With winds of more than 140 miles per hour, it was the most powerful hurricane ever to strike Florida's Big Bend region. Historic rainfall, in some areas over 30 inches, caused flash flooding in Tennessee, Virginia, and North Carolina. More than 230 people were killed and two million were left without power. The storm displaced more than 375,000 people, causing an estimated USD 78 billion in damage.

More than six million acres of agricultural lands were affected by Hurricane Helene, with an estimated 96,871 farms in the region. Trees were uprooted, with sand and sediment deposited onto farmland, damaging soil microbiology. There were significant agricultural losses, particularly in Georgia. Estimates suggest USD 5.5 billion in damages.

Georgia is the country's biggest chicken-producing state, slaughtering 1.3 billion chickens annually. According to local reports, Hurricane Helene destroyed

at least 165 poultry houses, causing damage to another 500. With approximately 30,000 birds in each unit, this equates to an estimated five million birds killed in just one state. The exact number of farmed animal deaths has not been published. Birds were killed as buildings were destroyed and when electricity outages and road damage impacted feed deliveries.

Poultry farmer Vann Wooten lost most of his chicken houses to Helene. "We never expected anything like this in a lifetime. I've lost two million dollars' worth of value and USD 400,000 income. I've been through a lot of tragedy in my life but nothing like this." Georgia poultry farmers are believed to have suffered around USD 683 million in losses.

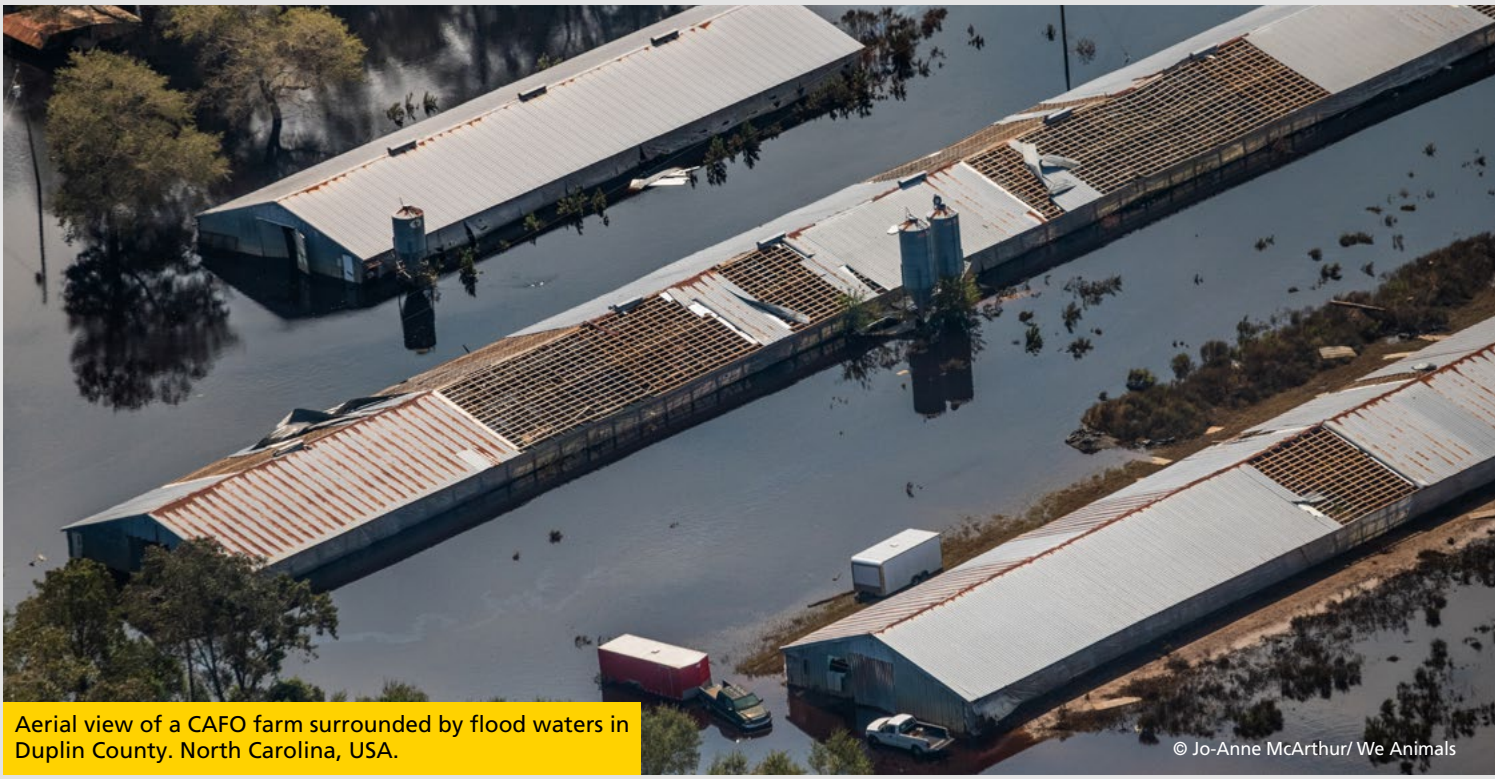
Efforts to address the immediate needs of livestock producers affected by Hurricane Helene were initially hampered because of the Farm Service Agency offices being closed due to damage. However, volunteers and farmer-to-farmer aid supplied hay and feed and outside 'surge' teams were created. The Federal Emergency Management Agency shipped meals, water, and generators to affected areas, and the Livestock Indemnity Program provided benefits to livestock owners for animal deaths. Relief loans were also available. However, as of March 2025, farmers had still to receive federal disaster relief funds.

In response to previous hurricanes in the region, the United States Department of Agriculture (USDA)

Cows stranded on a porch, surrounded by flood waters. North Carolina, USA.

Southeast Climate Hub has provided guidance for poultry producers. It notes that as ocean temperatures rise due to global warming, hurricane intensity will increase. It advises farmers to develop a Farm Emergency Plan because assistance may not be available "until weeks or months after a hurricane".

