BENDING THE CURVE: THE RESTORATIVE POWER OF PLANET-BASED DIETS

SUMMARY REPORT

WWF Food Practice

WWF is one of the world's largest and most experienced independent conservation organizations, with over 30 million followers and a global network active in nearly 100 counties. Alongside work in areas like wildlife, oceans and forests, the WWF Food Practice works to transform the food system as, in its current form, it is the single biggest threat to nature. Our vision is a food system which provides nutritious food to all current and future generations while protecting our planet. To help achieve this goal, we work across three pillars of the food system: Sustainable Production, Healthy and Sustainable Diets and Food Loss and Waste.

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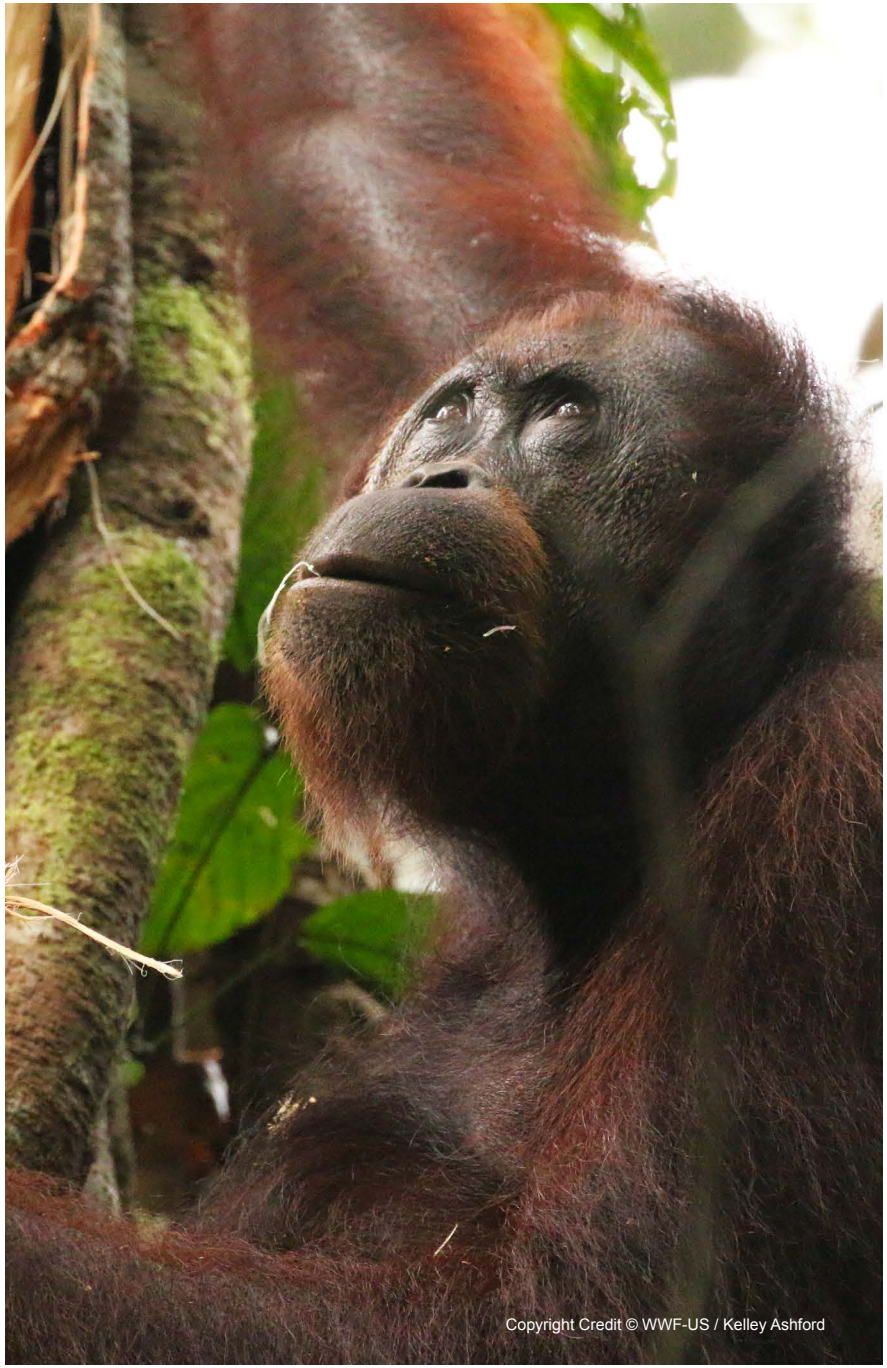


BENDING THE CURVE:
THE RESTORATIVE POWER OF PLANET-BASED DIETS

147
COUNTRIES
ASSESSED

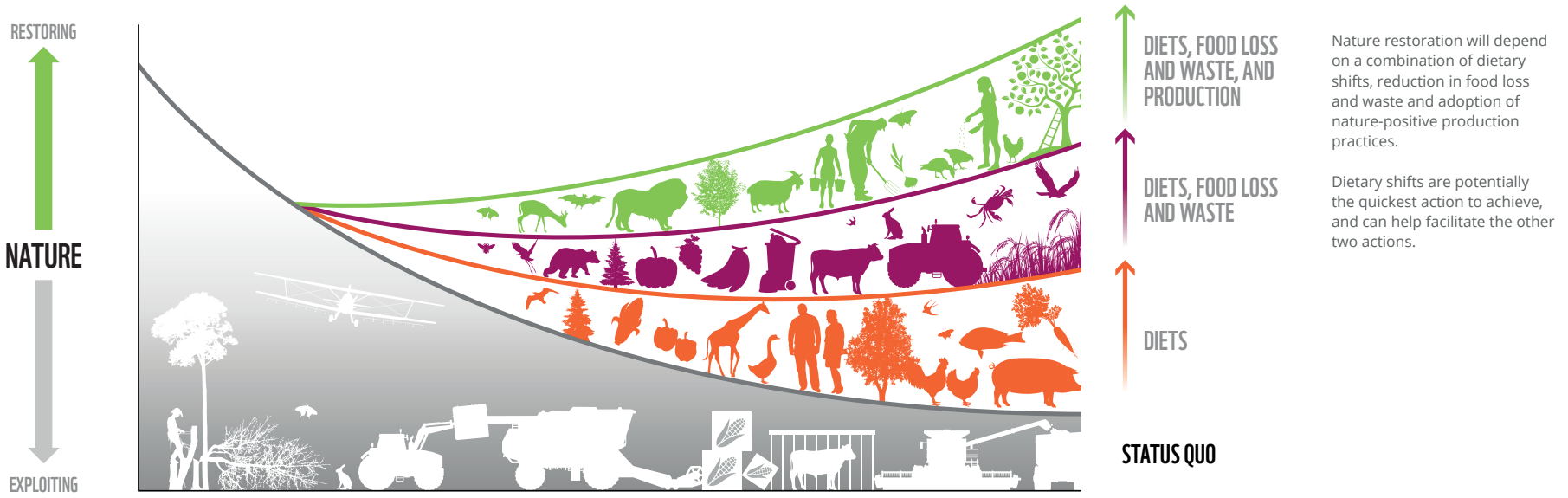
Numerous recent studies have shown that a global shift toward healthier, more sustainable diets will combat climate change, improve human health and food security, reduce biodiversity loss, save lives, decrease the risks of future pandemics, and unlock economic benefits. This research has helped establish the global impacts of the current food system; now these global recommendations must be translated into local reality. We begin this work by offering a detailed analysis of the impacts of various dietary patterns (including national dietary guidelines) on several health and environmental variables in 147 countries around the world, highlighting impacts using a handful of examples.

