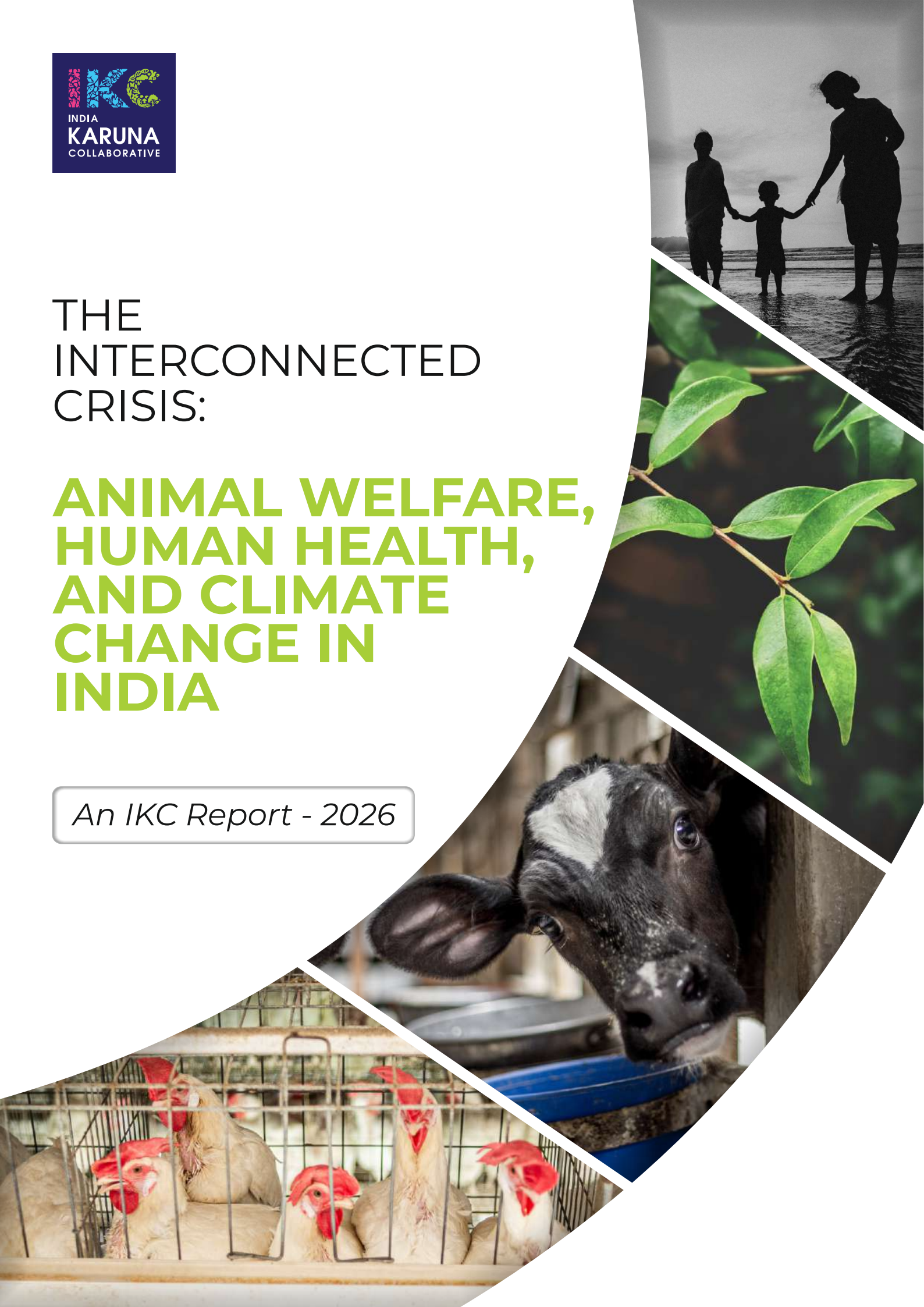
INDIA KARUNA COLLABORATIVE

THE INTERCONNECTED CRISIS:

ANIMAL WELFARE, HUMAN HEALTH, AND CLIMATE CHANGE IN INDIA

An IKC Report - 2026



India Karuna Collaborative (IKC) is a unified movement supported by cause-aligned funders that brings together leaders, organisations, and citizens to advance animal, human, and planetary wellbeing. By unifying voices, raising awareness, and shifting narratives, IKC seeks to end animal suffering, mitigate climate change, and build a healthier world for all.

“

The least I can do is speak out for those who cannot speak for themselves.

- Jane Goodall

”

PREFACE

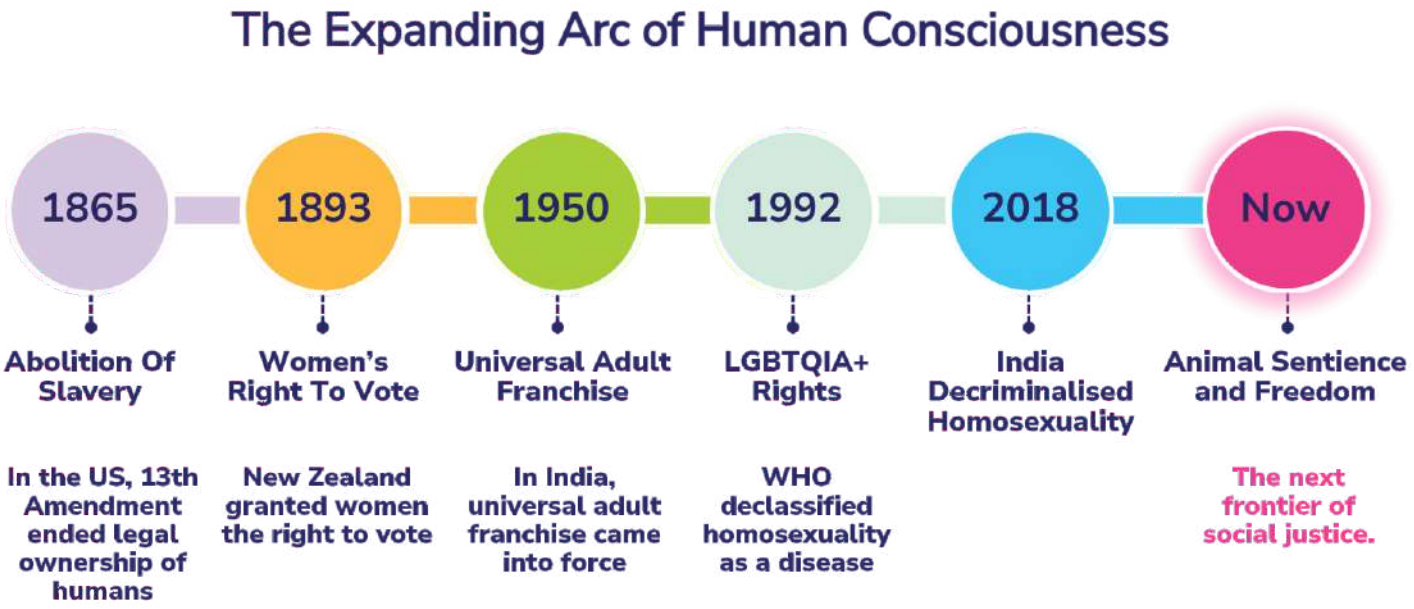
Animal Freedom: The Next Frontier of Progress

Throughout history, societies have overhauled systems once regarded as normal or economically necessary – when their broader consequences became clear and moral consciousness caught up with evidence.

Slavery – the legal ownership of human beings – persisted until the mid-19th century. Women were denied the right to vote well into the 20th century; in India, universal adult franchise came about only in 1950. Homosexuality remained criminalised in India until 2018. Each of these shifts followed a recognisable arc: societies constructed hierarchies based on perceived differences – race, gender, sexuality – used those differences to justify exclusion and exploitation, and eventually found those justifications impossible to sustain against the weight of evidence and expanding ethical consideration.

The logic now operating through modern animal agriculture is structurally similar. Species membership is invoked to justify practices that, when applied to humans, would be considered unconscionable. The scientific evidence of animal sentience has reached the same inflection point that evidence of shared human capacity reached in prior movements. The question is not whether animals differ from humans. It is whether those differences justify the scale of suffering currently built into India's economic systems.

Within India's social and economic context, animal freedom cannot be framed as an immediate or absolute demand. Millions depend on animal-based livelihoods, and concerns of income, nutrition, and food security continue to shape everyday realities.



The practical pathway forward lies in advancing higher animal welfare: reducing suffering at scale, strengthening welfare standards in supply chains, and improving food systems in ways that protect public health, sustain livelihoods, and enable inclusive change. Over time, these shifts can create the conditions for deeper transformation.

Seen this way, animal welfare emerges as a cautious but compelling next frontier of progress – one that India can approach through incremental, system-wide reform, grounded in science, *karuna* (compassion), and the interconnected well-being of animals, people, and the planet.

Image Credit: We Animals

An estimated 400 million hens live confined in industrial farming systems, each denied natural behaviour and cramped into spaces smaller than an A4 sheet of paper for life

How This Report Is Organised

This report, The Interconnected Crisis: Animal Welfare, Human Health, and Climate Change in India, is published by the India Karuna Collaborative (IKC) – a collective of 45+ NGOs spanning animal welfare, public health, climate, sustainability, and education. The title is not incidental. Animal welfare, human health, and climate change are not three separate problems requiring three separate conversations. They share the same root – food systems designed without any mechanism to account for the cost of animal suffering – and they demand a connected response.

This report examines the interconnected impacts of animal agriculture on public health, climate and environmental stability, animal welfare, and India's long-term development trajectory – and outlines practical pathways for systemic change. It is organised into four core chapters:

Chapter 1 – Animal Welfare

- Scale of India's farmed animal populations
- Conditions in dairy, poultry, and pig production systems
- Confinement, selective breeding, and productivity pressures
- Routine practices causing pain, stress, and premature death
- Invisibility of suffering within supply chains
- Regulatory gaps and enforcement challenges
- Ethical implications of treating animals as production units

Chapter 2 – Health

- Non-communicable diseases and diet-related risk factors
- The double burden of malnutrition and protein inadequacy
- Vitamin B12 deficiency and hidden micronutrient gaps
- Food safety risks in animal-sourced foods
- Zoonotic diseases and pandemic vulnerability
- Antimicrobial resistance driven by antibiotic use in farmed animals
- Systemic links between food systems, environment, and human health

Chapter 3 – Climate

- Farmed animals greenhouse-gas emissions and methane intensity
- India's agricultural emissions profile and climate targets
- Land use, water consumption, and feed resource demands
- Deforestation and biodiversity loss linked to animal feed production
- Pollution from manure, waste streams, and intensive production
- Climate impacts on farmed animals, ecosystems, and rural livelihoods
- The role of dietary transitions in climate mitigation

Chapter 4 – Pathways Forward

- Integrating animal welfare into public policy and development planning
- Welfare standards aligned with the Five Freedoms framework
- Expansion of affordable plant-based protein ecosystems
- Institutional procurement reform (schools, hospitals, public programs)
- National One Health Mission implementation
- Farmer transition pathways and alternative livelihoods
- Public awareness, education, and healthcare integration
- Economic incentives for sustainable and humane food systems

Introduction: The Missing Layer in India’s Growth Story

India seems well on its way to a *Viksit Bharat*. The country has doubled its renewable energy capacity, become the world's fourth-largest economy, and expanded universal health coverage under *Ayushman Bharat*. Yet one critical layer remains structurally absent from how growth and development are conceived and governed: Animal welfare.