Yet, these measures alone fail to address intensive animal farming's contribution to climate change which is helping to drive these devastating consequences for animals, farms, communities, economies, and food security.



Aerial view of a CAFO farm surrounded by flood waters in Duplin County. North Carolina, USA.

CASE STUDY

Country: Vietnam

CLIMATE CHANGE TYPHOON TRIGGERS FARMING CATASTROPHE

A hen gasps for breath in a crowded cage at an intensive farm in Hanoi, Dong Quang, Vietnam.

"Our farm raises chickens about 2km from the Red River, and was inundated when water levels rose, and we were unable to respond in time ... The flood wiped out most of our laying hens, which were at peak production, along with all our investment... Years of savings have been wiped out, leaving me with nothing and burdened with bank debts."

Hoang Ngoc Doan, farmer, Tam Xa commune

Vietnam is one of the world's most vulnerable countries to the climate crisis and in September 2024, Typhoon Yagi, widely acknowledged to be a climate change weather event, met landfall in northern Vietnam. Yagi was the strongest storm to hit the South China Sea in 70 years. Winds of 213km/h and five days of heavy rain raised river levels, triggering flooding and landslides.

Despite early warnings, there was extensive damage to 284,000 homes and infrastructure. 122,000 households were evacuated and 745 healthcare facilities damaged. The disaster affected 3.6 million people and 351 were killed. Damage was estimated at USD 3.29 billion.

Agriculture was hit hard. 286,647 hectares of rice fields were damaged, impacting food security. There was a sharp increase in the price of vegetables.

Millions of animals died. 5.75 million poultry were killed in floods, 44,556 cattle and 11,832 fish farms were damaged causing USD 278.29 million in damages. The number of pigs killed is unknown, however, one report states that a pig farm in Tuy Loc lost almost 5,000 pigs: "More than 4,800 pigs were swept away by the raging flood, hundreds of them died scattered across the fields".

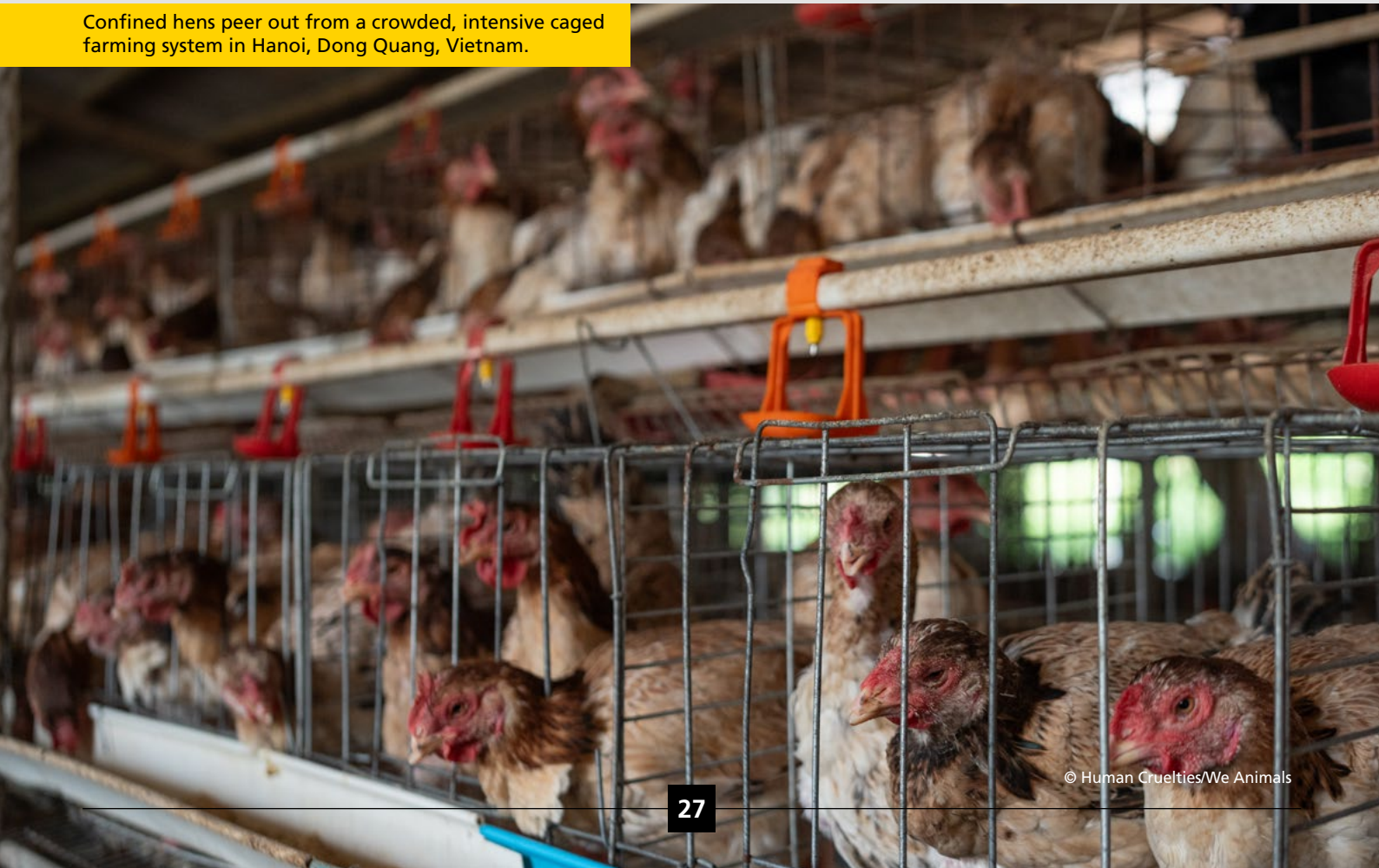
Duong Van Sang lost 20,000 chickens at his unit in Dong Xe: "You can't imagine how much time I spent caring for and raising them. There's nothing more painful".