We frame the analysis around five strategic actions that can be strongly influenced by dietary shifts and are needed to bend the curve on the negative impacts of the food system, moving from one that exploits the planet to one that restores it for nature and people (Figure 1).

These actions are 1) reversing biodiversity loss; 2) living within the global carbon budget for food; 3) feeding humanity on existing cropland; 4) achieving negative emissions; and 5) optimizing crop yields. National-level success on these strategic actions through dietary changes is critical to building a nature-positive food system that helps to reverse the loss of nature to restore both people and planet.

FIGURE 1.
National level success on five strategic actions is needed to bend the curve on the negative impacts of the food system, moving from one that exploits the planet to one that restores it for nature and people.

The relative position of the lines does not reflect the magnitude of potential impact of each action but instead that all three actions are important.



Dietary shifts toward planet-based diets can contribute to climate, biodiversity and sustainable development goals. As the Living Planet Report 2020 highlights, achieving these international goals and commitments is more urgent than ever: *"humanity's increasing destruction of nature is having catastrophic impacts not only on wildlife populations but also on human health and all aspects of our lives."*

Currently, we are producing enough food to feed the planet, but global food production does not respect planetary boundaries. We are now beginning to see the consequences of our actions and the warning signs of a planet in crisis. Dietary shifts are key in reversing course so that food is produced in a way that restores the planet, not destroys it. In the end, dietary changes will play out at local levels and differently in countries around the world. Understanding the impacts of country-level dietary shifts and how the strategic actions outlined in this report synergistically interact is a critical first step toward taking action.

WHAT ARE PLANET-BASED DIETS?

Planet-based diets are "win-win" consumption patterns that are high on human health benefits and low on environmental impacts. They comprise healthy and sustainable ingredients produced within planetary boundaries and adaptable to local contexts. These diets discourage over-consumption of any food, to the extent that over-consumption negatively impacts biodiversity, the environment and human health. In particular, a large body of evidence has shown that reducing over-consumption of animal-source foods, by increasing the relative consumption of plant-based foods, confers both environmental and health benefits (win-win).

KEY POINTS

1. Shifting diets can unleash a multitude of environmental and health benefits including combating the climate and biodiversity crises, relieving water stress and eutrophication of lakes and oceans, and saving lives. But these impacts play out differently in countries around the world and must to be assessed separately for each country.

2. Dietary shifts toward more planet friendly diets is a powerful lever for achieving more ambitious Nationally Determined Contributions (NDCs), a more holistic Post-2020 Global Biodiversity Framework, and a renewed commitment to the Sustainable Development Goals (SDGs).

3. National Dietary Guidelines (NDGs) are important tools for changing diets and act as a bridge between global dietary recommendations and local context and relevance. Current NDGs, however, are not ambitious enough to achieve global goals and commitments and should therefore be reviewed and updated to ensure they are in line with global health and environmental targets.

4. Five strategic actions need to be achieved to bend the curve on a food system that currently exploits nature to one that restores nature. These actions are 1) reversing biodiversity loss; 2) living within the global carbon budget for food; 3) feeding humanity on existing cropland; 4) achieving negative emissions and; 5) improving water and fertilizer use.

5. A full range of policy levers need to be implemented to leverage dietary changes as a tool for achieving the five strategic actions outlined in this report. Countries must commit to closing the evidence gaps that remain regarding specific implications of dietary shifts at the national level and which actions are most effective for their context.

ENVIRONMENTAL AND HEALTH IMPACTS OF FOOD

Currently, our dietary choices are driving a system of food production that is destroying the planet (Figure 2). The agricultural revolutions of the past have allowed us to feed more people, but this has come at the expense of forests, grasslands, wildlife, water and a stable climate.

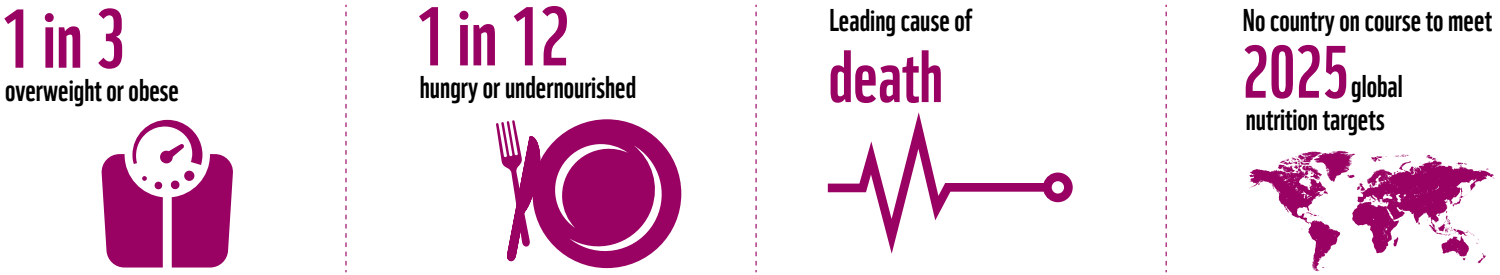
FIGURE 2

The global food system is a leading contributor to our rapidly deteriorating environment and unraveling of nature.

Our dietary choices are also damaging our health (Figure 3). People in some countries have an abundance of food and choice while people in other countries still lack both. This highly polarized reality has led to a situation where many countries face a growing obesity epidemic, in others hunger and undernutrition persist, and in far too many both realties exist at the same time.

FIGURE 3

The global food system is also a major contributor to much of the ill-health that we see around the world.



FOOD CONSUMPTION PATTERNS AROUND THE WORLD

An entry point for making sense of the health and environmental impacts of diets is an understanding of consumption patterns around the world. Currently, consumption varies widely and can best be characterized by massive inequality. Although undernutrition and overweight and obesity affect most all countries, the rate of underweight people is up to 10 times higher in the poorest countries while the rate of overweight and obese people is up to 5 times higher in the richest countries.[3] These health outcomes mirror current consumption patterns in the richest and poorest countries, with European countries consuming approximately 600 g/day more food (1,800 g/day – Figure 4) than African countries (1,200 g/day – Figure 5).

FIGURE 4

Current per capita food consumption patterns in **European** countries and the food intake (g/day) required to shift toward NDGs and other dietary patterns.