Over 1.5 billion farm animals are embedded in India's daily economic and food systems. Yet they remain effectively invisible in economic decisions, policy frameworks, and measures of progress. Animal agriculture accounts for approximately 14.5% of total global greenhouse gas emissions. Dairy farms with more than 500 cows or buffaloes are classified 'Red category' – the highest pollution tier – by India's Central Pollution Control Board. Around 70% of global antibiotics are used in farming animal production, driving antimicrobial resistance (AMR) that could cause up to 10 million deaths annually by 2050.

The evidence is clear. Animal welfare can no longer be viewed solely with an emotional lens, or merely as an ethical gap. It must be viewed for the systemic failure that it is – one with direct and measurable consequences for human health, climate stability, and India's long-term development trajectory. It is time for it to become a strategic lever and be factored into development planning, assessments of public health risks, and environmental sustainability targets.

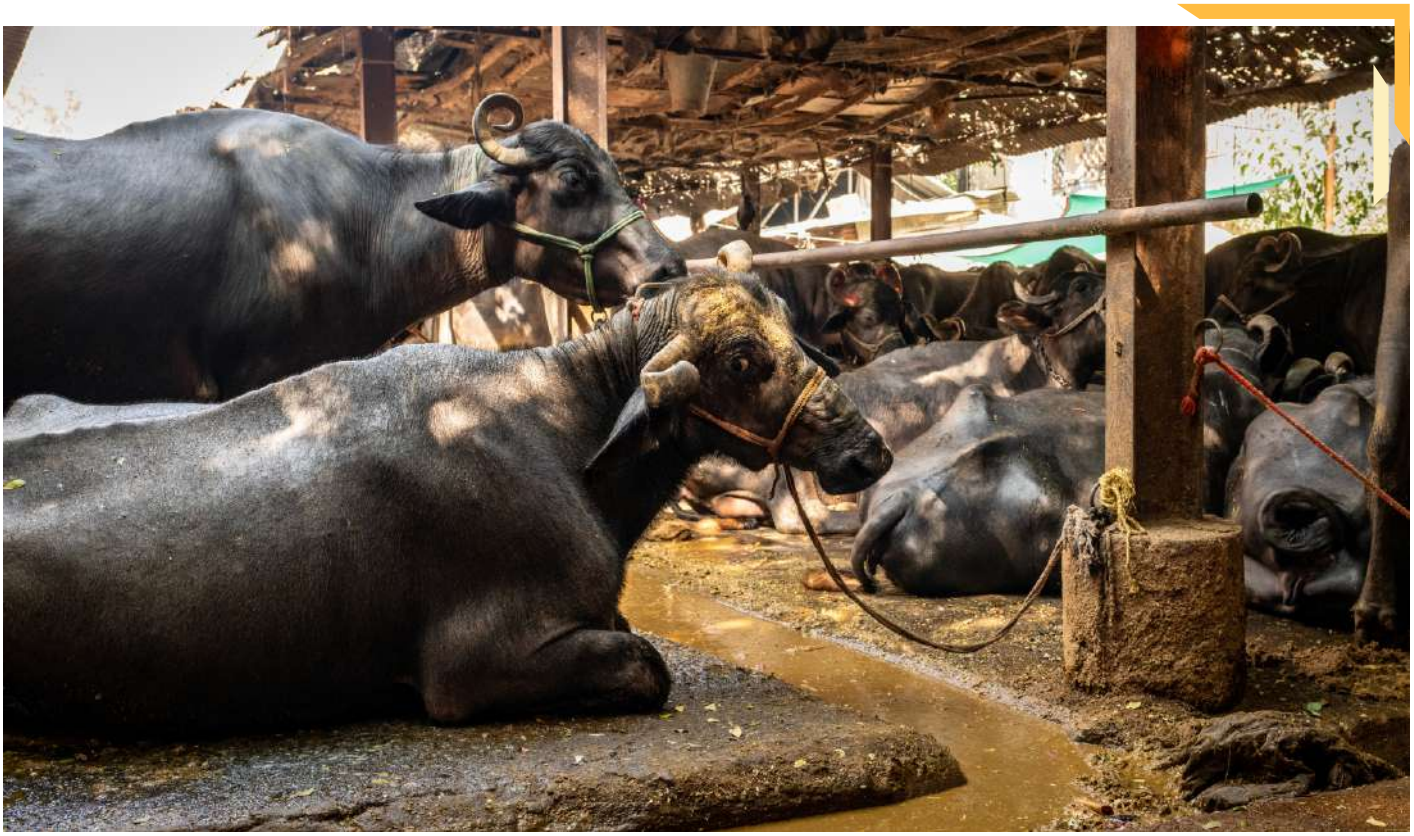
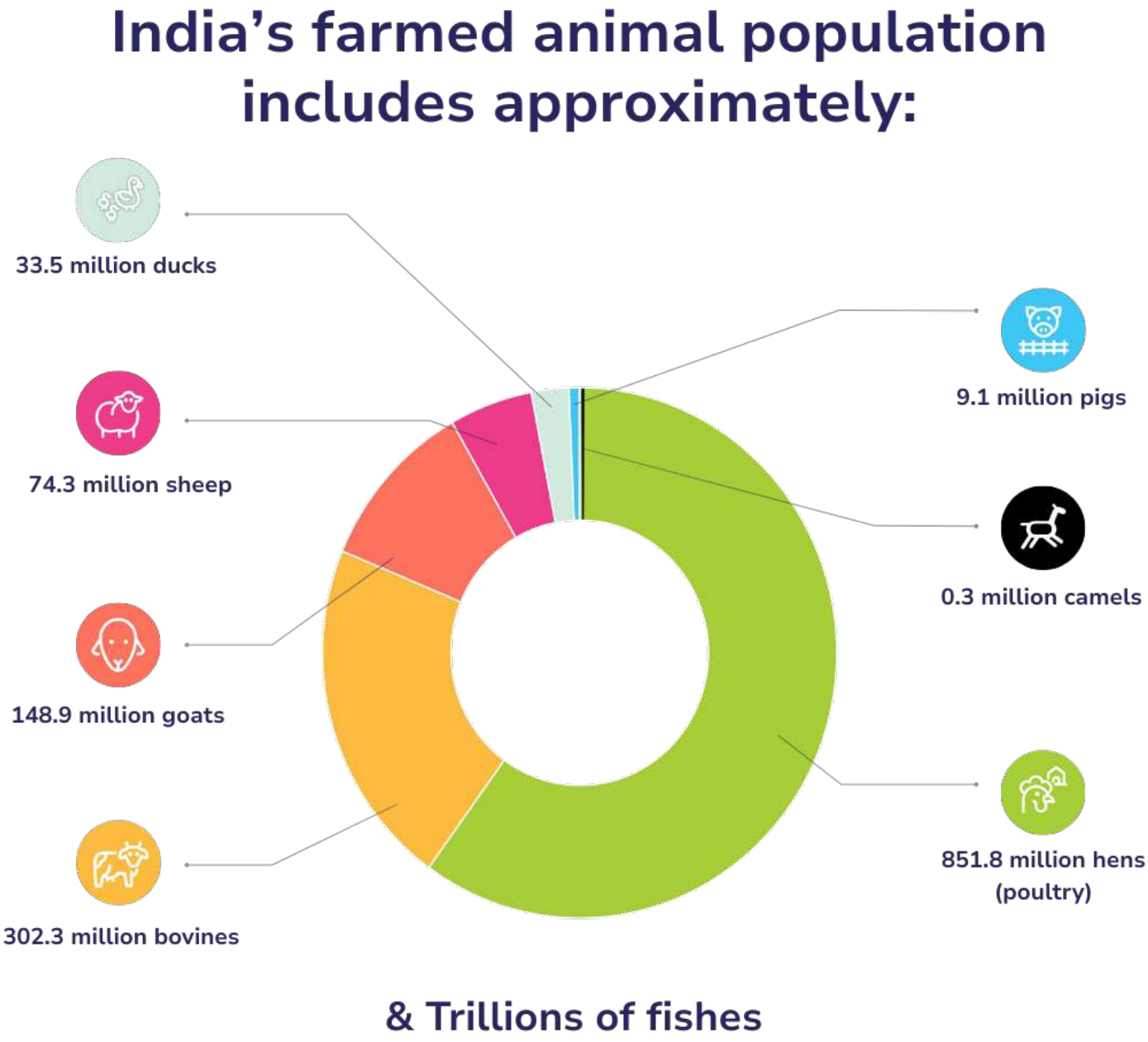


Image Credit: Anipixels.com

Lifelong tethering of buffaloes in small urban dairies (tabelas), characterised by overcrowding and inadequate housing, sanitation, and drainage

The Scale of Invisible Animal Suffering

India's farmed animal population is vast – 851.8 million hens, 302.3 bovines, 148.9 million goats, 74.3 million sheep., 33.5 million ducks, 9.1 million pigs, 0.3 million camels, and trillions of fish. While housing and management systems vary across regions and production models, one thing remains constant – these intensive or semi-intensive systems are all invisible. We don't see the scale or the supply chains which treat these animals as inputs. The industry measures milk, eggs, and meat. It does not measure distress. There is no mechanism to measure pain.



India's Milk Isn't as White or Green

India is the world's largest milk producer, contributing 24% of global milk production in 2021-2022 and producing 239.30 million tonnes in 2023-24.

These statistics come at a cost – bovines are subjected to repeated artificial insemination, early separation from calves, and sustained production pressures that exceed natural biological limits. Sadly, the consequences are no less severe. Antibiotic residues in milk contribute to antimicrobial resistance, hormonal residues carry endocrine disruption risks, and Brucellosis – transmitted through infected cattle and contaminated dairy products – remains endemic in parts of India. **Milk isn't as white as we think it is**.

Environmentally, India's bovine population generates approximately 1,655 million tonnes of dung annually, contributing to methane emissions and groundwater contamination when unmanaged, while global enteric methane emissions account for approximately 2.7 gigatonnes of CO_2-equivalent each year.

Globally, animal farming is a major water user: animal production accounts for 29% of the total water footprint of global agricultural production, much of it embedded in feed. In India, the dairy water footprint is similarly high: Government sources report the water footprint of milk production in India at 1,078 litres per litre of milk. **Milk isn't green either.**

Image Credit: PFA-PPF

A truckload of dead male calves – often deemed economically unviable in the dairy industry, deprived of maternal milk, care, and medical attention; many die within weeks, others are funneled into slaughter

From 20 Eggs to 300+ Per Year

In commercial egg production, hens are confined in battery cages with lesser space than an A4 sheet of paper. Through trait selection, they are bred to lay more than 300 eggs per year instead of their natural tendency to lay 20. Male chicks are culled at birth, and routine antibiotic use is standard practice to prevent infection spread, which is rampant in cramped spaces. Salmonella contamination was detected in 7.7% of eggs sampled in a Tamil Nadu retail survey. Antibiotic residues entering the food chain contribute to AMR.

Image Credit: We Animals

Rows of egg-laying hens confined in stacked battery cages on an egg production farm. Each shed holds rows of vertically stacked cages housing 8,000–18,000 birds; an estimated 400 million hens spend their lives confined in such systems

Pigs: Zoonoses and AMR, not Pork or Bacon

In pig farming, breeding sows spend extended periods confined in gestation and farrowing crates, and piglets undergo tail docking and teeth clipping without anaesthesia. Poor hygiene and swill feeding create pathways for zoonotic disease transmission, while antibiotic residues in pig meat contribute further to AMR. The confinement conditions that compromise immune function also amplify biosecurity risk – a reality exposed by African Swine Fever, which since 2020 has devastated pig-farming communities; Mizoram alone suffered losses of ₹114.64 crore in 2025 due to African Swine Fever. (Source: Mizoram's Animal Husbandry & Veterinary Department). Untreated slurry from intensive pig systems contributes to groundwater contamination and local pollution.