Approximately 1.55 million people working in agriculture needed urgent assistance, and damages were estimated at USD 354 million.

In response, the Ministry of Agriculture and Rural Development (MARD) coordinated with local authorities to provide relief for farmers and a Multi-Sectoral Assessment for Recovery (VMSA) was conducted to ensure food security and to rebuild agricultural infrastructure. Despite Vietnam's Disaster Risk Reduction Strategies, and proactive responses, the damage incurred highlighted shortcomings in early warning systems for livestock farmers, with many lacking time to save their animals and property. In response, MARD has proposed disaster warning maps and flash flood warning systems to prepare for future events.

Prime Minister Chính has also called for restructuring crop and animal husbandry and aligning production with local conditions. This is an echo of the commitments detailed in Vietnam's National Strategy on Climate Change and MARD are promoting climate smart agriculture (CSA) to mitigate climate change. Yet, adaptation measures alone fail to address the problem of intensive animal farming's contribution to climate change which helps drive these extreme events. A more holistic approach, that includes supporting farmers to transition to more humane and sustainable farming practices, is essential.

Confined hens peer out from a crowded, intensive caged farming system in Hanoi, Dong Quang, Vietnam.



© Human Cruelties/We Animals

CASE STUDY

Country: Czech Republic

EXTREME HEAT CAUSES MASS ANIMAL MORTALITY ON FACTORY FARMS

Young pigs live in compact, barren pens in this Czech industrial farming facility. Once they reach six months of age, the farm will send them to a slaughterhouse.

The Czech Republic has seen an increased occurrence and intensity of heatwaves, particularly over the last decade. The number of warm days has doubled since 1960. These are likely to continue with increasing global warming. Central Europe has also experienced repeated droughts with a cost of €500 million in the Czech Republic, now monitored with the Czech Drought Monitor.

The impact on agriculture includes soil degradation and vegetation loss. Food security is affected with a reduced crop yield. Animals on farms are impacted through reduced feed, water and grazing, affecting their health and welfare.

Heat stress is common in farmed animals due to their rapid growth and production levels. High temperatures cause significant physiological stress for dairy cows above 25°C and during a Czech summer, they can suffer for 10 hours each day. Symptoms include hyperventilation, loss of appetite, longer standing, lameness and foot lesions. Cows bred for increased milk production in industrial systems experience more heat stress.

The Czech Republic has seen repeated incidents of large-scale farmed animal deaths during periods of extreme heat. In the summer of 2015, more than 70,000 chickens died. 15,000 broilers died in Ústí nad Labem after a falling tree interrupted the electricity supply. In 2017, ventilation failures caused 100,000 chickens to die across 11 farms. In 2018, there were 30,000 poultry deaths from overheating. In 2019, 1,800 pigs died from suffocation when the power in the unit failed,

and 25,000 chickens across five farms died from heat stress in the same year.

According to media reports in 2017, in response to heat stress mortality, the State Veterinary Administration (SVA) introduced requirements for large industrial units to install contingency energy sources for ventilation in case of power outages. The SVA also increased the number of farm inspections during the summer which increasingly focused on hot weather compliance to ensure sufficient ventilation, water, cooling and shelter for animals with outdoor access. However, a study on adherence to welfare legislation revealed violations in almost 15% of the farms, most with regards to water/nutrition and space requirements, crucial to mitigate heat stress.

The European Green Deal within the Common Agricultural Policy is also fundamental to the adoption of climate smart agriculture (CSA) among farmers, and the Czech Ministry of Agriculture submitted its one in 2022. CSA seeks to mitigate climate change in farming. Breeding programmes focusing on heat-tolerant, disease-resistant animals, the promotion of native breeds, investment in climate-controlled barns

Chickens sit on the floor of a dirty enclosure on a small Czech farm.

and digital monitoring to regulate temperature and ventilation, as well as the use of cooling systems and health monitoring technologies, are gaining traction.

However, these measures alone are insufficient to properly address the climate issue. What's needed are national policies to tackle the problem more holistically, one's that include a shift to more climate- and nature-friendly farming practices, as well as national targets for meat reduction.

Thousands of young chickens live inside a massive rearing barn at an industrial broiler chicken farm. Czech Republic.

CASE STUDY

Country: The Netherlands

DUTCH FARMING SYSTEM FAILS FARMED ANIMALS IN UNPRECEDENTED HEAT

© Sabine Grootendorst/We Animals

Pigs in an intensive farm, Netherlands, 2016. Representative of the costs of heatwaves and system failures on farmed animals.

"We immediately went to see what was going on, but when we got to the barn, lots of the pigs were already dead. I saw many die. It was terrible, very emotional. We are completely devastated."

Peter van der Linden, pig farmer, Maarheeze, the Netherlands

In the summer of 2019, the Netherlands experienced three heatwave periods, with July reaching unprecedented temperatures of 40.7°C, breaking the heat record by more than 2°C. The Royal Netherlands Meteorological Institute (KNMI) issued a Code Orange warning for the entire country.

The heat led to 400 excess human deaths, the majority among the elderly. The extreme weather in Europe was the world's deadliest event in 2019, with 2,500 deaths in total across the region.

Research shows that the heatwave was made 100 times more likely due to climate change.

In response, the Netherlands government activated its National Heatwave Plan, which included a public awareness campaign and guidelines for vulnerable people.

The Netherlands has one of the highest densities of livestock in Europe and has been striving to reduce livestock numbers. Yet, whilst animal death numbers aren't monitored, the heatwave led to significant livestock fatalities due to failures in ventilation systems. Wakker Dier states that summer heat cost the lives of an estimated 163,000 animals.

In Neer, southern Netherlands, 4,000 chickens bred for meat died. At least 500 chickens also died during transportation in a Dutch poultry carrier en route to Poland because they were not provided with water. In Maarheeze, 2,100 pigs suffocated when a power failure stopped the ventilation. Pig farmer Peter van der Linden said: "We are completely devastated. It is only now sinking in what has happened".