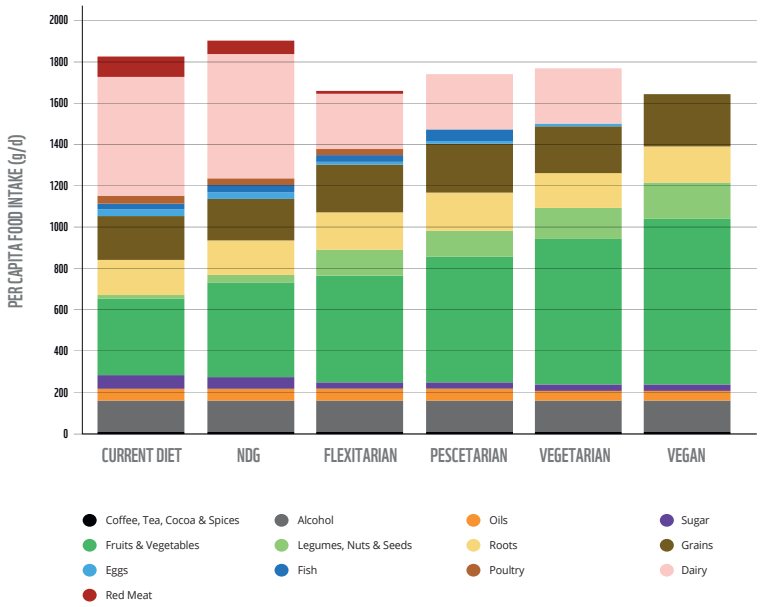
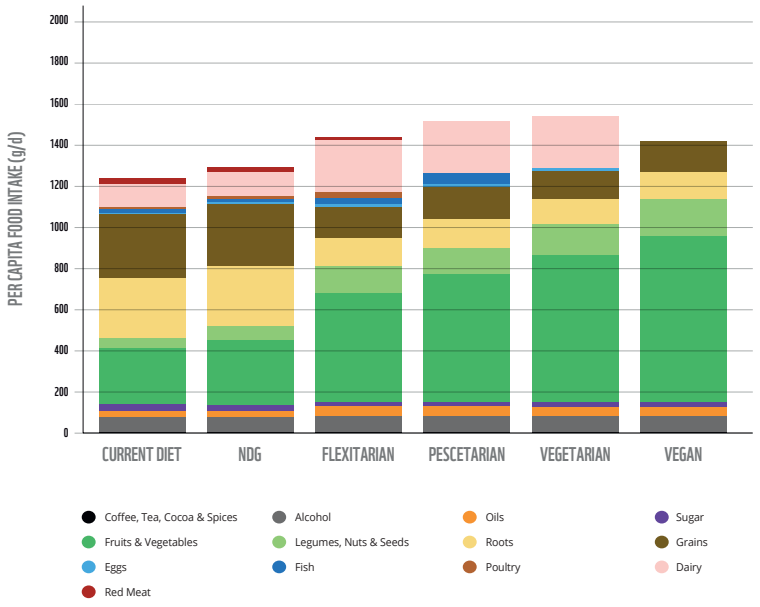


FIGURE 5

Current per capita food consumption patterns in **Africa** and the food intake (g/day) required to shift toward NDGs and other dietary patterns.



Important to note is the fact that in most countries, NDGs are closer to current consumption levels than more sustainable diets and in some cases are not supported by the latest science on healthy diets. In a recent study, researchers found that most NDGs are incompatible with global health and environmental targets such as the Paris Agreement or the global health agenda on non-communicable diseases and that even the WHO recommendations on healthy diets are insufficient for meeting these targets.

HEALTH IMPACT OF DIETS

Several recent studies have demonstrated the significant impact that increasing consumption of plant-based foods relative to animal-source foods can have on human health; our results support these findings. Germany, for example, would see up to nearly a 20% reduction in premature mortality (Figure 6), mainly through decreasing daily food intake by about 10% and increasing the relative proportion of fruits, vegetables and legumes compared to red meat and dairy.

Kenya would see smaller but still significant reductions in premature mortality, from 5%, if NDGs were followed, up to a maximum reduction of approximately 9% for a shift toward a vegan diet (Figure 7). These reductions come mainly from a large increase (up to nearly 20%) in daily food intake and an increase in daily consumption of fruits, vegetables, nuts and legumes.

FIGURE 6

Percentage reduction in premature mortality in **Germany** from a shift toward NDGs and other dietary patterns.

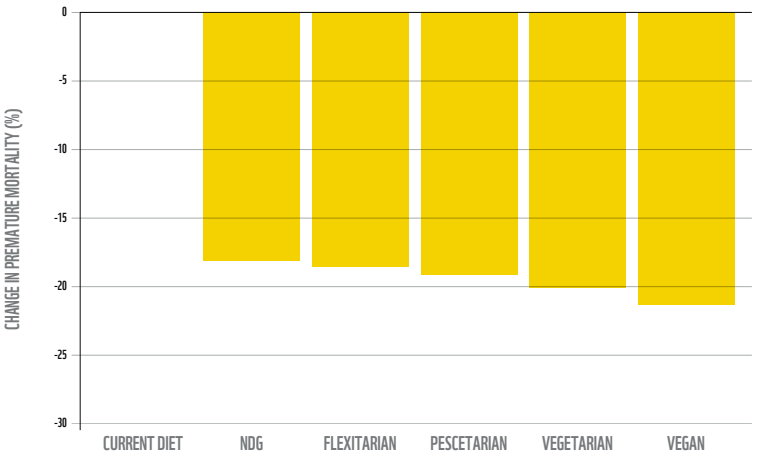
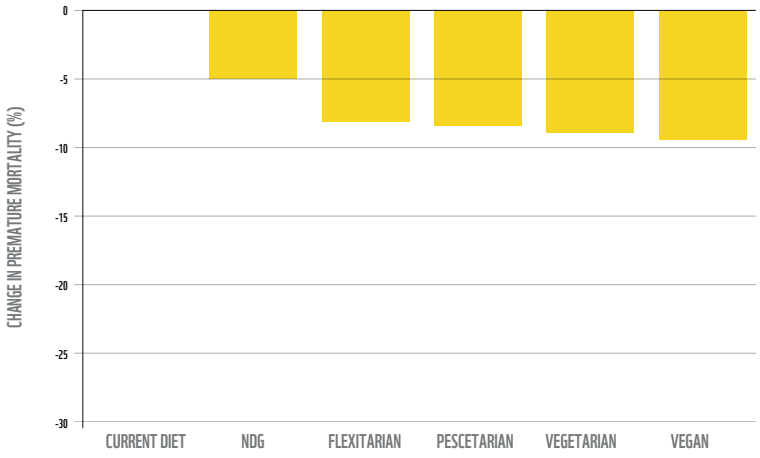


FIGURE 7

Percentage reduction in premature mortality in **Kenya** from a shift toward NDGs and other dietary patterns.



TAKEAWAY:

Eating a planet-based diet improves health outcomes in all countries, including reductions in premature mortality. Some countries would see their largest health gains from reductions in overall daily food intake and increased consumption of plant foods. Other countries would see the largest health gains from increased total daily food intake and adopting a more balanced diet. These results again highlight the significant inequalities that exist in our current food system. What these country-level results fail to show, however, are the inequalities that exist within countries and communities, with vulnerable groups being the most affected.

STRATEGIC ACTION 1:
REVERSING BIODIVERSITY LOSS

What needs to happen – rapidly slow down and move toward zero loss of biodiversity from food production while also using agricultural systems to restore biodiversity across the planet.