Image Credit: PFA-PPF

Standard industry practice: A mother pig confined to inches in an illegal farrowing crate, unable to turn or move freely, fully immobilised so breeding, production, and profit can continue

Still Don't Think It's a Problem?

Approximately 80% of the world's soybean crop goes to animal feed, driving the loss or replacement of over 8.2 million hectares of forests and savannahs globally between 2001 and 2015. Growing crops to feed them to farm animals is inherently inefficient, driving up the price of grains and legumes and further contributing to global poverty. According to the World Resources Institute (WRI), producing just one calorie of chicken meat requires nine calories of crop feed (and chicken is considered the most 'efficient' of animals produced for food). Globally, animal agriculture uses 77% of agricultural land for grazing and for growing feed crops, yet provides only 37% of protein; the remaining 23% of agricultural land is used for crops for direct human consumption.

Image Credit: Feed Planet Magazine

Industrial animal feed systems rely on nearly 80% of global soy, driving deforestation and large scale habitat destruction

Last, But Most Critical

Animals are sentient beings. They are capable of experiencing happiness, pain, distress, and sorrow. Scientific evidence has shown that animals possess nervous systems that process pain, form social bonds, exhibit problem-solving behaviour, and demonstrate clear indicators of emotional states.

Most of us feel this intuitively when it comes to dogs and cats – animals we share our homes with, or those we see in India's streets. We recognise their sentience because we can see it. Factory farmed animals – billions of them – are invisible while moving through India's food supply chains. They are born, confined, and processed in facilities that the public never sees. They are governed by a language of yield, throughput, and unit cost that contains no word for suffering. They are part of a system that is designed to ensure that we remain disconnected from what happens inside it.

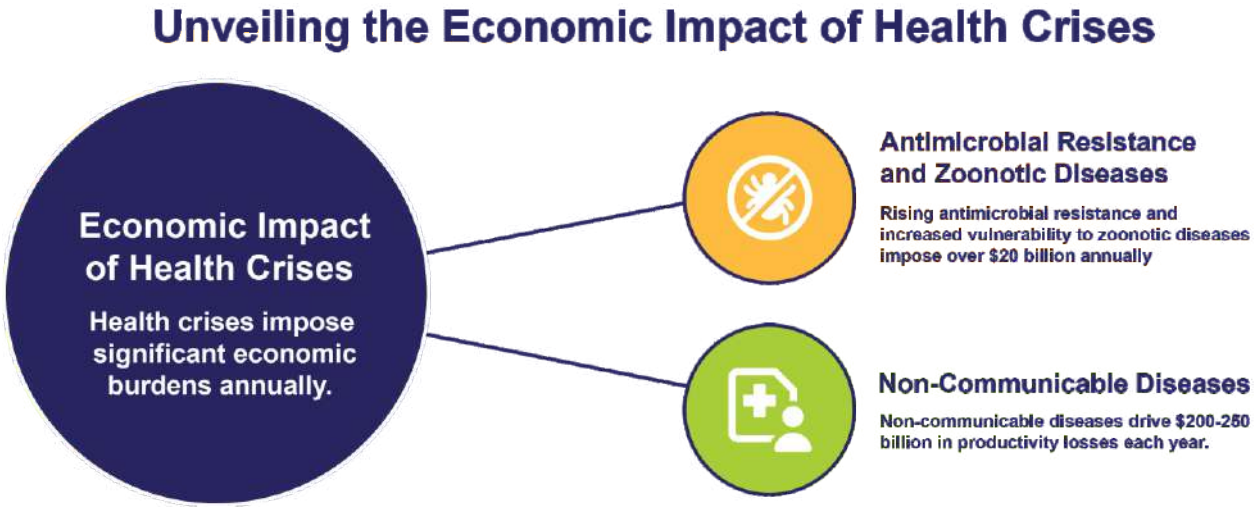
The welfare crisis and the public health and climate crises share the same root: Food systems designed without any mechanism to account for the cost of animal suffering. The costs are measurable and documented across each chapter of this report. Indian farmed animals contribute approximately 214.5 million tonnes of CO_2-equivalent annually. Within India's agricultural emissions, enteric fermentation alone accounts for 54.84% – highlighting the dominant role of farmed animal methane in the country's climate footprint.

Approximately 60,000 newborns die each year in India from sepsis related to antibiotic-resistant neonatal infections. India acutely reflects this growing burden. While AMR is particularly prominent in low and middle-income countries, it is a global challenge affecting every region.

And approximately 75% of newly emerging human pathogens detected in recent decades have originated from animals. In addition, non-communicable diseases (NCDs) account for 63% of all deaths in India (with cardiovascular diseases alone causing 27% of all deaths). These are not peripheral concerns. They are India's development statistics.

The One Health Lens

These linkages are increasingly recognised through the United Nation's One Health framework, which understands human, animal, and environmental health as interdependent. Within this framework, animal welfare is not an ethical add-on, but a strategic layer that determines how systems function and perform.



This report examines how animal welfare sits at the intersection of India's health, climate, and food systems – and why addressing these challenges in isolation is no longer viable. Importantly, it clarifies how integrating welfare considerations into supply chains creates just pathways for transition that are pro-growth, pro-sustainability, pro-choice, pro-health, and pro-solutions, while also being pro-animals.

The report draws on evidence across 4 interconnected domains

The welfare crisis built into India's animal agriculture at scale;

The public health consequences of food systems that treat animals primarily as production units;

The climate costs of animal-intensive agriculture; and

Practical policy solutions – from institutional procurement reform and the National One Health Mission to plant protein integration and welfare-linked economic incentives – that can begin delivering measurable change in the short term.

The Rationale for the India Karuna Collaborative

The India Karuna Collaborative (IKC) was established to bridge the systemic gap between growing evidence of animal sentience and the way food systems currently operate. It is a collective of 45+ NGOs spanning animal welfare, climate, sustainability, education, and public health, built on the conviction that awareness is the foundational lever that unlocks talent, capital, and policy for kinder, future-ready food systems.

IKC's position is clear about what it is not. It is not a campaign against individual dietary choices. It does not seek to impose restrictions on the socio-economically marginalised, or on farmers whose livelihoods depend on animal agriculture. It does not treat this as a religious or cultural issue. The core of IKC's position is structural: Systems built without recognising the critical layer of animal welfare impose costs on humans and on the planet that compound over time – and that India's development trajectory can no longer absorb it.

IKC seeks to shift the debate from individual dietary practices to the invisible cruelty embedded in modern supply chains – and to build a coalition of business leaders, healthcare professionals, policymakers, educators, and citizens necessary to transform those systems.

IKC is pro-animals: Animal sentience is the core issue. Every animal deserves a life of dignity, and IKC is working to improve welfare standards and gradually replace animal use in the food chain through alternative technologies.

IKC is pro-choice: We respect individual freedom. But just as we accept limits on choices that harm other humans, we believe the same principle should extend to sentient beings – driven by awareness, voluntary behaviour change, and nudging mechanisms in public and private policy.

IKC is pro-health: There is evidence that plant-based diets are generally healthier, and it is possible to get adequate and diverse nutrition without animal products. India needs to address protein deficiency for the poor by developing sustainable and affordable plant-based protein sources.

IKC is pro-sustainability: Animal agriculture is a primary driver of GHG emissions and consumes a disproportionate share of natural resources. A gradual transition to plant-based food systems is essential to leaving a healthier planet for future generations.

IKC is pro-growth: Animal welfare and economic growth are not in conflict. Integrating welfare standards into national policy – and building just transition pathways for farmers into alternative livelihoods such as cage-free systems – strengthens, not weakens, India's development trajectory.

Solutions

IKC believes that animal suffering can end in our lifetime. But, for that to happen, the welfare of farmed animals needs to be integrated into the national development agenda and existing public and private policy frameworks to drive **four key outcomes**:

Welfare standards meeting the Five-Freedom framework (freedom from hunger, discomfort, pain & injury, fear and the freedom to express normal behaviour), integrated into supply chains, backed by transparent humane certification infrastructure. The first crucial step would be integration into public and private policy.

Scaling up the supply-side ecosystem of 'Alternative Proteins' to drive better public health and climate outcomes through policy support and investments in protein-rich, affordable plant foods.

Evidence-driven integration of plant-based nutrition into the healthcare system for improved public health outcomes.

Bringing humane education into educational institutions – helping students understand animal sentience and its intersections with public health and climate.

1

Animal Welfare: The Missing Link In India's Development Story

Modern agricultural systems treat animals primarily as units of production rather than as sentient beings. **In systems optimised for output, welfare is registered only when suffering reduces productivity.** Suffering that does not affect milk yield, egg production, or weight gain remains invisible – not because it does not exist, but because systems built for volume contain no mechanism to account for it. The focus on production en masse eliminates consideration for individual lives, whether animal or human.

In India, more than 1.5 billion animals are integrated into daily economic and food systems, yet their welfare remains structurally absent from policy, regulation, and public discourse. This absence is not merely an ethical oversight – it represents a systemic failure with profound consequences for public health and environmental sustainability.

When Production Demands Suffering

The scale of animal exploitation in India's food systems is both extensive and invisible to consumers. The industry that is animal agriculture which raises cows and buffaloes, egg-laying hens, and pigs, confines, mutilates, and systematically causes immense suffering to hundreds of millions of animals – all because output and profits are structurally and repeatedly prioritised over welfare.

Cruelty in Numbers: Inside India's Dairy Systems

India is home to over 303.76 million bovines – cow, buffalo, mithun, and yak.

The country is the highest milk producer in the world, contributing 24% of global milk production in the year 2021-22.

It produced 239.30 million tonnes of milk in 2023-24.

As per 20th Livestock Census (2019), 80.83 million farmers' households are engaged in dairy farming activities, having either cow or buffalo.

As per data provided by the National Dairy Development Board, there were 2,02,521 organised Dairy Cooperative Societies (DCS) during 2023-24, in India.

However, there is no central national registry of dairy farms, so regulatory oversight and welfare monitoring remain fragmented.