By 2016 the Dutch livestock sector and the Netherlands Food and Consumer Product Safety Authority (NVWA) had developed heat stress protocols in response to previous heatwaves. The National Plan for Livestock Transportation in Extreme Temperatures was introduced, with mitigations in place from 27°C. At 35°C, no transportation is allowed. Poultry are not included in the National Plan, as the industry is self-regulating.

In 2020, The Minister of Agriculture, Nature and Food Quality (LNV) also introduced the 'Action Programme for Climate Adaptation in Agriculture'. Within this is the 'Action plan for heat stress in livestock' strategy. Steering groups with government and stakeholders were set up, and a structured approach to minimising heat stress was enacted. Initiatives include providing shelter for animals outside, and ensuring safe ventilation in livestock units which must now be fitted with emergency backup systems and alarms. Transport vehicles and slaughterhouses are now obligated to standards concerning space allocation, ventilation, and cooling systems. The NVWA are also urging farmers to report heat stress deaths so risk analysis can be better achieved.

In 2021, the LTO Nederland and Royal GD developed an online tool allowing livestock farmers to determine whether there is a risk of heat stress to animals in the coming seven days; a pig specific protocol was also developed, enabling farmers to take action sooner, reducing animal deaths.

These measures alone are not enough to address the problem and animal protection groups say the NVWA are failing to enforce welfare legislation, and that many heat stress regulations have not been enacted.

Pigs confined in an indoor industrial farming system.

SOLUTIONS

Solutions to prevent climate disasters require multiple approaches. These can involve reducing GHG emissions, transforming our food systems into regenerative or agroecological practices, and adapting to the changing environment to cope with extreme weather conditions.

MITIGATION – REDUCING GHG EMISSIONS

The UN Environment Programme (UNEP) suggested one of the most cost-effective ways to avoid 0.3°C of global warming is to concentrate on reducing methane. The UNEP (2021) indicated that the mitigation potentials of reducing livestock methane emissions ranges from 4-42 metric tonnes per year. However, even if 100% adoption of mitigation strategies in livestock systems are incorporated, the 1.5°C target will not be met by 2050. This is because methane emissions will still continue to increase from meat and dairy demand (Arndt *et al*., 2022).

Healthy diet. © iStockphoto

Methane emissions can be further reduced if people adopt healthier, plant-based diets and by eating less meat and dairy, reduce food loss (decreased food quality or quantity). Such measures could reduce methane emissions by 65-80 metric tonnes per year (UNEP, 2021). The Intergovernmental Panel on Climate Change (IPCC) further reinforces this point: "Where calories and ruminant animal-sourced food are consumed in excess of health guidelines, reduction of excess meat (and dairy) consumption is among the most effective measures to mitigate GHG emissions, with a high potential for environment, health, food security, biodiversity, and animal welfare co-benefits (robust evidence, high agreement)" (IPCC, 2022).

The 2024 Harvard University study, *Options for a Paris-compliant Livestock Sector*, shows that more than 200 leading climate, food and agriculture scientists refute sustainable intensification as a solution. Most (90%) believe that reducing meat consumption – particularly in the Global North – is the most effective action for lowering emissions from animal agriculture. Eighty seven per cent assert that reducing animal numbers globally is critical.

The IPCC (2019) has previously shown the detrimental impacts of high levels of meat consumption in contributing to high levels of GHG emissions, human health and biodiversity loss. The IPCC report states: "The shift away from diets rich in animal-sourced protein is important as these diets generate extreme pressure on land as a result of producing feed for animals".

We need a holistic approach that shifts towards healthy diets; to do this we need to transition from animal-sourced proteins to an increasing consumption of vegetables, fruits, nuts, legumes, and whole grains. The EAT Lancet report suggested a 50% global reduction in animal-sourced proteins is required. However, low-income regions may need to increase their consumption of animal-sourced foods, to ensure that they receive a healthy balanced diet and to combat undernutrition (Willett *et al*., 2019).

Free range hens.

© iStockphoto

TRANSFORMING OUR FOOD SYSTEMS ... THE RIGHT WAY

Sustainable intensification – which involves increasing efficiency and the number of animals farmed and rearing them in closer confinement – will not only cause more animal suffering but also fails to address the many environmental problems caused by intensive animal farming, such as deforestation and habitat loss.

In 2023, the FAO developed a roadmap to achieve Zero Hunger (SDG 2) whilst not breaching the Paris Agreement of 1.5˚C. One of the actions was to focus efforts on intensifying farmed animal production to boost efficiency, particularly in developing countries. However, climate experts argue that intensification of farmed animals will have little impact on meeting the 1.5˚C target (Harwatt *et al.*, 2024), or remaining within planetary boundaries (Li *et al.*, 2024).

The move to farmed animal intensification practices also increases the risk of zoonotic disease and antimicrobial resistance (AMR) because animals are crammed into barren environments which increases the possibility of disease and stress. It is projected that antimicrobial use will rise (67% by 2030) due to increased demands of farmed animal products and a shift to large intensive farms (Van Boeckel *et al*., 2015). The increased use of antimicrobials will certainly increase the risks of AMR and further threaten food security, human, and animal health (FAO, 2023).

An enabler of intensive farming practices is the reliance on subsidies. Globally, agriculture producers receive USD 540 billion a year, with the majority of the subsidies supporting the most harmful practices, including beef and dairy production. Instead, governments should repurpose subsidies for more practices which are better for the environment, food security, nutrition, and supporting small scale farmers (FAO, UNDP and UNEP, 2021). The World Resources Institute (WRI) also explored repurposing subsidies and investing in low-carbon farming techniques, showing that every USD 1 invested, can lead to up to USD 30 in economic benefits (Ding *et al.*, 2021).