Biodiversity generates critical ecosystem services that support food production including pollination, creating and maintaining healthy soils, pest control, water regulation, carbon sinks and habitat for wildlife. All of these make food systems more resilient to shocks and stresses, including those caused by a rapidly changing climate. Yet, despite the central role of biodiversity in food production, we are losing species at a rate 100–1,000 times greater than the underlying rate during the Holocene and have entered the sixth mass extinction.

Increasing consumption of plant-based foods relative to animal-source foods is often cited as a method for reducing biodiversity loss by reducing pressure on land and natural habitats. At the global and certain regional and national levels this assertion is consistent with our results. In Brazil, biodiversity loss could be reduced by 50% to 77% depending on the dietary pattern adopted (Figure 8).

AT THE GLOBAL SCALE DIETARY SHIFTS ARE NEEDED TO **REDUCE THE DRAMATIC DECLINE IN SPECIES**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However, dietary shifts may not always lead to reductions in biodiversity loss. For example, Indonesia could potentially see increases in biodiversity loss with a shift to other dietary patterns. This is mainly due to recommended nutritional increases in the consumption of fruits, vegetables, dairy and oil (Figure 8 and 9) and less driven by red meat consumption as in other countries. Holding food production practices constant and assuming that food imports do not increase, this increase in total food consumption would require more total agricultural land.

FIGURE 8

Number of total species expected to go extinct per year as a result of food production for current diets, NDGs, and other dietary patterns: **Brazil.**

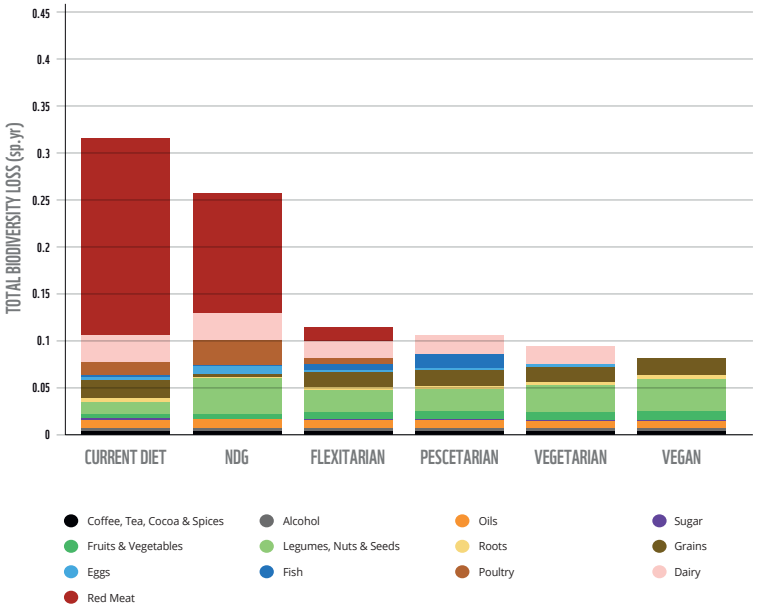
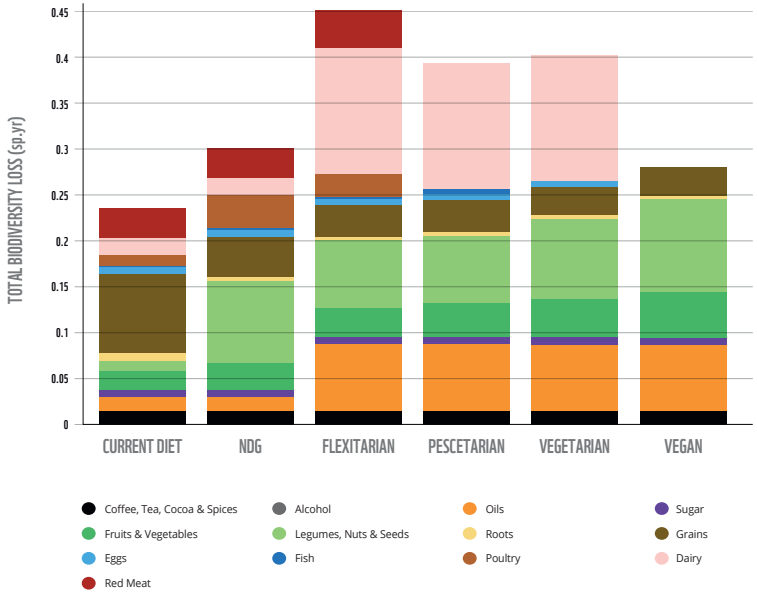


FIGURE 9

Number of total species expected to go extinct per year as a result of food production for current diets, NDGs, and other dietary patterns: **Indonesia.**



TAKEAWAY:

These results highlight the complex nature of dietary shifts and their impact on biodiversity loss at global, regional and national scales. At the global scale, dietary shifts are needed to reduce the dramatic decline in species. However, our results demonstrate that at the national scale, shifting toward healthier diets or increasing total caloric intake to tackle undernutrition without also reducing food loss and waste or improving food production practices could result in an increase in biodiversity loss in particular countries. These losses appear to be most dramatic in tropical countries which are both the most biodiversity-rich countries on the planet and those most likely to suffer from undernutrition.

STRATEGIC ACTION 2:
LIVING WITHIN THE GLOBAL CARBON BUDGET FOR FOOD

What needs to happen – reduce total greenhouse gas emissions from food production to at most 5 Gt CO2-eq.

Keeping global warming below 2°C and aiming for 1.5°C requires rapid decarbonization of all sectors by 2050. This means halving global emissions every decade until 2050 while at the same time massively increasing carbon sinks to begin achieving negative emissions near mid-century.

The food system accounts for just over a quarter of total global greenhouse gas (GHG) emissions, at approximately 14Gt. About two-thirds of all food-related GHG emissions are accounted for in the agriculture, forestry and land use (AFOLU) sector, while the remaining third come from processing, transport and packaging. To meet Paris Agreement goals, emissions from the food system must be reduced to within a carbon budget of 5Gt CO2 eq – including hard-to-avoid emissions of methane from livestock and nitrous oxide from fertilizer use.

TACKLING ALL FORMS OF MALNUTRITION REQUIRES WE **LIVE WITHIN THE GLOBAL CARBON BUDGET FOR FOOD**

Diets have a large impact on GHG emissions, though impacts depend on current consumption patterns in a country or region. Malawi, for example, may need to increase consumption of certain food groups including dairy, fish and fruits and vegetables to meet health targets – which would lead to an increase in per capita GHG emissions of up to around 30% (Figure 10).

Sweden on the other hand, would be able to nearly halve its emissions by adopting a flexitarian diet, mainly by decreasing red meat and dairy consumption (Figure 11). Doing so, however, would require a decrease in red meat consumption of nearly 90% (from 110 g/day to 14 g/day) and dairy of about 69% (from 940 g/day to 290 g/day). Following the NDGs would not deliver the ambitious reductions needed but would still reduce per capita GHG emissions from food by approximately 30%.

FIGURE 10

Per capita GHG emissions in **Malawi** for current diets, NDGs and other dietary patterns.