Image Credit: PFA-PPF

Muzzled and weakened: A sick and injured calf lies on the floor, denied his mother's milk, food, and water - a common fate for male calves in the dairy industry

Image Credit: Anipixels.com

The 'khaal bachcha' a cruel practice in dairies: The skin of a dead calf is used to mimic the calf's presence and trigger milk let-down, after the calf has been deprived of milk and maternal care

India's Dairy Reality

Bovine Population	303.76 million
Global Milk Production (2021-22) (India's share in global dairy)	24%
Milk Production (2023-24)	239.30 million tonnes
Farmer Households (Engaged in dairy farming)	80.83 million

India is the highest milk producer in the world

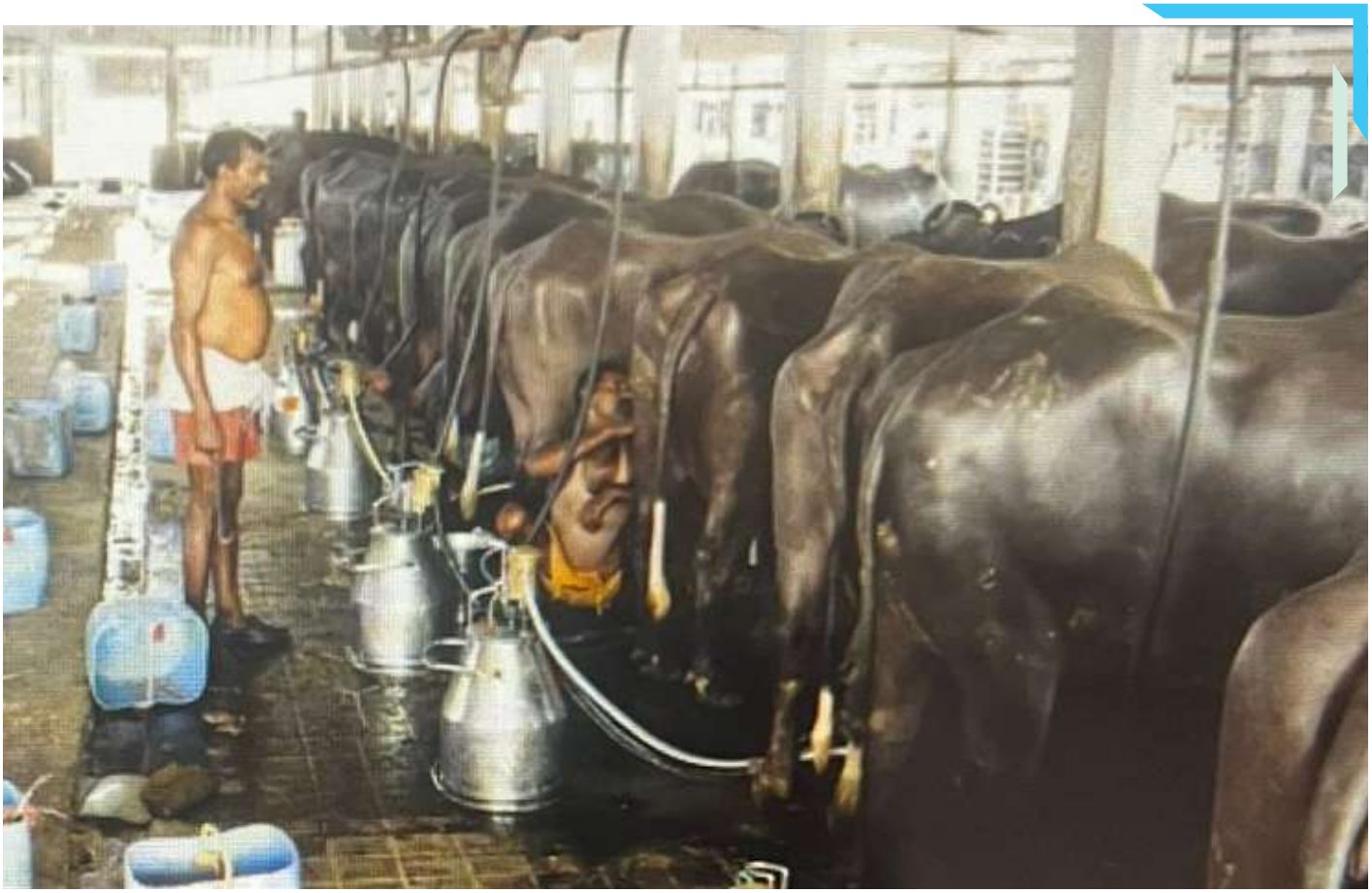


Image Credit: Anipixels.com

Calves denied their mothers' milk and care; buffaloes tethered to machines in an industrial dairy where sentient lives are reduced to output

Life in Dairy Production Systems

	Natural / Traditional Setting	Dairy Farm Setting
Average lifespan (cow)	20 years	5 years
Lifespan (male calf)	20 years	1 day - few weeks
Calves per lifetime	4-5	4.19
Milk yield (per day)	4-5 litres (indigenous)	10-25 litres (crossbred)
Primary diet	Grass, legumes, hay	Feed waste, supplements
Common antibiotics	None	Enrofloxacin, Amoxicillin, Oxytetracycline
Welfare laws	None specific	Minimal enforcement

In natural conditions, a cow can live up to 20 years but on dairy farms, her productive life is just five years. While male calves could live up to 20 years naturally, on dairy farms they often survive only days or weeks. They are neglected, sold for slaughter, or left to die as the industry is focused on lactation and male calves are considered economically unproductive.

Oxytocin injections are often used for faster milk let down and bovine somatotropin (bST) to boost production. These interventions push biological limits and increase vulnerability to mastitis, metabolic stress, and reproductive disorders. While cattle naturally graze on grasses, legumes, and hay, in dairies their diets include commercial feed, bakery and brewery waste, and even garbage. To maintain high yield, farms use feed enhancers, shorten the age of first calving, and reduce calving intervals, often at the expense of animal health and longevity.

Image Credit: Anamika Rana

Spurious oxytocin is routinely injected in dairy units to force milk let-down without calves present, triggering intense uterine contractions twice daily for the duration of lactation

A4-Sized Space, A Layer Hen's Reality

Image Credit: We Animals

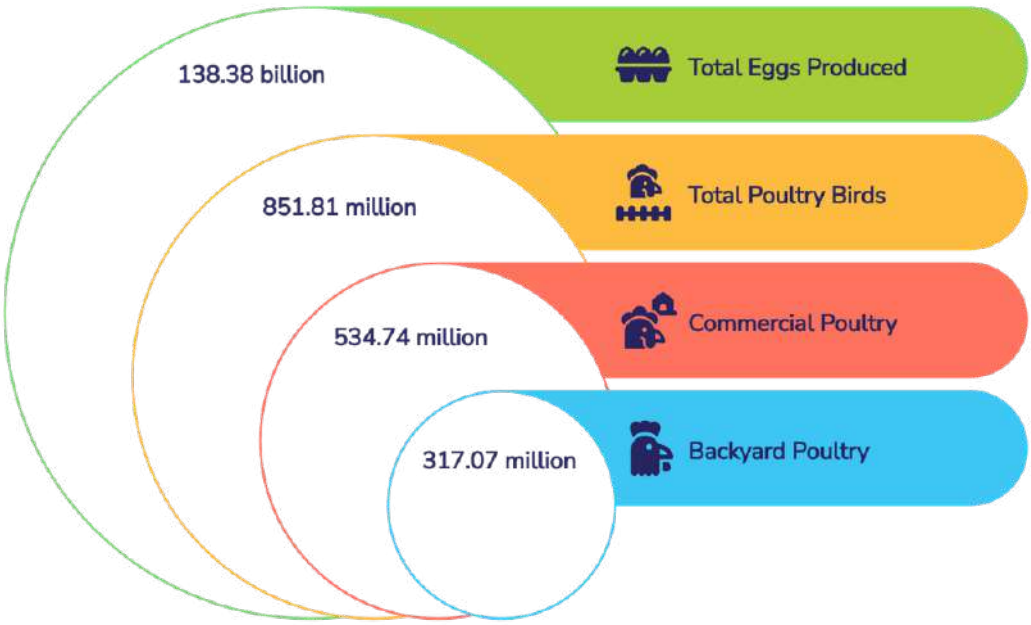
A layer hen confined for life to less space than an A4 sheet of paper, denied natural movement in an undersized battery cage, in violation of Section 11(1)(e) of the Prevention of Cruelty to Animals Act, 1960

India ranks as the world's second largest egg producer, producing 138.38 billion eggs.

According to the 20th Livestock Census (2019), India's total poultry population was 851.81 million birds, including 534.74 million commercial poultry and 317.07 million backyard poultry (Government of India data).

The scale and structure of this sector – combining large organised commercial operations with dispersed backyard systems – underscore the magnitude of animals involved in egg production. In the absence of a centralised national registry of poultry farms, systematic welfare monitoring and enforcement remain structurally challenging across such a vast and heterogeneous production landscape.

India's Poultry Industry at a Glance



- India is the world's 2nd largest egg producer
- No centralised registry of poultry farms

Natural vs. Industrial Layer Farms

Indicator	Natural / Traditional Setting	Industrial Layer Farm
Average lifespan	10–14 years	2 years
Space	Free roam	A4 paper (550 cm^2)
Eggs laid per year	10–15	250–300+
Interval between eggs	30 days	24–26 hours
Mortality	Negligible	6.7–9.2%
Diet	Natural forage	Corn–soy feed
Common antibiotics	None	Amoxicillin, Enrofloxacin, Tetracyclines
Welfare laws	None specific	Minimal enforcement

Hens are maintained in a state of sustained reproductive demand. This relentless productivity is achieved through selective breeding, continuous lighting, nutrient-dense feed, and forced moulting. What these techniques achieve is not simply 'efficiency,' but the systematic intensification of a biological function, raising chronic stress, physiological depletion, and the erosion of the **Five Freedoms** (from hunger and thirst; discomfort; pain, injury or disease; the ability to express normal behaviour; and fear and distress), as well as the ethical limits of production-driven husbandry.

The conditions these birds endure include battery cage confinement providing each hen with around 550 cm^2 of floor space – smaller than an A4 sheet of paper (623.7 cm^2), routine administration of hormones and antibiotics to sustain unnatural productivity, and debeaking performed with crude and often rusted blades without anaesthesia – so they don't peck each other. And no, that practice is not to ensure the hen's safety, it is to safeguard the output. Male chicks are ground up alive immediately after hatching as they cannot produce eggs.