One Health is a conceptual holistic framework that considers people, animals, and the environment. Four agencies including the Food and Agriculture Organization of the United Nations (FAO), United Nations Environment Programme (UNEP), World Health Organization (WHO) and World Organisation for Animal Health (WOAH) – developed a *One Health* quadripartite.

Together, the Quadripartite uses science-based, cross-sectoral collaboration and multidisciplinary approaches to ensure *One Health* is globally prioritised, implemented and strengthened. An advisory group known as One Health High-Level Expert Panel (OHHLEP) provides evidence-based scientific and policy advice to the Quadripartite.

When considering 'sustainable intensification' through a One Health lens we see significant risks including the spread of zoonotic diseases, antimicrobial resistance or driving GHG emissions higher (in the long term, due to increased demand). Conversely, when exploring dietary change, we should be mindful of food security and ensuring healthy, nutritious food, especially within the Global South, which may include a diet consisting of animal-sourced foods (as previously discussed) (Willett *et al*., 2019; Verkuijl *et al*., 2024). Any strategy to meet the impacts of climate change, to remain within planetary boundaries, to reduce GHG emissions, and to ensure food security and livelihood protection, should consider a *One Health* approach. Low-carbon farming practices such as agroforestry, regeneration, and silvopasture systems are not only better for the welfare of the animals, they also improve biodiversity, are better for the environment and are more resilient to extreme weather, acting as a viable adaptation practice.

ADAPTATION – ADJUSTING TO CLIMATE CHANGE

'Adaptation' as defined by the IPCC (2023), is an adjustment of natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Adaptation can involve simple and often localised strategies. For example, providing extensively farmed animals in heat-stricken areas with more shade, raising chicken houses off the ground to increase air flow, keeping fewer animals together, and increasing watering points (Bashiru HA and Oseni SO, 2025).

Agroforestry, silvopastoral, and regenerative farming practices are being adopted as adaptation (and mitigation) strategies (IPCC, 2019). These practices involve integrating trees, pasture, and forage into a single system. Incorporating trees improves land health and significantly increases carbon sequestration. They are also a natural source of shade and shelter.

Free-range pigs foraging on pasture. Regenerative and high-welfare farming practices like these help restore soil health and improve animal welfare.

One of the benefits of agroforestry is that it can easily be incorporated into pasture-based systems and provides economic, social, and environmental benefits to local communities. Previously, Compassion in World Farming outlined how 11.5 billion to around 16 billion people could be fed by reducing food loss and waste and to shift to sustainable diets in the current farming system. Through regenerative farming practices, up to 10 billion people can be fed. In addition, these practices also enhance biodiversity, soil fertility and can act as both mitigation and adaptation practices (Tamburini *et al.,* 2020).

When considering climate disasters and extreme weather, anticipatory adaptation enables planning to happen before a climate disaster has struck. Such measures include early warning systems – these analyse and identify potential weather and climate-related risks and hazards. Issued within 24 hours of a climate disaster, they can reduce 30% of the potential damage (WMO, 2024). The aim of these measures is to enable early action to save and protect lives, and the livelihoods and assets, of people at risk (IPCC, 2019).

Farmers could use these early warning systems to plan or make provisions before any extreme weather event. However, adaptation has limitations and, in some instances, there may be nothing more that communities can do to adapt – further threating livelihoods, food security and animal welfare. This reaffirms the need to transform food systems within planetary boundaries.

DESPITE PROGRESS... THE WORLD IS WAY OFF TRACK

Despite global progress, the latest predictions from the Emissions Gap Report 2024 put us on course for a catastrophic rise of 2.6-3.1°C this century unless there are immediate, major cuts to GHG emissions. The IPCC (2023) stresses the urgent need for rapid changes across all sectors, including agriculture, to reach sufficient emission reductions. Otherwise, a liveable and sustainable future will not be possible.

National Determined Contributions (NDCs) are individual commitments that countries make and submit every five years through the 'Global Stocktake' – to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat. These plans outline mitigation and adaptation policies that countries will undertake to meet the Paris Agreement. However, the number of countries that have specific mitigation or adaptation contributions remains relatively small. Only 27 countries mentioned livestock mitigation, and 31 countries mentioned adaptation in 2024 (Dittmer et al, 2024).

The current NDCs would achieve 2.6°C this century (UNEP, 2024), which is clearly off target. To stand any chance of meeting the 1.5°C target, the NDCs submitted before COP30 in Brazil must be ambitious and achieve a 42% reduction in emissions. But urgent action is also needed, not just commitments. The world will be looking on to see if this is delivered. Failing to deliver at COP30 will only increase pressure to reduce emissions which must fall by 57% by 2035's NDC, to ensure the 1.5°C is met (UNEP, 2024).

Delaying is not an option. The longer we wait, the more climate disasters will continue.

Global progress in adaptation is also slowing down rather than accelerating. This is despite the increasing climate risks and impacts worldwide (UNEP, 2024). The IPCC (2023) states that the current global financial flows for adaptation are insufficient, especially for developing countries. The UNEP (2023) estimates that the cost of adaptation is between USD 215-387 billion per year, with USD 16 billion to address chronic hunger. Furthermore, many of the adaptation practices effective today will become increasingly less so with continued global warming (IPCC, 2023; Bilotto *et al*., 2024).

Disaster preparation, risk reduction, adaptation plans, and legislation to protect farmed animals are being used by some governments to tackle climate disasters. But limitations exist. For example, while there may be national plans to evacuate people, animals are often not included. And many countries have no requirements to officially record their deaths during disasters even when they happen in their millions.

Early warning systems are considered important to climate change adaptation strategies. However, 30% of the global population is still not yet covered by these systems (WMO, 2024). More finance is needed to ensure those most vulnerable to climate change have these systems in place (UNEP, 2024).

Dairy cows gather together amid the smoke from a wildfire. Firefighters stopped the blaze within hours, and no cows or calves were injured. Tabolango, Region de Valparaíso, Chile.