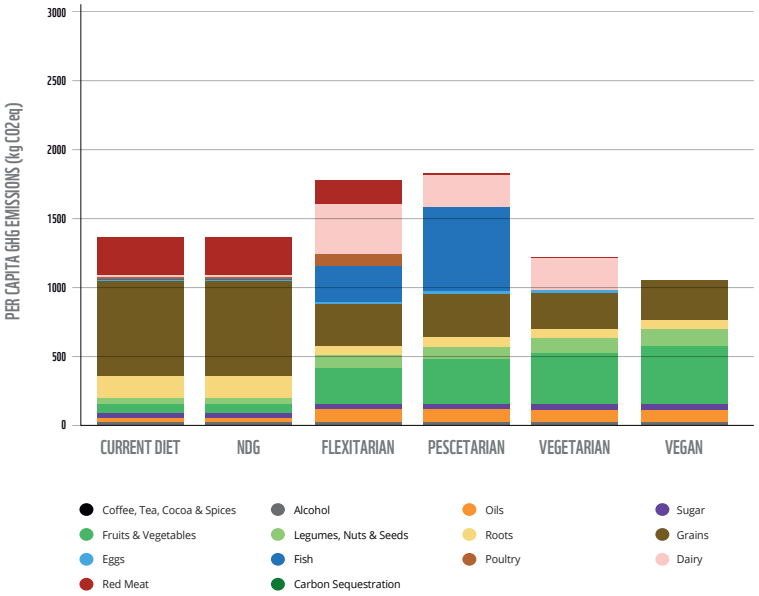
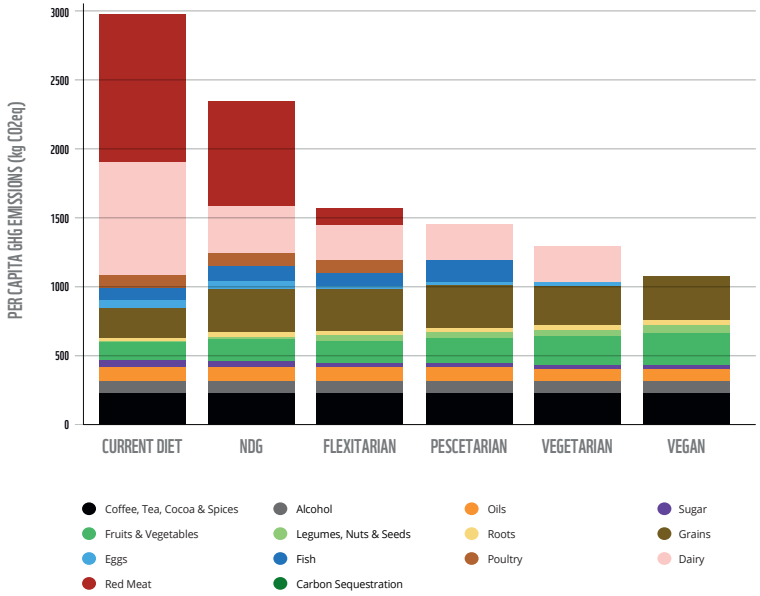


FIGURE 11

Per capita GHG emissions in **Sweden** for current diets, NDGs and other dietary patterns.



TAKEAWAY:

The trends described here highlight a dilemma in our food system; tackling all forms of malnutrition while keeping GHG emissions within the planetary boundary for food. Solving this dilemma requires a more equitable distribution of the global carbon budget for food to enable all countries to alleviate all forms of malnutrition while also tackling climate change. Countries should raise the ambition of their NDGs to align with international commitments such as the Paris Agreement, while ensuring that efforts to improve nutrition do not lead to the adoption of high-carbon diets.

STRATEGIC ACTION 3:
FEEDING HUMANITY ON EXISTING CROPLAND

What needs to happen – stop expansion of new cropland, or any agricultural land, at the expense of natural habitats, supplying future food demand on the same area of land as today (or ideally less).

Today, agricultural land is the largest biome on Earth: about 40% (~ 4.2 Bn ha) of all habitable land is used to feed humans. Of this, 71% (~ 3.0 Bn ha) is used for livestock grazing, leaving roughly 1.2 Bn ha to grow crops – and about 38% of this is used to grow feed for livestock.

Since the main drivers of biodiversity loss and GHG emissions from the AFOLU sector stem from land conversion mainly for agriculture we must halt expansion of new agricultural land at the expense of natural habitats to have any chance to reversing biodiversity loss and achieving the Paris Agreement. This means that humanity must be fed on the existing area of cropland – and for that to happen, we need to stop using nearly 40% of croplands to feed livestock and instead devote this nearly 460 M ha of arable cropland to growing food for human consumption.

Although the total amount of cropland globally will remain nearly constant if we shift diets, individual countries could see drastic changes. In Canada, for example, arable cropland demand (both domestically and internationally) could be reduced by 36-47%, depending on the dietary pattern (Figure 12). This is mainly driven by a decrease in cropland used for livestock feed.

WE NEED TO OPTIMIZE PRODUCTION ON ALL AVAILABLE LAND TO FEED 10 BILLION PEOPLE BY 2050 WHILE BENDING THE CURVE ON BIODIVERSITY LOSS AND LIVING WITHIN THE GLOBAL CARBON BUDGET FOR FOOD

On the other hand, in Madagascar adopting alternative dietary patterns could potentially increase demand for cropland use by 39-48% (Figure 13). If this increase in demand for arable cropland is met by converting additional lands in the country instead of relying on improvements in food production practices, reductions in food loss and waste or changes in international trade, this could result in high rates of forest and biodiversity loss and increases in GHG emissions from land conversion. The main factor behind the increase in demand for cropland in Madagascar by adopting alternative dietary patterns is the large increase in daily food intake of nearly all food groups and a shift in the majority of food calories coming from rice to a diversity of food groups.

FIGURE 12

Total cropland use for current diets, NDGs and other dietary patterns: **Canada.**