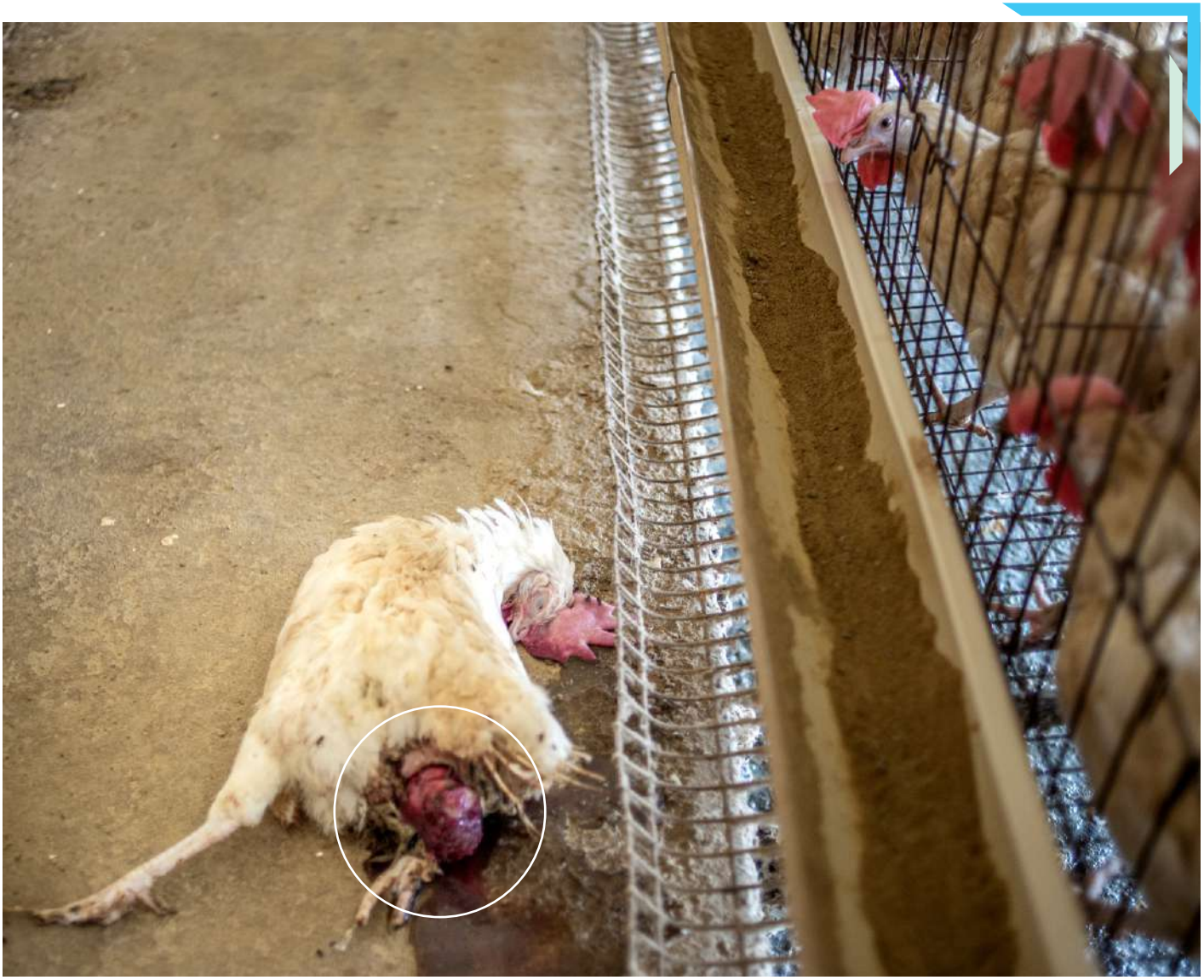


Image Credit: We Animals

This hen lies dead after suffering a prolapsed cloaca (or vent) - a painful condition commonly linked to the extreme physical strain of commercial egg production. It is a serious, often fatal condition where the lower reproductive tract turns inside out and protrudes through the vent after laying, failing to retract

9.06 Million Pigs in Unregulated Systems

Image Credit: We Animals

Routine tail docking and tooth clipping of newborn piglets is performed without proper anaesthesia to prevent biting and reduce injuries during intensive confinement during nursing

According to the 20th Livestock Census (2019), India has 9.06 million pigs, accounting for approximately 1.7% of the country's total farmed animal population (excluding poultry).

Pig farming in India is largely practised within smallholder and backyard systems, particularly in rural and North-Eastern regions, and is characterised by low capital investment and limited infrastructure.

Studies assessing pig production systems in Indian states document variability in housing, hygiene, veterinary access, and biosecurity standards, indicating uneven welfare conditions and limited systematic monitoring.

Pig Welfare in Natural vs. Farm Conditions

Gestation and farrowing crates severely restrict movement throughout pregnancy and nursing. Tooth cutting and tail docking are performed with crude tools without anaesthesia. Pigs are confined in cramped pens with poor flooring, no bedding, and no environmental enrichment.

They are fed expired, putrefied food waste, violating food safety standards. The Health chapter of this report correlates such practices vis a vis diets and human health indicators, while the Climate chapter highlights the impacts to groundwater and climate.

Image Credit: PFA-PPF

Fed decomposing hotel waste and confined in unsanitary conditions without proper waste management, pigs are left vulnerable to infection in an environment primed for zoonotic outbreaks

Welfare at the Heart of a Shared Future

The consequences of poor animal welfare extend far beyond the farms themselves, creating an interconnected crisis that touches human health, food safety, and environmental sustainability.

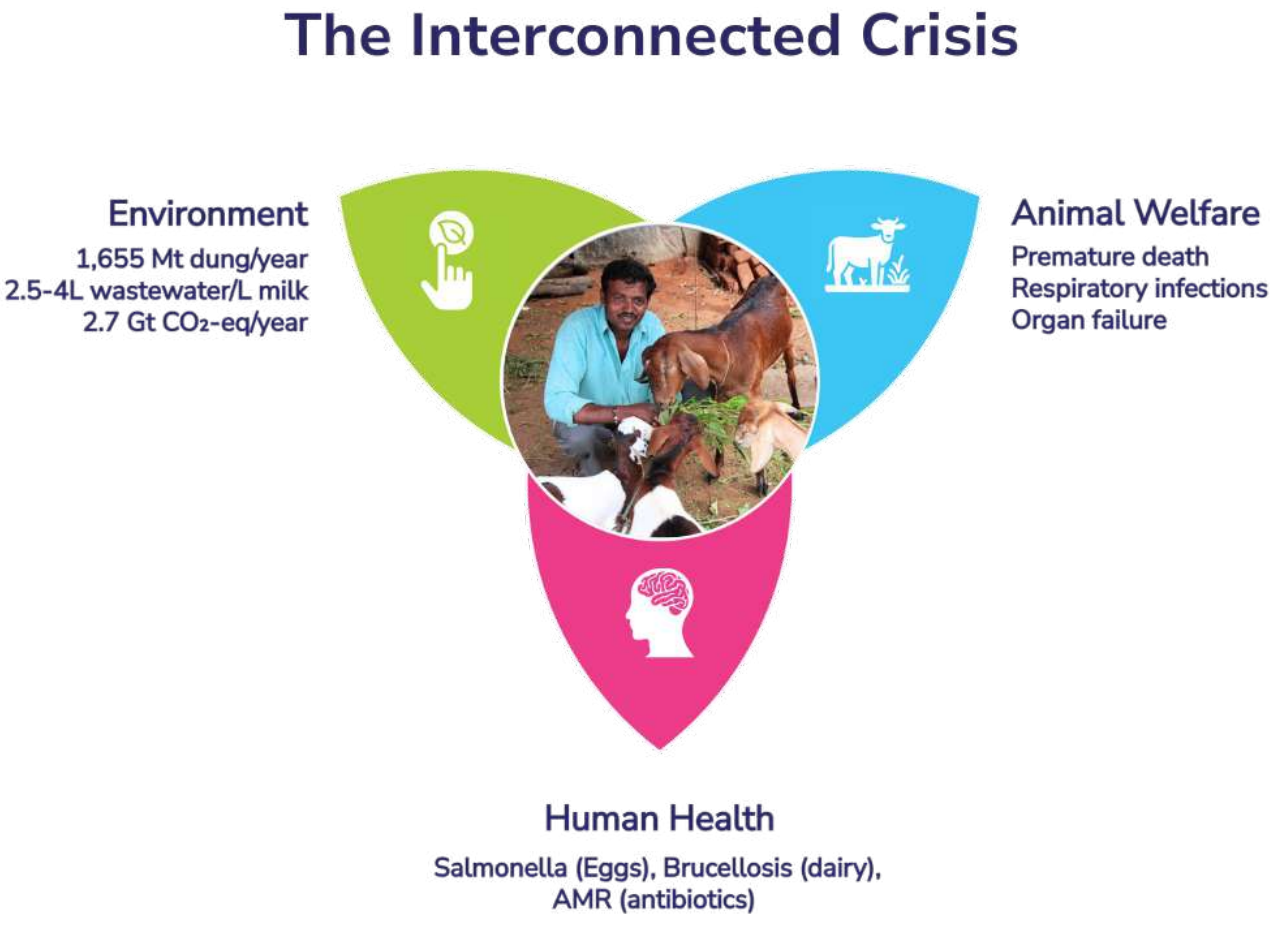
High animal densities and poor hygiene in intensive production systems increase opportunities for pathogen transmission. Crowded facilities rely on routine antibiotic use to manage disease pressures, directly fuelling antimicrobial resistance.

Animals die prematurely from respiratory infections, organ failure, and diseases. These system-level vulnerabilities do not remain confined to farms; they extend into human communities. Eggs are globally recognised as a vehicle for Salmonella transmission, particularly Salmonella Enteritidis, and have been linked to numerous food-borne outbreaks associated with shell eggs and egg products (WHO).

In India, a retail survey conducted in Tamil Nadu detected Salmonella contamination in 7.7% of sampled eggs (38 of 492), including isolates found on eggshells and within egg contents.

Pig farms harbour pathogens with zoonotic potential, with poor hygiene and swill feeding increasing disease transmission risks. Antibiotic residues enter pork and milk, contributing to antimicrobial resistance in human populations.

Dairy systems also carry zoonotic risks. Brucellosis, a bacterial infection transmitted from infected cattle and buffaloes to humans through direct contact with animals or contaminated dairy products, remains endemic in parts of India and is recognised as a public health concern (WHO).



Beyond infectious risk, the scale of modern dairy production generates significant environmental externalities. Dairy farms with more than 500 cows or buffaloes are classified under the 'Red' category – denoting high pollution potential – by the Central Pollution Control Board of India.

The environmental footprint of India's dairy sector is substantial. Government of India data (NDDB inputs) indicate that India's bovine population generates approximately 1,655 million tonnes of dung annually, creating one of the world's largest organic waste streams.

When not scientifically managed, this volume of manure contributes to methane emissions, groundwater contamination, and local air pollution.

Dairy processing is also water intensive. Indian studies report that dairy processing plants can generate 2.5–4 litres of wastewater per litre of milk processed, often containing high levels of organic pollutants that require treatment before discharge.

Dairy production also carries a significant carbon footprint. The Food and Agriculture Organization estimates that global dairy supply chains account for approximately 2.7 gigatonnes (Gt) of CO_2-equivalent annually.

Systemic Failures, Not Individual Fault

It is essential to recognise that the welfare crisis in India's animal agriculture systems is not primarily the result of individual cruelty or farmer negligence. Rather, it reflects systemic design failures embedded in economic incentives, institutional structures, and policy frameworks.

Farmers operate within economic constraints that make welfare improvements financially unviable without external support. A 2024 needs assessment study of Indian egg producers found that producers identified financial assistance, technical training, and institutional support as necessary for transitioning to cage-free systems; without such support, they must compete on price with conventional systems, undermining the commercial viability of transitioning to higher welfare systems.

Image Credit: Anamika Rana

Five-day-old chicks being injected by workers and roughly handled before being thrown into cages

These findings align with broader economic analyses showing that improving animal welfare can incur costs for producers, including investments in training, facility reconfiguration, pain relief, and changes in management practices.

The fundamental challenge is that we have built systems where animal suffering is structurally invisible and economically rewarded. The highest-impact interventions are therefore those that make welfare outcomes visible, shift economic incentives, and build institutional capacity at both policy and implementation levels.

The suffering documented in this chapter is not the consequence of individual cruelty or farmer negligence. It is the output of systems designed without any mechanism to account for animal welfare – and that design has measurable consequences for public health, climate stability, and India's long-term development trajectory. The Solutions chapter in this publication sets out the practical levers through which that design can change: embedding welfare standards into institutional frameworks, restructuring economic incentives, and building the governance architecture for food systems that work for animals, people, and the planet.

Image Credit: We Animals

The birds are illegally transported to the market violating the transportation and slaughterhouse rules; kept in metal cages, many birds show signs of skin diseases, stress, and trauma. As they await their turn, the birds have a clear view of the butchering and slaughtering process

2

India's Interconnected Public Health Crisis

India is facing a grave public health crisis – one driven by poor nutrition, a rise in non-communicable diseases (NCDs), unsafe and unsustainable food systems, increasing risks of zoonotic diseases, antimicrobial resistance (AMR), and growing vulnerability to climate change. While these challenges are often addressed in isolation, they are deeply interconnected.

At the heart of this crisis is how food is produced, processed, and distributed. The expansion of intensive animal agriculture – where animals are treated primarily as units of production – shapes dietary quality, disease risk, and environmental stability. The consequences extend far beyond farms and supply chains, contributing to calorie-sufficient but nutrient-poor diets, rising non-communicable diseases, infectious disease emergence, and antimicrobial resistance.