CONCLUSION

Climate Doom Loop highlights the devastating impacts of climate disasters around the world. Climate disasters not only affect the livelihoods and food security of millions of people but also cause significant animal welfare issues. Our report shows from just a small selection of 11 case studies, at least 14.8 million animals died, approximately 7,000 people were killed, 56.4 million people were displaced or impacted, and it cost over USD 120 billion in damages as a result of these climate disasters. This represents only a tiny fraction of the true devastation that climate disasters have on a global scale.

There is a clear challenge in meeting the needs of our world's growing population and ensuring food security. However, if we continue with business as usual or to expand industrial animal agriculture, the Paris Agreement will fail or cross our planetary boundaries as GHG emissions continue to rise. This will result in more severe and frequent climate disasters and put even more people, animals, and our planet's biodiversity at risk.

All countries are susceptible to climate disasters, but it is likely that the Global South will be particularly vulnerable in the future. Despite such risks, adaptation approaches to climate disasters are lacking. Consequently, more financial support and implementation of adaptation techniques is needed. Our case studies show that governments are still falling short of what is needed to deal with and to respond to climate disasters.

Countries must be encouraged to include ambitious, measurable, food-related actions in their NDCs. These must reflect the critical role of food systems in achieving climate, nature, and health goals. Transforming food systems must be recognised as a core pillar of global climate action. Time is running out; urgent changes to our food system are essential to significantly reduce emissions, while simultaneously increasing the focus on adaptation to build resilience. If we don't – then we will remain within the 'doom loop' of devastation and destruction.

Flower-rich grass margin growing alongside a crop field to promote biodiversity.

RECOMMENDATIONS

These integrated mitigation and adaptation measures by governments are required.

- **Supporting farmers to shift away from intensive agriculture to climate- and nature-friendly systems producing food within planetary boundaries, redirecting public support towards agroecological and regenerative systems that prioritise the production of pulses, wholegrains, fruits, vegetables, and nuts, and towards higher-welfare, nature-positive animal farming.** These systems support climate mitigation and adaptation, environmental resilience, and animal welfare. They are in line with the urgent need for a just and sustainable food transition. Training, with financial and technical support, should be provided by governments to help the transition away from intensive farming systems towards more regenerative and agroecological practices.
- **Setting clear targets for reducing consumption of animal-sourced foods in high consuming populations and shifting towards plant-rich diets**. These should be aligned with the Paris Agreement, the Kunming-Montreal Global Biodiversity Framework, and the UN's SDGs, as well as the need for food production to operate within the planetary boundaries. The reduction targets should also be supported with a holistic transformative food strategy or action plan, coordinated across government departments to ensure consistency. Such strategies and plans could include updating nutrition guidelines, undertaking public awareness campaigns, and introducing institutional and school programmes. These measures should inspire and enable people, communities and organisations to meet targets for reduction.
- **Assisting farmers to prepare for climate disasters.** Providing, investing, and ensuring that all animal keepers and smallholders have early warning systems and climate-resilient infrastructure so that animals and communities are better protected when climate disasters hit. Governments should invest to support the shift towards agroecological and regenerative farming practices that promote both mitigation and adaptation. Farmers should also receive support in developing risk assessments and emergency plans to prepare them for a climate disaster. This could include storing additional feed, medication, and shelter so that animals do not suffer.
- **Ensuring adaptation strategies receive further global finance and implementation particularly for the Global South.** These adaptation strategies should be monitored to ensure that they remain effective. To do this, governments must incorporate mitigation and adaptation measures for livestock in their NDCs. Currently only a few governments do so (Dittmer *et al*., 2024).
- **Adopting guidance and/or legislative reform to ensure the welfare of animals during climate disasters and extreme weather is protected to avoid suffering.** These measures will also ensure food security and livelihoods are better protected.