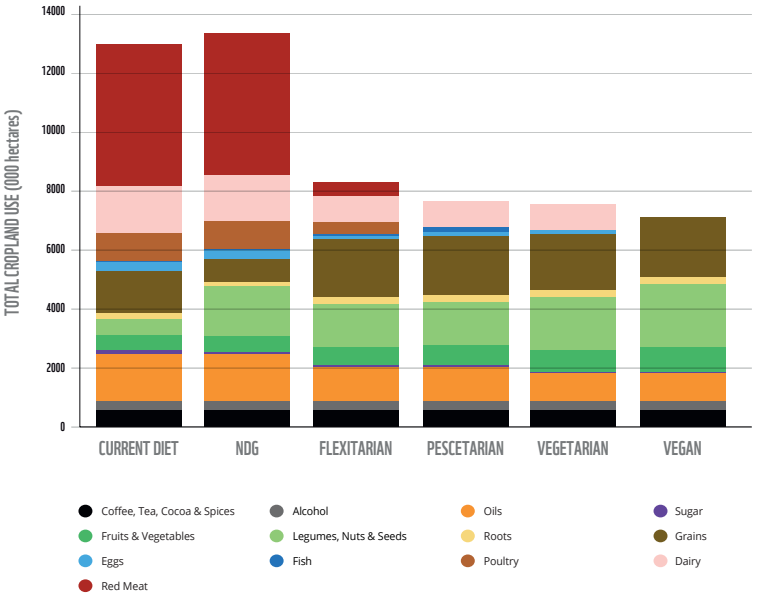
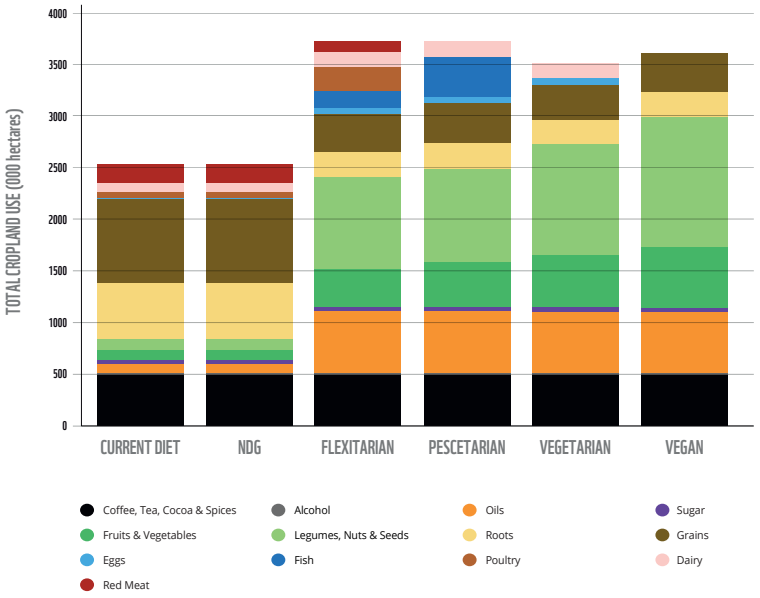


FIGURE 13

Total cropland use for current diets, NDGs and other dietary patterns: **Madagascar.**



Madagascar does not report an NDG, and we therefore interpret this to mean there is no recommendation on dietary composition, so diets remain the same as the Current Diet.

TAKEAWAY:

Addressing the climate and biodiversity crises requires a halt in the expansion of new agricultural land at the expense of natural habitats. This can be achieved but requires that nearly all 1.2 Bn ha of cropland be used to grow crops for humans instead of feed for livestock. The addition of 2 billion more people on the planet will put even more strain on current croplands necessitating even greater urgency to reserve these lands to grow food for human consumption. Those countries that currently have high levels of food intake could see significant reductions in demand for cropland, while those countries that still experience an undernutrition burden could see an increase in demand for arable land. If this increase is met by converting additional lands in the country instead of relying on improvements in food production practices, reductions in food loss and waste or changes in international trade, this could result in high rates of forest and biodiversity loss and increases in GHG emissions from land conversion.

STRATEGIC ACTION 4:
ACHIEVING NEGATIVE EMISSIONS

What needs to happen – move agriculture from a carbon source to a carbon sink, including freeing up existing agricultural lands that can be reforested or restored and rapid implementation of food production practices that increase carbon storage on agricultural land.

Studies show that keeping the global temperature rise to well below 2°C, let alone 1.5°C, is only possible through "negative emissions" – removing massive amounts of CO2 from the atmosphere and storing it on land, underground or in the oceans.

Diets are a key piece of the puzzle in successfully sequestering carbon. In short, by eating more healthy and sustainable diets, we can free up agricultural land (mainly grazing lands – Figure 14) and use it for other purposes – like planting trees and bioenergy combined with carbon capture and storage. This general finding is not new. The special reports of the Intergovernmental Panel on Climate Change (IPCC) on Global Warming of 1.5°C and Climate Change and Land both highlighted the key need to reduce pressure on land through changes in food production and consumption.

HUMANITY HAS NEVER BEFORE NEEDED TO **CHANGE THE FOOD SYSTEM SO RADICALLY** AT THIS SCALE OR SPEED

Because increasing consumption of plant-based foods relative to animal-source foods can free up land, it can theoretically enable more land to be available to restore nature – up to 3.0 Bn ha (Figure 14). This in turn will sequester carbon as natural ecosystems return.

However, in our pursuit of achieving negative emissions, we must be careful not to drive more loss of grassland ecosystems. Some grazing lands are naturally occurring grasslands, savannahs and native prairies that are critically important ecosystems, rich in biodiversity and providing multiple ecosystem services. Other grazing lands have been converted from other ecosystems, including forests that have been cut down or burned to create livestock pasture.

FIGURE 14

Total **global** area of grazing lands (pasture and rangelands) to support current diets, NDGs and other dietary patterns.

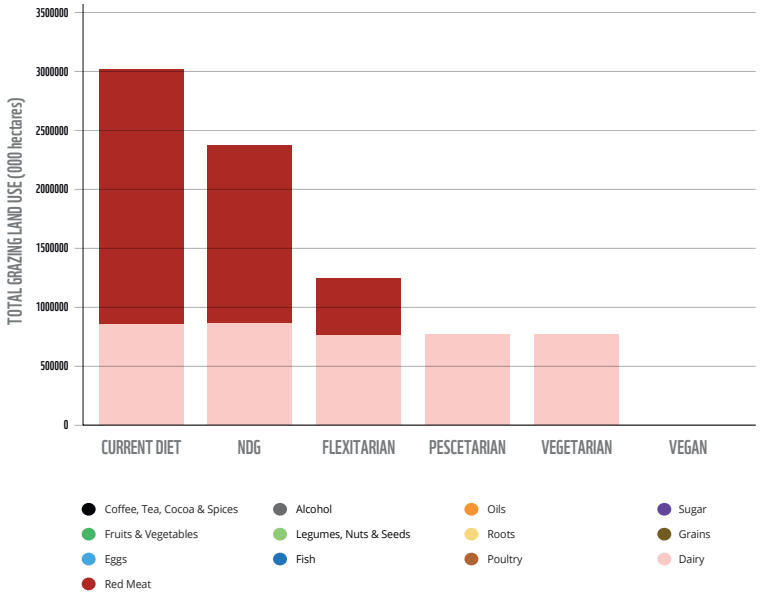
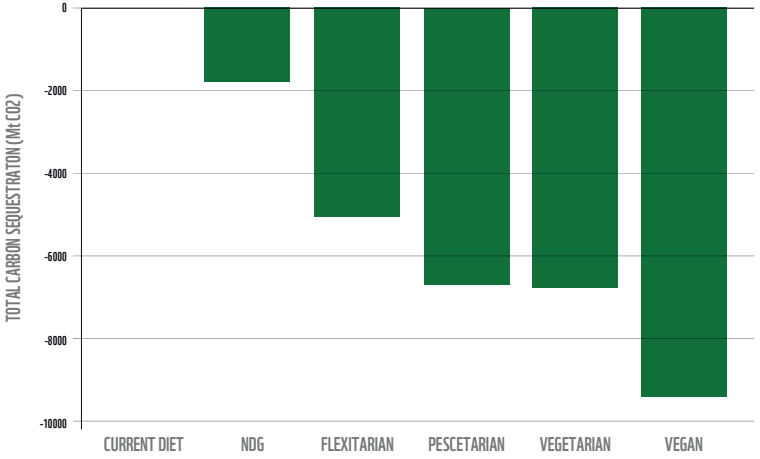


FIGURE 15

Total **global** carbon sequestration for current diets, NDGs and other dietary patterns.