This underscores the need for a **One Health approach**, which recognises that human health, animal welfare, and environmental sustainability are inseparable.

The One Health approach recognises that human health, animal health, and environmental health are interdependent. It emphasises that risks such as non-communicable diseases, zoonotic infections, antimicrobial resistance, and climate-related health impacts are shaped by shared systems – particularly food production, land use, and environmental management – and therefore cannot be effectively addressed in isolation.

NCDs account 63% of all deaths in India

Non-communicable diseases (NCDs) are on the rise globally. Cardiovascular disease and cancer alone account for an estimated 71% of all premature deaths worldwide. India mirrors this trend, with NCDs accounting for 63% of all deaths in India, and with cardiovascular diseases alone causing 27% of all deaths. This is driven not only by urbanisation and lifestyle changes, but also by declining diet quality.

Indian dietary patterns show increased consumption of refined carbohydrates, ultra-processed foods, and excess saturated fats, alongside inadequate intake of fruits, vegetables, legumes, nuts, seeds, and whole grains. Such imbalances are a major driver of premature deaths from non-communicable diseases, globally too.

Source: Global NCD estimates; PAN International Position Paper; ICMR INDIAB analysis

Cardiovascular Disease, Diabetes, and the Role of Diet

The link between diet and cardiovascular disease is well-established. Red and processed meat consumption is associated with a 25% increased risk of heart disease and a 20–30% higher incidence of type 2 diabetes primarily attributed to the higher cholesterol and saturated fat content in animal products.

Hypertension adds further weight to this picture. A countrywide ICMR INDIAB analysis estimated approximately 35.5% prevalence of hypertension in India – equating to around 315 million people – alongside 28.6% generalised obesity and 39.5% abdominal obesity. These figures reflect a population increasingly burdened by diet-related metabolic disease.

By contrast, plant-rich dietary patterns offer measurable protection. In the Indian context, vegetarian diets are associated with improvements across multiple cardiometabolic risk factors. These findings reinforce the potential of plant-forward food environments to reduce India's NCD burden at scale.

Cancer Risk and Dietary Patterns

Regular consumption of red and processed meat raises colon cancer risk by 18%, as established through multiple epidemiological studies. On the flip side, a meta-analysis found that higher adherence to plant-based diets was associated with a significantly reduced risk of overall digestive system cancers. **Together, these findings point to diet as a modifiable and consequential determinant of cancer risk** – one that current food systems in India are slow to embrace.

Plant-Based Diets as Prevention

Well-planned plant-based dietary patterns – including vitamin-rich fruits and vegetables, and protein-rich legumes, pulses, nuts, and whole grains – offer a proven strategy to prevent NCDs.

Within this context, protein alternatives offer a practical pathway to improve nutrition while reducing dependence on intensive animal production systems and address widespread protein inadequacy and dietary diversity gaps identified in India. And this, while avoiding many of the health, environmental, and animal welfare risks embedded in conventional animal-derived food.

Positioned alongside whole-food dietary improvements, these alternatives support voluntary behaviour change by enabling people to meet protein needs without reinforcing food systems that treat animals primarily as units of production, advancing One Health outcomes across human health, animal welfare, and environmental sustainability.

Image Credit: Pexels.com

The Double Burden of Malnutrition

However, prevailing food environments have not enabled these nutritional principles to be realised in practice. Instead, current consumption patterns reflect food systems that deliver sufficient calories while failing to ensure dietary diversity and micronutrient adequacy. This has contributed to a paradoxical '**double burden' of malnutrition, in which persistent undernutrition coexists with rising obesity and metabolic disease**.

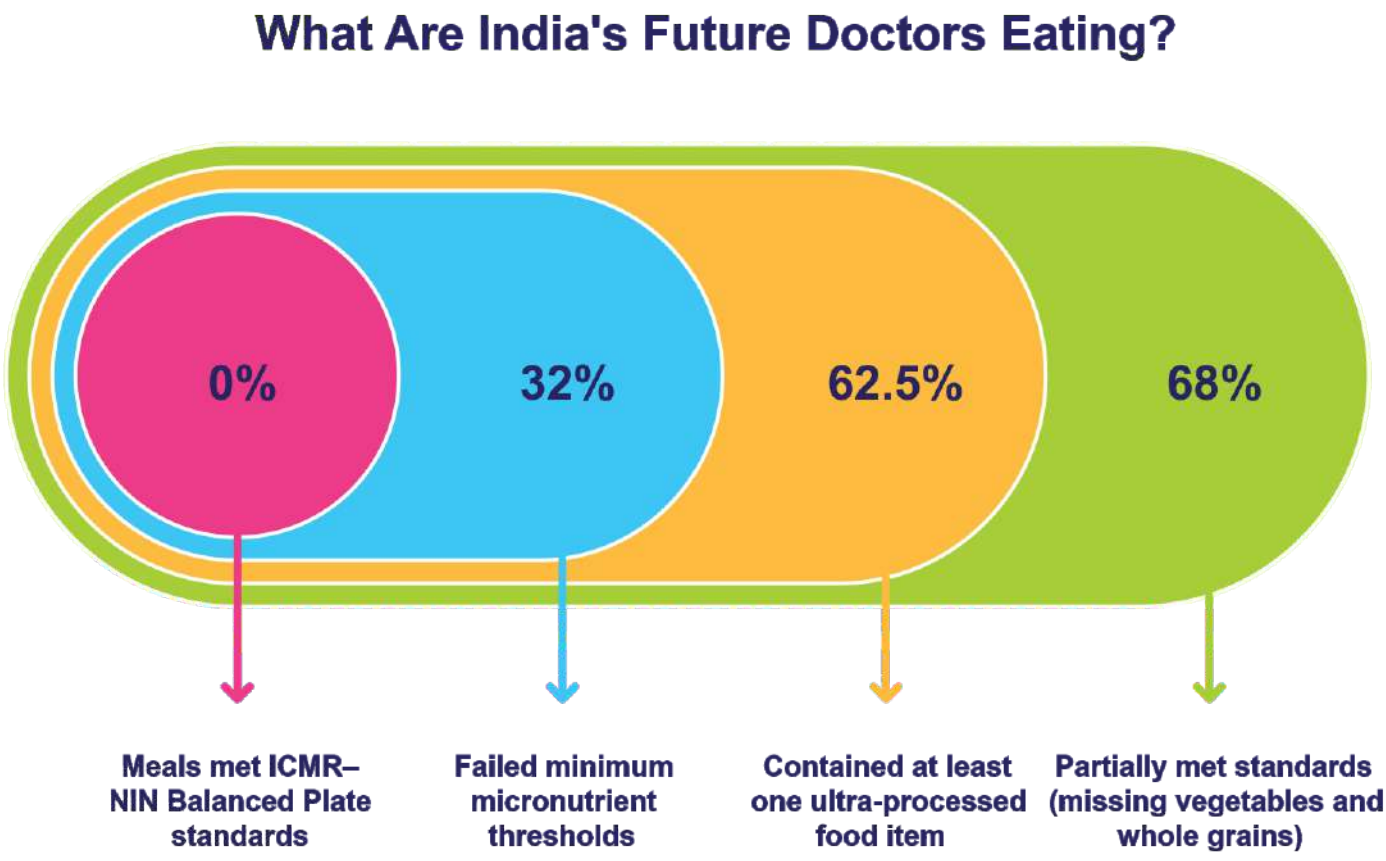
This gap is not driven by individual choice alone. It reflects food environments shaped by affordability constraints, limited access to diverse and nutrient-dense foods, and institutional meal systems that prioritise low-cost, calorie-dense staples over dietary diversity and micronutrient adequacy.

What India's Future Doctors Are Eating: The MENAP Study

The consequences of these systemic dietary patterns are already visible among adolescents and young adults. Evidence from the Medical Students' Eating and Nutrition Assessment Project (MENAP) highlights that protein inadequacy and low dietary diversity are widespread, extending even to future healthcare professionals. **Medical students frequently fall short of recommended intakes of protein, iron, folate, and omega-3 fatty acids** – as evinced by a cross-sectional assessment of lunch meals consumed by 40 medical students aged 18–23 years across 15 medical colleges. It was found that none of the meals met ICMR–NIN Balanced Plate standards. While 68% of meals partially met standards – typically providing some protein and hydration – they fell short on vegetable and whole-grain inclusion. A further 32% failed to meet minimum micronutrient adequacy thresholds, and 62.5% contained at least one ultra-processed food item.

These findings underscore how calorie sufficiency can coexist with nutritional inadequacy. The MENAP study noted that 'the very individuals preparing to advise a nation on prevention, healing, and wellness are themselves being undernourished by the systems that train them.'

Beyond nutritional risks, the same intensive food systems that drive deficiency also create the conditions for infectious disease emergence.



75% of New Human Pathogens Come From Animals

Image Credit: We Animals

In an intensive egg-production farm, stacks of hundreds of crated eggs rest on the ground, ready for transportation. The eggs sit beside tiered rows of battery cages, each densely packed with multiple hens

Between 2011 and 2018, the World Health Organization tracked 1,483 epidemic events across 172 countries, underscoring how frequently infectious threats now arise in an interconnected global system (Global Preparedness Monitoring Board, 2019).

Many of these outbreaks are linked to zoonotic infections – diseases transmitted between animals and humans. The pandemic spread of influenza A (H1N1) is cited as a topical example of the challenges presented by zoonotic viruses.

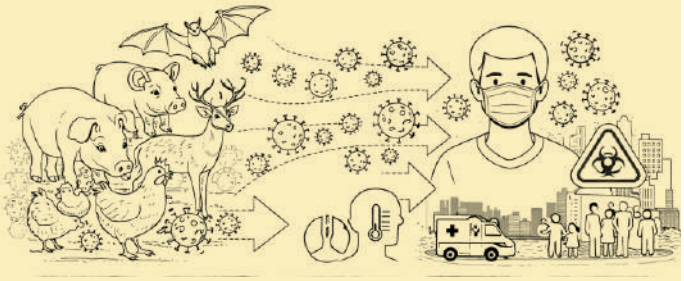
Approximately 75% of newly emerging human pathogens over the past 25 years originated from animals, highlighting the expanding zoonotic threat at the human–animal interface, as noted in a 2009 study published in Philosophical Transactions of the Royal Society.

Environmental changes and intensified farming practices are identified as major drivers of infectious disease emergence and spread, placing global food security at risk when such diseases are not effectively controlled (Royal Society, 2009).

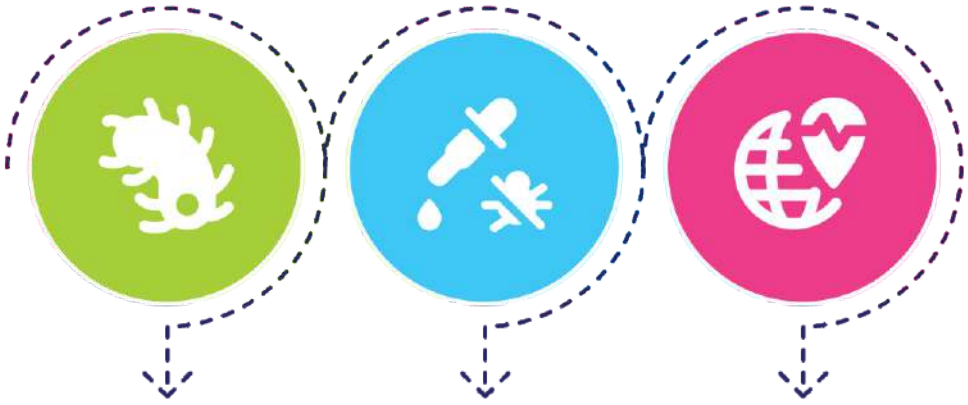
Infectious diseases from animal agriculture are identified as serious global threats to animal and human health, food security, and economic development. The increasing emergence and re-emergence of zoonotic diseases is driven by environmental change, agricultural intensification, and growing urbanisation. Outbreaks such as avian influenza, bluetongue virus, and African swine fever demonstrate how rapidly infectious diseases can spread through production systems and disrupt food supplies.