REFERENCES

1. Adil, L.; Eckstein, D.; Kuenzel, V.; Schaefer, L.: Climate Risk Index 2025 – Who suffers most from extreme weather events? Available at: http://www.germanwatch.org/en/93013
2. Arndt C, Hristov AN, Price WJ, McClelland SC, Pelaez AM, Cueva SF, Oh J, Dijkstra J, Bannink A, Bayat AR, Crompton LA, Eugène MA, Enahoro D, Kebreab E, Kreuzer M, McGee M, Martin C, Newbold CJ, Reynolds CK, Schwarm A, Shingfield KJ, Veneman JB, Yáñez-Ruiz DR, Yu Z. Full adoption of the most effective strategies to mitigate methane emissions by ruminants can help meet the 1.5 °C target by 2030 but not 2050. Proc Natl Acad Sci U S A. 2022 May 17;119(20):e2111294119. doi: 10.1073/pnas.2111294119. Epub 2022 May 10. PMID: 35537050; PMCID: PMC9171756.
3. Bai, Yuping & Deng, Xiangzheng & Zhang, Yue & Wang, Chao & Liu, Yu. (2018). Does climate adaptation of vulnerable households to extreme events benefit livestock production?. Journal of Cleaner Production. 210. 10.1016/j.jclepro.2018.10.250.
4. Bashiru HA and Oseni SO (2025) Simplified climate change adaptation strategies for livestock development in low-and middle-income countries. Front. Sustain. Food Syst. 9:1566194. doi: 10.3389/fsufs.2025.1566194
5. Bilotto, F., Harrison, M.T., Vibart, R., Mackay, A., Christie-Whitehead, K.M., Ferreira, C.S., Cottrell, R.S., Forster, D. and Chang, J., 2024. Towards resilient, inclusive, sustainable livestock farming systems. Trends in Food Science & Technology, p.104668.
6. Bowles, Nicholas, Samuel Alexander, and Michalis Hadjikakou. "The livestock sector and planetary boundaries: a 'limits to growth'perspective with dietary implications." Ecological Economics 160 (2019): 128-136.
7. Carbon Brief 2024 Mapped: How climate change affects extreme weather around the world - Carbon Brief
8. Carvajal, Mario A., Alberto J. Alaniz, Constanza Gutiérrez-Gómez, Pablo M. Vergara, Veerasamy Sejian, and Francisco Bozinovic. "Increasing importance of heat stress for cattle farming under future global climate scenarios." Science of The Total Environment 801 (2021): 149661.
9. Crippa, M., Solazzo, E., Guizzardi, D. et al. Food systems are responsible for a third of global anthropogenic GHG emissions. Nat Food 2, 198–209 (2021). https://doi.org/10.1038/s43016-021-00225-9
10. Das R, Sailo L, Verma N, Bharti P, Saikia J, Imtiwati, Kumar R. Impact of heat stress on health and performance of dairy animals: A review. Vet World. 2016 Mar;9(3):260-8. doi: 10.14202/vetworld.2016.260-268. Epub 2016 Mar 12. PMID: 27057109; PMCID: PMC4823286.
11. Ding H., A. Markandya, R. BARBIERI, M. Calmon, M. Cervera, M. Duraisami, R. Singh, J. Warman, and W. Anderson. 2021. Repurposing Agricultural Subsidies to Restore Degraded Farmland and Grow Rural Prosperity. Washington DC, World Resources Institute.
12. Dittmer, K.M.; Rose, S.C.; Khatri-Chhetri, A.; Stier, M.; Trang, V.H.; Nelson, K. (2024) Agricultural sub-sectors in new and updated NDCs: 2020-2024. https://doi.org/10.7910/DVN/4PO5Z0
13. EFSA Panel on Animal Health and Welfare (AHAW). "Scientific Opinion concerning the welfare of animals during transport." EFSA Journal 9.1 (2011): 1966.
14. FAO, IFAD, UNICEF, WFP and WHO. 2024. In Brief to The State of Food Security and Nutrition in the World 2024 – Financing to end hunger, food insecurity and malnutrition in all its forms. Rome, FAO. https://doi.org/10.4060/cd1276en
15. FAO, UNDP and UNEP. 2021. A multi-billion-dollar opportunity – Repurposing agricultural support to transform food systems. Rome, FAO. https://doi.org/10.4060/cb6562en
16. FAO. 2011. World Livestock 2011 – Livestock in food security. Rome, FAO.
17. FAO. 2023. Loss and damage and agrifood systems – Addressing gaps and challenges. Rome. https://doi.org/10.4060/cc8810en

18. FAO. 2023a. Achieving SDG 2 without breaching the 1.5 °C threshold: A global roadmap, Part 1 – How agrifood systems transformation through accelerated climate actions will help achieving food security and nutrition, today and tomorrow, In brief. Rome.

19. FAO. 2023b. Pathways towards lower emissions – A global assessment of the greenhouse gas emissions and mitigation options from livestock agrifood systems. Rome https://doi.org/10.4060/cc9029en

20. FAO. 2023c. The Impact of Disasters on Agriculture and Food Security 2023 – Avoiding and reducing losses through investment in resilience. Rome. https://doi.org/10.4060/cc7900en

21. Gaviglio A, Corradini A, Marescotti ME, Demartini E, Filippini R. A Theoretical Framework to Assess the Impact of Flooding on Dairy Cattle Farms: Identification of Direct Damage from an Animal Welfare Perspective. Animals (Basel). 2021 May 28;11(6):1586. doi: 10.3390/ani11061586. PMID: 34071330; PMCID: PMC8229036.

22. Gerber, P.J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A. & Tempio, G. 2013. Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities. Food and Agriculture Organization of the United Nations (FAO), Rome.

23. Harwatt, H. (2018). Including animal to plant protein shifts in climate change mitigation policy: a proposed three-step strategy. Climate Policy, 19(5), 533–541. https://doi.org/10.1080/14693062.2018.1528965

24. Harwatt, H. Hayek, M.N. Behrens, P. and Ripple, W.J. (2024) Options for a Paris compliant livestock sector. Timeframes, targets and trajectories for livestock sector emissions from a survey of climate scientists. Research report, Brooks McCormick Jr. Animal Law & Policy Program, Harvard Law School. March 2024. Available at: https://animal.law.harvard.edu/wp-content/uploads/Paris-compliant-livestock-report.pdf

25. IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3-24, doi:10.1017/9781009157940.001.

26. IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3-24, doi:10.1017/9781009157940.001.

27. IPCC, 2019: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)]. In press

28. IPCC, 2022: Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem (eds.)]. In: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3-33, doi:10.1017/9781009325844.001.

REFERENCES

29. IPCC, 2023: Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34, doi: 10.59327/IPCC/AR6-9789291691647.001

30. Ivanovich, C.C., Sun, T., Gordon, D.R. et al. Future warming from global food consumption. Nat. Clim. Chang. 13, 297–302 (2023). https://doi.org/10.1038/s41558-023-01605-8

31. Michael A. Clark et al., Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets. Science370,705-708(2020).DOI:10.1126/science.aba7357

32. Milford AB, Le Mouël C, Bodirsky BL, Rolinski S. Drivers of meat consumption. Appetite. 2019 Oct 1;141:104313. doi: 10.1016/j.appet.2019.06.005. Epub 2019 Jun 10. PMID: 31195058.

33. Morgado JN, Lamonaca E, Santeramo FG, Caroprese M, Albenzio M, Ciliberti MG. Effects of management strategies on animal welfare and productivity under heat stress: A synthesis. Front Vet Sci. 2023 Mar 15;10:1145610. doi: 10.3389/fvets.2023.1145610. PMID: 37008346; PMCID: PMC10050400.

34. Newman, R., Noy, I. The global costs of extreme weather that are attributable to climate change. Nat Commun 14, 6103 (2023). https://doi.org/10.1038/s41467-023-41888-1

35. Li C, Pradhan P, Wu X, Li Z, Liu J, Hubacek K, Chen G. Livestock sector can threaten planetary boundaries without regionally differentiated strategies. J Environ Manage. 2024 Nov;370:122444. doi: 10.1016/j.jenvman.2024.122444. Epub 2024 Sep 14. PMID: 39278021.