TAKEAWAY:

Carbon sequestration associated with dietary shifts can play a critical role in climate mitigation globally. Our results demonstrate that up to 10Gt CO_2 can be sequestered per year through dietary shifts (Figure 15) that would free up agricultural land and allow for reversion to native ecosystems. Other studies have estimated the total global potential of carbon sequestration from dietary shifts to be between 332Gt (flexitarian diet) and 547Gt (vegan diet) of CO_2 by 2050, which is equivalent to 99-163% of the CO_2 emissions budget.[62] However, when looking for land to sequester carbon, it is important to carefully consider other ecosystem services and prevent the conversion of natural grasslands and savannahs and the loss of the flora and fauna that they support.

STRATEGIC ACTION 5:
OPTIMIZING CROP YIELDS

What needs to happen – use all agricultural lands to their maximum potential including optimizing crop yields through better food production practices that more efficiently use water and fertilizers, preserve ecosystem functions and contribute to resilient landscapes.

To feed 10 billion people by 2050 while bending the curve on biodiversity loss and living within the global carbon budget for food, we will need to sustainably improve crop yields where possible to optimize production on all available land while also considering where key habitats can be restored (Figure 16).

This presents a dilemma, as increasing crop yields using a business-as-usual approach (i.e. no changes in how we currently produce food) would require additional inputs of water (from irrigation) and fertilizer, yet global freshwater resources are already under strain in many parts of the world and nitrogen and phosphorus pollution already greatly exceed planetary boundaries in some locations. Excessive fertilizer application in food production has substantial consequences, notably in runoff into streams and rivers driving the eutrophication of freshwater and marine ecosystems and subsequent development of dead zones, causing fish dieback and other environmental harm. Additionally, climate change will further increase challenges for water availability in many important agricultural regions, including more erratic precipitation and increased frequency of droughts.

ADDRESSING THE CLIMATE AND BIODIVERSITY CRISES REQUIRES **A HALT IN THE EXPANSION OF NEW AGRICULTURAL LAND** AT THE EXPENSE OF NATURAL HABITATS

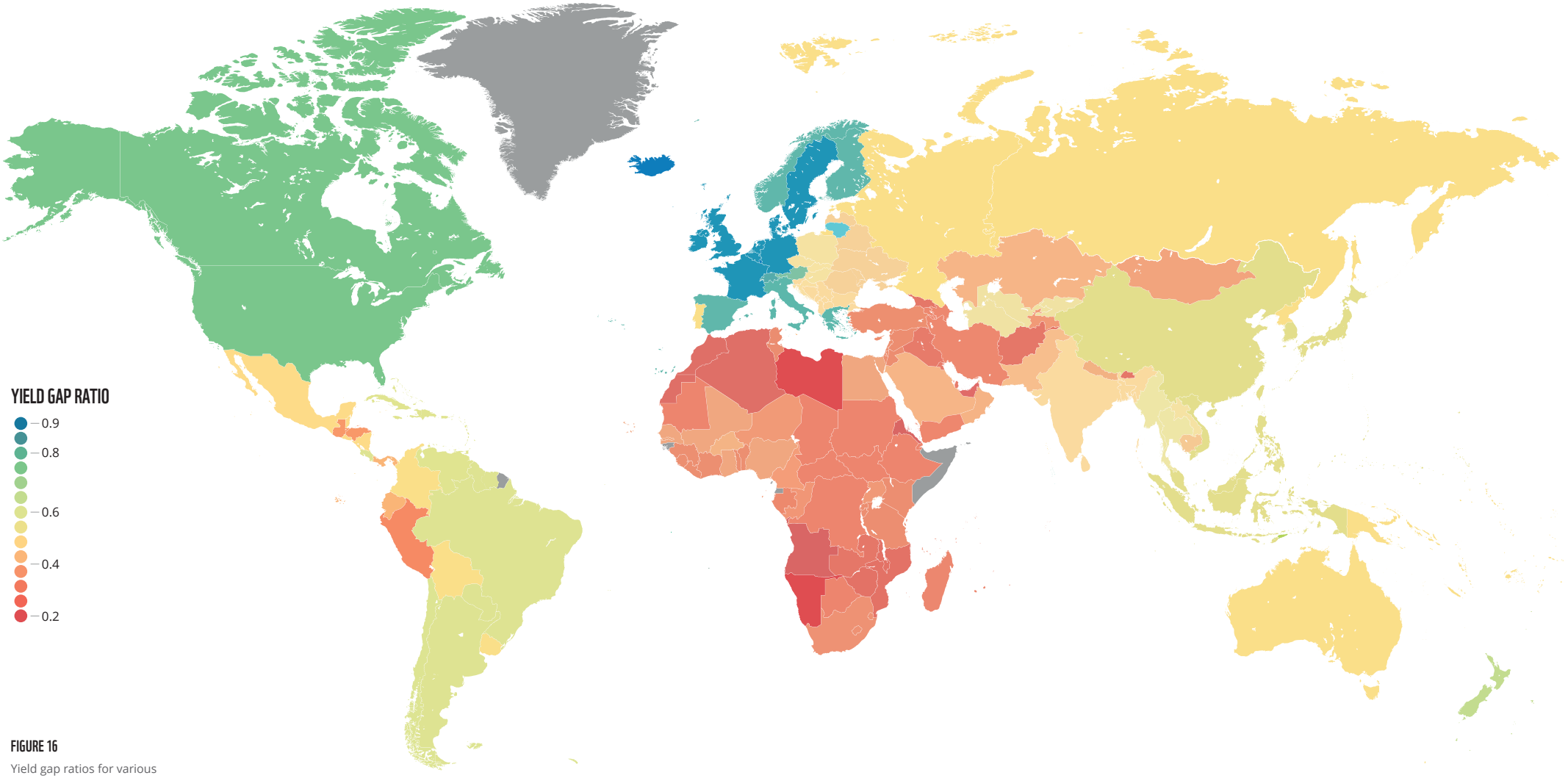


FIGURE 16

Yield gap ratios for various countries. Green and blue represents high yields and low yield gaps while countries in red and orange have high yield gaps.

Source: Clark et al. (2018).[63]

HUMANITY HAS NEVER BEFORE NEEDED TO **CHANGE THE FOOD SYSTEM SO RADICALLY** AT THIS SCALE OR SPEED

This dilemma highlights the fact that feeding 10 billion people within planetary boundaries will require significantly different methods of food production. Examples of some of these methods include conservation agriculture, agroforestry and regenerative agriculture. These various farming practices all share the potential for high crop yields while reducing water and fertilizer inputs and enhancing the resilience of landscapes. However, changes in food production practices alone will not be enough – dietary shifts will also be needed if we are to increase food production without further environmental damage.

TAKEAWAY:

These results highlight that dietary shifts can contribute to reducing water use and eutrophication potential in some countries. However, as with the other strategic actions, the impact will play out differently in various countries depending on the specific conditions that exist and the governance and practices in place that can translate potential reductions in water or fertilizer use into realized gains for water management and freshwater ecosystems. In addition, in some places that are already facing severe limitations on water availability or highly depleted soils, the international trade of food can help ease food security challenges, allowing countries and economies to overcome local water and soil limitations on their food supply. However, while easing food security in one country, trade can also exacerbate water and eutrophication problems in another, so a more holistic and globally coordinated response may be necessary.