India's unregulated piggery sector illustrates how these risks materialise at the domestic level. A 2025 survey of 146 piggery units across eight Indian states – conducted by PAN India and People for Animals Public Policy Foundation – found near-universal failures in biosecurity and waste management. A staggering 145 piggery units were found to have severe fly infestations and odour nuisances caused by swill and other poor waste management systems, creating active vectors for pathogen transmission. Of 142 units where wastewater disposal could be observed, 83 were discharging untreated wastewater directly into public drains – with faecal contamination linked to antibiotic-resistant organisms including Salmonella enterica serovar Typhimurium, a known cause of typhoid fever. A further 103 units were found to be operating with inappropriate siting parameters, including being in close proximity to residential areas, schools, colleges, hospitals, piggeries/other animals and National and State Highways – amplifying the risk of community-level disease transmission. Of the 142 units where wastewater disposal could be observed, merely five units were found to be fully compliant with the limited waste management protocols in place.

Together, these dynamics point to infectious disease emergence as a systemic consequence of food systems shaped by environmental change and intensified animal production.



From Farms to Pandemics



Emerging Diseases

75% of emerging infectious diseases originate in animals

Zoonotic Diseases

60% of known infectious diseases are zoonotic

Epidemic Events

1,483 epidemic events were tracked by WHO between 2011–2018

Image Credit: We Animals

Young pigs confined in a filthy holding pen at a commercial pig farm; India's pig industry includes around 9 million animals, with industrial units housing up to 1,500 pigs

As infectious disease pressures intensify across animal and human populations, reliance on antimicrobials to control outbreaks and sustain intensive production systems has also increased – setting the stage for another escalating public-health threat: Antimicrobial resistance.

In India, about 60,000 new-borns deaths are associated with antibiotic-resistant neonatal infections

Antimicrobial resistance (AMR) occurs when microorganisms/ bacteria become resistant to antibiotics designed to kill them, undermining the effective prevention and treatment of infectious diseases.

The scale of the crisis is already severe. Updated global estimates based on 2019 data show that 4.95 million deaths were associated with drug-resistant bacterial infections worldwide, with 1.27 million deaths directly attributable to AMR. Earlier UK government projections warn that, without systemic change, globally, AMR could cause up to 10 million deaths annually by 2050, equivalent to one death every three seconds.

India acutely reflects this growing burden. **Approximately 60,000 newborns die each year in India from antibiotic-resistant neonatal infections**, highlighting the severe impact of antimicrobial resistance in a country with high antibiotic use. While AMR is particularly prominent in low-and middle-income countries, it is a global challenge affecting every region.

The trajectory is stark: By 2050, bacterial infections are projected to outnumber cancers as a cause of human death – because currently available antimicrobials will no longer be as effective in treating bacterial infections. This represents not merely a medical failure but a systemic one, rooted in how antibiotics are used across human and animal systems.

Antibiotic Use in Animal Agriculture

Approximately 70% of global antibiotics are used in livestock production, contributing to an estimated 10 million annual AMR-related deaths worldwide.

Modern food production systems play a central role in accelerating this interconnected crisis recognised as a One Health issue. There is growing evidence that widespread non-therapeutic antibiotic use in animals promotes resistance in humans. Resistant bacteria are transmitted through direct contact with animals, exposure to manure, consumption of undercooked meat, contact with raw meat or contaminated surfaces, airborne dust particles, and environmental pathways involving soil and water.

Beyond terrestrial farming, these environmental pathways extend into aquatic food systems, where antibiotic use and waste are discharged directly into surrounding ecosystems.

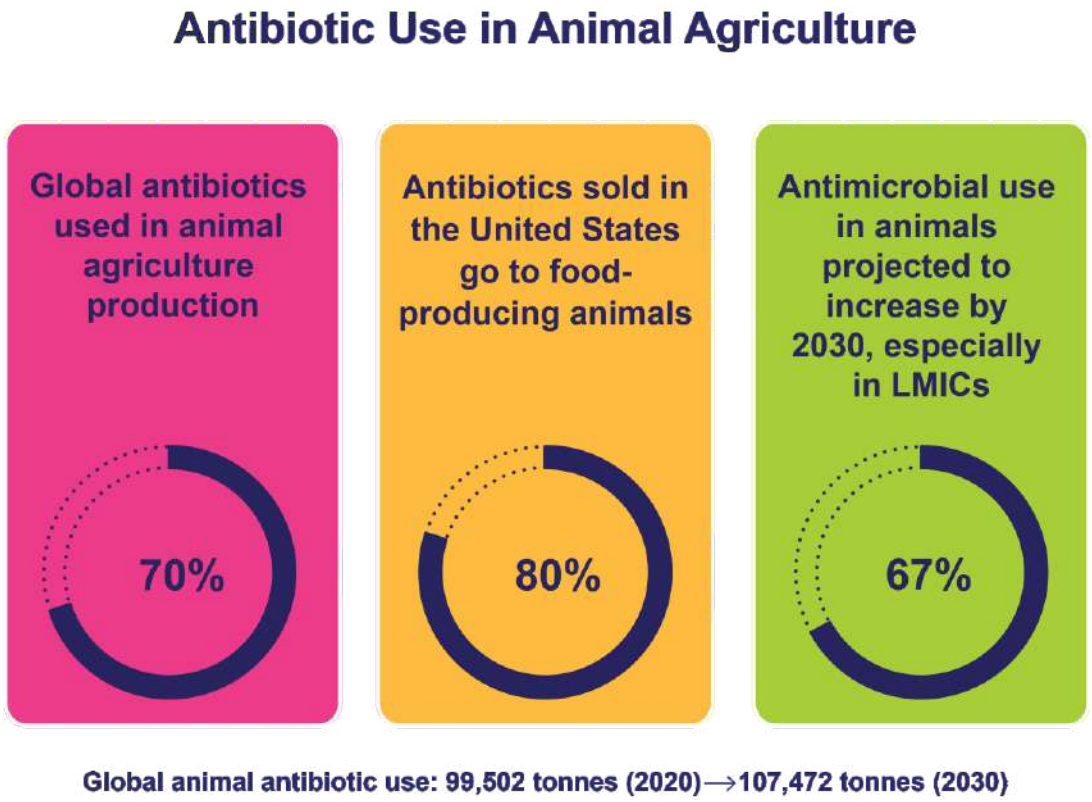
Image Credit: Anamika Rana

The routine use of multiple antibiotics in intensive production systems to prevent disease in high-stress, overcrowded conditions, fueling the rise of antimicrobial resistance

In the United States, approximately 80% of antibiotics sold are intended for use in food-producing animals, many of which belong to classes considered critically important for human medicine by the WHO.

Antibiotics are routinely administered in feed to marginally improve growth rates and to prevent disease under crowded and unsanitary conditions.

Globally, antibiotic use in animals reached an estimated 99,502 tonnes in 2020 and is projected to rise to 107,472 tonnes by 2030. Antimicrobial use in animals is expected to increase by 67% by 2030, particularly in low- and middle-income countries where regulatory frameworks are weaker.



Environmental Pathways of Resistance

Antibiotics are metabolically stable by design. It is estimated that 50-80% of antibiotics are excreted in urine and 4-30% in faeces, meaning large volumes of unmetabolised antibiotics enter sewage systems. Sewage environments contain dense populations of antimicrobial-resistant bacteria and resistance genes, facilitating horizontal gene transfer.

Antibiotics used in animals further enter the environment through manure. Pathogens introduced through manure can persist in soil for extended periods depending on environmental conditions. Resistant bacteria and genes have been detected across milk, eggs, meat, vegetables, tap water, soil, rivers, sediments, wastewater, and air .

These environmental reservoirs create continuous opportunities for resistance to re-enter human populations, especially among those working in intensive animal production environments.

Image Credit: We Animals

Broiler chickens raised for rapid growth are routinely given antibiotics and growth-promoting drugs, practices linked to antimicrobial resistance and potential risks to human health

Aquaculture and AMR in Asia

Aquaculture has emerged as one of the largest contributors to environmental AMR. Since antibiotics are often administered via medicated feed or directly into water, a large proportion – estimated at 70% – enters waterways, contaminating sediments and adjacent soils. Tetracyclines have been used extensively in aquaculture, contributing to the global spread of tetracycline resistance genes, including detections in remote regions such as Antarctica and the Arctic in 2017.

Asian countries account for approximately two-thirds of global food fish production. Yet concerning levels of resistance to clinically critical antibiotics and high burdens of foodborne zoonotic pathogens have been documented, with resistance accumulating along major river systems in China and India. With rising seafood consumption, seafood-borne bacterial diseases are becoming increasingly significant global health hazards.

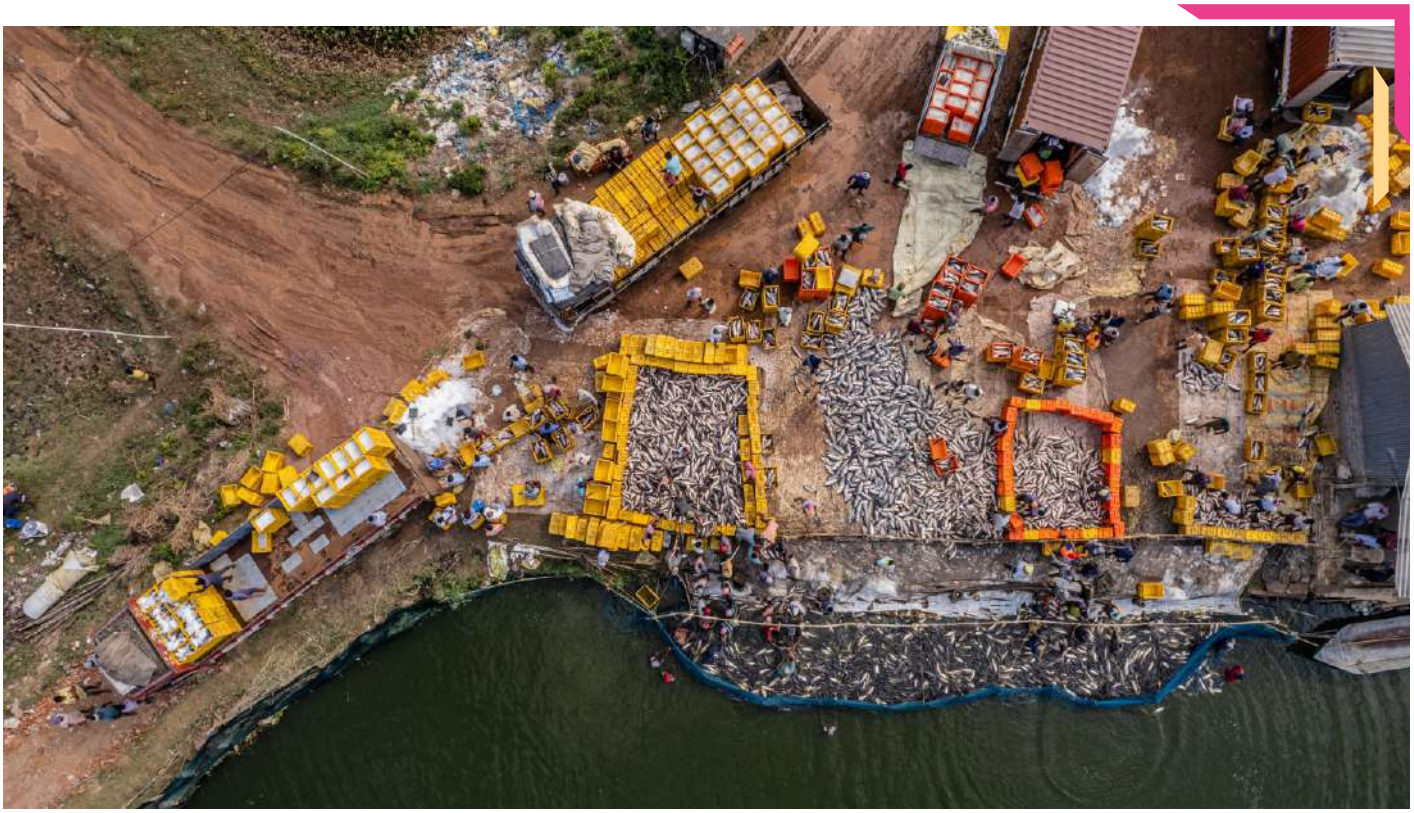


Image Credit: We Animals

Thousands of fishes are trapped by workers inside a net and transferred to shore during a harvest on a fish farm