36. Richardson K, Steffen W, Lucht W, Bendtsen J, Cornell SE, Donges JF, Drüke M, Fetzer I, Bala G, von Bloh W, Feulner G, Fiedler S, Gerten D, Gleeson T, Hofmann M, Huiskamp W, Kummu M, Mohan C, Nogués-Bravo D, Petri S, Porkka M, Rahmstorf S, Schaphoff S, Thonicke K, Tobian A, Virkki V, Wang-Erlandsson L, Weber L, Rockström J. Earth beyond six of nine planetary boundaries. Sci Adv. 2023 Sep 15;9(37):eadh2458. doi: 10.1126/sciadv.adh2458. Epub 2023 Sep 13. PMID: 37703365; PMCID: PMC10499318.

37. Stott, P., Stone, D. & Allen, M. Human contribution to the European heatwave of 2003. Nature 432, 610–614 (2004). https://doi.org/10.1038/nature03089

38. T.P. Van Boeckel,C. Brower,M. Gilbert,B.T. Grenfell,S.A. Levin,T.P. Robinson,A. Teillant,& R. Laxminarayan, Global trends in antimicrobial use in food animals, Proc. Natl. Acad. Sci. U.S.A. 112 (18) 5649-5654, https://www.pnas.org/doi/full/10.1073/pnas.1503141112

39. Tamburini G, Bommarco R, Cherico Wanger T, Kremen C, van der Heijden MGA, Liebman M, et al. Agricultural diversification promotes multiple ecosystem services without compromising yield [Internet]. Vol. 6, Sci. Adv. 2020. Available from: https://www.science.org

40. Thornton PK, Boone RB, J Ramirez-Villegas 2015. Climate change impacts on livestock. CCAFS Working Paper no. 120. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org

41. Tian, H., Xu, R., Canadell, J.G. et al. A comprehensive quantification of global nitrous oxide sources and sinks. Nature 586, 248–256 (2020). https://doi.org/10.1038/s41586-020-2780-0

42. United Nations Environment Programme (2023). Adaptation Gap Report 2023: Underfinanced. Underprepared. Inadequate investment and planning on climate adaptation leaves world exposed. Nairobi. https://doi.org/10.59117/20.500.11822/43796

43. United Nations Environment Programme (2024). Adaptation Gap Report 2024: Come hell and h igh water — As fires and floods hit the poor hardest, it is time for the world to step up adaptation actions. Nairobi. https://doi.org/10.59117/20.500.11822/46497

44. United Nations Environment Programme (2024). Emissions Gap Report 2024: No more hot air … please! With a massive gap between rhetoric and reality, countries draft new climate commitments. Nairobi. https://doi.org/10.59117/20.500.11822/46404

45. United Nations Environment Programme and Climate and Clean Air Coalition (2021). Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions. Nairobi: United Nations Environment Programme.

46. Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermeulen S, Garnett T, Tilman D, DeClerck F, Wood A, Jonell M, Clark M, Gordon LJ, Fanzo J, Hawkes C, Zurayk R, Rivera JA, De Vries W, Majele Sibanda L, Afshin A, Chaudhary A, Herrero M, Agustina R, Branca F, Lartey A, Fan S, Crona B, Fox E, Bignet V, Troell M, Lindahl T, Singh S, Cornell SE, Srinath Reddy K, Narain S, Nishtar S, Murray CJL. Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems. Lancet. 2019 Feb 2;393(10170):447-492. doi: 10.1016/S0140-6736(18)31788-4. Epub 2019 Jan 16. Erratum in: Lancet. 2019 Feb 9;393(10171):530. doi: 10.1016/S0140-6736(19)30212-0. Erratum in: Lancet. 2019 Jun 29;393(10191):2590. doi: 10.1016/S0140-6736(19)31428-X. Erratum in: Lancet. 2020 Feb 1;395(10221):338. doi: 10.1016/S0140-6736(20)30144-6. Erratum in: Lancet. 2020 Oct 3;396(10256):e56. doi: 10.1016/S0140-6736(20)31828-6. PMID: 30660336.

47. WFP and FAO. 2024. Hunger Hotspots. FAO–WFP early warnings on acute food insecurity: November 2024 to May 2025 outlook. Rome.

48. WMO (World Meteorological Organization). (2024). State of the Global Climate 2023. Geneva: WMO. Available at https://library.wmo.int/viewer/68835/download?file=1347_Global-statement-2023_en.pdf&type=pdf&navigator=1

49. World Animal Protection (2024). Factory farms contribute at least 11% of emissions causing climate disasters. Available at: world-animal-protection-cop28-report.pdf

50. World Meteorological Organization (WMO). (2025). State of the Global Climate 2024. WMO-No. 1368. Available at https://wmo.int/sites/default/files/2025-03/WMO-1368-2024_en.pdf

51. WRI. (2025) What Is 'Loss and Damage' from Climate Change? 8 Key Questions, Answered. Available at: https://www.wri.org/insights/loss-damage-climate-change

52. Verkuijl, Cleo, Jessie Smit, Jonathan MH Green, Rebecca E. Nordquist, Jeff Sebo, Matthew N. Hayek, and Maria José Hötzel. "Climate change, public health, and animal welfare: towards a One Health approach to reducing animal agriculture's climate footprint." Frontiers in Animal Science 5 (2024): 1281450.

Free-range sow with her piglets.

Trapped pigs stand belly-deep in flood water that infiltrates their locked and crowded enclosures inside an Italian pig farm, 2023.

Published: June 2025

Special thanks to **We Animals** for contributing powerful images that capture the impact climate disasters have had on animals.

Compassion in World Farming International
River Court, Mill Lane, Godalming,
Surrey, GU7 1EZ, UK

Email: ciwf.org
Web: ciwf.org