POLICY RECOMMENDATIONS

NATIONAL-LEVEL ACTIONS

Incorporate diets into nationally determined contributions

We encourage countries to set specific targets for mitigating climate change through food production, including sustainable diets targets.

Commit to raising the ambition of national dietary guidelines

We urge countries to review and update, or if necessary develop, NDGs that integrate human health and environmental sustainability goals based on independent scientific advice, and to integrate these into multilateral frameworks.

Initiate national-level multi-stakeholder dialogues on healthy and sustainable diets

We encourage national policymakers – together with the private sector and civil society – to initiate multi-stakeholder dialogues at the national level to discuss and explore the implications of implementing the five strategic actions outlined in this report.

Curate the evidence base for your country

We encourage all stakeholders to use the Planet-Based Diets Impact & Action Calculator to explore the evidence base for your country to determine national-level environmental and health impacts for various diets.

MULTILATERAL ACTIONS

Facilitate international coordination of efforts

We encourage all stakeholders to use the findings of this report to serve as a scientifically robust evidence base to guide individual countries as they develop commitments leading up to and beyond the UN Food Systems Summit in 2021

Incorporate diets into the post-2020 global biodiversity framework

Healthy and sustainable diets and their associated impacts should be integrated into the post-2020 global biodiversity framework.

Establish global research coordination bodies for food systems

An international body that specifically focuses on healthy and sustainable diets, akin to the IPCC, could play a key role in curating the global evidence base necessary to build a global agenda on diets.

Develop a Framework Convention on Food Systems

A "UN Framework Convention on Healthy and Sustainable Food Systems", informed by a scientific body of experts on healthy and sustainable diets, would help organize global commitments toward food system transformation.

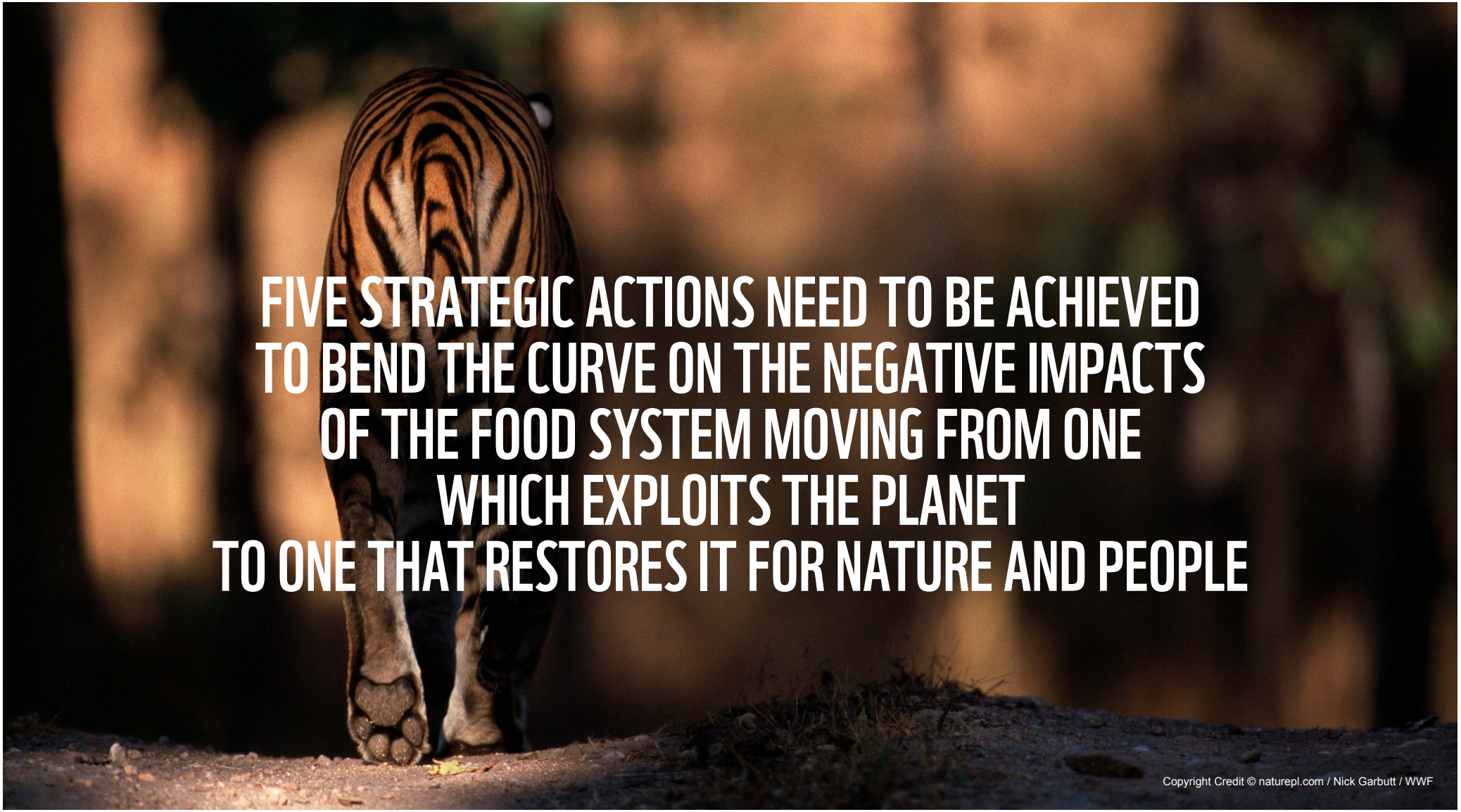
CONCLUSION

In this report, we have shown the restorative power of planet-based diets and their potential to help individual countries achieve both environmental sustainability and human health goals. This presents us with a rare "win-win" opportunity that does not require new technologies to implement – only a commitment from all nations to implement bolder, more ambitious NDGs and policies to ensure healthy planet-based diets for all citizens.

Diets by themselves, however, are not enough to bend the curve on the negative impacts of the global food system, moving from one which exploits the planet to one that restores it for nature and people. To achieve this also requires bolder, more ambitious commitments to advance more sustainable food production practices. This includes amplifying national-level efforts to implement agro-ecological practices such as conservation agriculture, agroforestry and regenerative agriculture. When combined with reduced food loss and waste, we have a roadmap for restoring biodiversity and nature while feeding humanity.

GLOBAL FOOD CONSUMPTION VARIES WIDELY CAN BEST BE CHARACTERIZED BY **MASSIVE INEQUALITY**

With this study we hope to build upon past research so that action can be taken on the ground. Dietary shifts will impact countries differently. Some countries may see GHG emissions decrease while others may see them increase. Some countries will need to radically transform current diets while others may need instead to work to hold on to traditional dietary patterns and resist a transition to a more Western diet. All countries, however, will need to raise the ambition of their NDGs so that they are aligned with the latest science on human health and environmental sustainability to enable diets to help them achieve more ambitious NDCs, a holistic post-2020 global biodiversity framework, and a renewed commitment to the SDGs. The time for talk is over. It's now time to roll up our sleeves and get to work.



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