Occupational Exposure and Direct Human Impact

Beyond consumer exposure through contaminated food and water, resistance also returns through occupational pathways. Farm workers exposed to resistant bacteria and antibiotic residues are up to 32 times more likely to develop antibiotic-resistant infections than the general population. Poultry antibiotic use led to vancomycin-resistant Enterococcus faecium (a critical, high-priority, healthcare-associated pathogen causing severe infections like bacteremia and UTI, particularly in immunocompromised patients) in chickens, later detected in farmers and abattoir workers, some of whom required hospitalisation.

Resistance levels were also higher among broiler farmers than egg farmers, reflecting heavier antibiotic use in broiler production systems.

Beyond individual exposure, intensive animal agriculture systems sustain broader reservoirs of pathogens that circulate between animals, environments, and human populations.

Zoonotic Pathogens and Priority Drug-Resistant Infections

Animal agriculture systems act as reservoirs for zoonotic pathogens such as Escherichia coli, Salmonella, Campylobacter, Staphylococcus aureus, and Listeria, which spread through air, slurry, faeces, food, and environmental pathways.

Ground-level data from India's piggery sector underscores how these pathogen transmission pathways operate in practice. The aforementioned 2025 survey of 146 piggery units across eight Indian states found that 144 units lacked the necessary infrastructure for the treatment of solid waste. Further, 31 units were found to be discarding solid waste directly into water bodies, and 81 were found to be discarding solid waste into public or municipal drains. Of the 38 units where carcass disposal could be observed, each was found to employ inappropriate practices, raising serious biosecurity concerns and increasing the risk of disease transmission and environmental contamination. Of the 40 units where biomedical waste management could be assessed, all 40 were found to lack proper waste segregation systems.

Image Credit: We Animals

Degilled fishes lie on the ground at the feet of female fishmongers who work descaling them on a long blade at a fish market. Several descaled fishes soak in a pail of water in the foreground

In 2017, the WHO published an official 'priority' list of dangerous bacteria that have become resistant to multiple antibiotics, including Acinetobacter, Pseudomonas, Klebsiella pneumoniae, E. coli, and Enterobacter. These bacteria are increasingly difficult to treat and are responsible for infections such as severe pneumonia and bloodstream infections. Methicillin-resistant Staphylococcus aureus (MRSA) remains associated with high global mortality, while multidrug-resistant gram-negative bacteria increasingly complicate treatment of urinary tract infections, pneumonia, sepsis, gonorrhoea, tuberculosis, and typhoid fever.

The scale and clinical impact of these drug-resistant infections highlight that AMR is not an inevitable consequence of modern healthcare, but a preventable outcome shaped by policy and system design.

Evidence That Policy Action Can Reduce AMR

In response to the growing clinical impact of drug-resistant infections and rising healthcare costs, policy interventions have begun to emerge. The European Union banned antimicrobial growth promoters in 2006, and Denmark's subsequent ban on avoparcin led to declines in vancomycin-resistant enterococci in both animals and humans within two years, without adverse impacts on pork production.

India adopted a National Action Plan on Antimicrobial Resistance in 2017, aligned with global One Health objectives, with early assessments indicating improvements in awareness and stewardship alongside ongoing challenges related to high consumption and environmental exposure. Building on this foundation, in November 2025 the Union Minister of Health and Family Welfare launched NAP-AMR 2.0 (2025–2029), acknowledging that the first plan had been hampered by gaps in inter-sectoral coordination and private sector engagement, and setting out updated strategies to strengthen stewardship, laboratory capacity, and environmental surveillance under a One Health framework.

These examples show that policy action can help – but lasting progress depends on deeper systemic change.

Image Credit: We Animals

Live young chickens being transported to slaughter sit tightly packed in metal cages stacked on a bicycle cart outside a meat market

Food Safety and the Regulatory Gap: The Case of Milk

Diet-related disease does not arise only from what is absent in food – it also arises from what is present. India's dairy sector illustrates how food safety gaps, driven by weak regulation and poor animal welfare, translate into direct public health risks for domestic consumers.

India is the world's largest milk producer, yet the milk consumed daily by its population remains subject to far weaker safety scrutiny than the milk exported abroad. A critical indicator of milk quality is the Somatic Cell Count (SCC), universally used to detect udder infection, chronic inflammation, and poor animal welfare. Elevated SCC is not an abstract metric – it is a direct biological signal of mastitis arising from overcrowded housing, lack of clean water, unhygienic milking, and sustained animal stress. SCC measures the number of somatic cells – a combination of immune cells and epithelial cells shed from the udder – per millilitre of milk. While levels around 100,000 cells/mL are considered normal and healthy, levels exceeding 200,000 cells/mL are indicative of infection. Particularly concerning is Subclinical Mastitis (SCM), which occurs 15 to 40 times more often than its clinical form and shows no visible symptoms, meaning infected milk often appears perfectly normal even when SCC levels reach up to two million cells per millilitre. A landmark meta-analysis reviewing 140 Indian studies calculated a pooled SCM prevalence of 45% – meaning nearly one in two dairy animals in India may be suffering from a hidden udder infection on any given day.

Image Credit: Anipixels.com

Milk cans or pails and Indian buffaloes tied up in a line in a concrete shed on an urban dairy farm

While importing countries impose strict SCC thresholds on Indian milk exports to protect their consumers, India does not mandate routine SCC testing for milk sold within its own borders. Under Export Inspection Council (EIC) regulations, cow milk destined for export must not exceed 4,00,000 cells/mL – yet no such limit exists for milk sold domestically.

This creates a stark regulatory inversion: milk that would be rejected at international borders continues to circulate freely in the domestic market. The result is a food safety regime that systematically safeguards foreign consumers while leaving Indian citizens exposed to milk produced under conditions that fail globally accepted health and welfare standards.

Eggs: Retail Food Safety Gaps

The same regulatory gap is visible in India's egg supply chain. Despite being the world's second largest egg producer, India has no mandatory date-labelling requirement for loose eggs – which are widely sold across retail markets. FSSAI guidance notes that eggs remain fresh for only around 10 to 12 days at room temperature, yet consumers purchasing loose eggs have no reliable way to verify storage duration or freshness.

Food-borne risks associated with eggs are well documented. In a retail survey conducted in Tamil Nadu, Salmonella contamination was detected in 7.7% of sampled eggs, including isolates found on eggshells and within egg contents. In December 2024, FSSAI mandated quarterly reporting of expired food products by food businesses to help prevent practices such as re-labelling or repackaging of expired goods – reflecting ongoing regulatory concerns around food safety monitoring in supply chains.

These food safety failures – whether in milk or eggs – point to a deeper problem: the assumption that animal-sourced foods reliably deliver nutrition. The reality of Vitamin B12 deficiency across India challenges that assumption directly.

Micronutrient Deficiencies and Hidden Risks: More than 70% Indians may be deficient in Vitamin B12

Micronutrient deficiencies further compound India's nutrition crisis, with Vitamin B12 deficiency representing a widespread yet often under-recognised public-health risk. Vitamin B12 is essential for red blood cell formation, DNA synthesis, neurological function, and the maintenance of myelin, the protective sheath surrounding nerves.

Deficiency of Vitamin B12 is associated with megaloblastic anaemia, fatigue, cognitive impairment, peripheral neuropathy, and, if left untreated, irreversible neurological damage. Deficiency also leads to elevated homocysteine levels, which is independently associated with increased cardiovascular disease risk. Since symptoms often manifest late, deficiency can progress silently for years before clinical detection.

Why Animal Foods Do Not Guarantee Adequate B12

Vitamin B12 deficiency is more common in vegans and vegetarians due to the absence of reliable B12 sources in plant-based diets. So, the common assumption is that it can be addressed simply by increasing consumption of animal-sourced foods.

However, evidence summarised by PAN India challenges this view. Vitamin B12 is not produced by animals themselves, but by specific bacteria – such as Proteobacteria (e.g. Rhodobacter, Rhodopseudomonas, many marine heterotrophs), Pseudomonas denitrificans, Propionibacterium / Propionibacterium freudenreichii. Animal-sourced foods contain Vitamin B12 only because of microbial synthesis within animals or through contamination along the food chain. **As a result, the presence of meat, dairy, or eggs in the diet does not guarantee adequate or bioavailable Vitamin B12 intake**.

This helps explain why Vitamin B12 deficiency is widespread across all dietary patterns in India. Although only around 30% of the population identifies as vegetarian, studies indicate that **more than 70% of Indians may be deficient in Vitamin B12** (PAN International, Vitamin B12 Deficiency in Disguise). Substantial losses during cooking, limited dietary diversity, and poor absorption contribute to deficiency even in diets that include animal products.

Absorption constraints further exacerbate this risk. Gastrointestinal conditions such as atrophic gastritis, Helicobacter pylori infection, inflammatory bowel disease, and post-surgical changes impair Vitamin B12 uptake. Commonly prescribed medications, including metformin and proton pump inhibitors, as well as age-related decline in intrinsic factor production and chronic alcohol consumption, further reduce bioavailability.

The Trade-offs of Relying on Animal-Sourced Foods

Importantly, reliance on animal-sourced foods as a primary response to Vitamin B12 deficiency also carries health trade-offs. Red and processed meat consumption is associated with a 25% increased risk of heart disease and a 20–30% higher incidence of type 2 diabetes, and regular consumption raises colon cancer risk by 18% (Li, Chunxiao et al., 2025; Enshaie E et al., 2025; Farvid MS et al., 2021). Addressing one nutritional gap by intensifying reliance on foods linked to other health risks underscores the limitations of narrow, product-focused solutions.

Fortification and Supplementation as Policy Solutions

Food fortification and targeted supplementation are essential public-health strategies for addressing widespread Vitamin B12 deficiency in India. Fortified foods – including cereals and plant-based milks – and supplementation, are especially important for high-risk groups such as pregnant women, older adults, individuals with malabsorption disorders, and those consuming predominantly plant-based diets. Despite the scale of deficiency, public awareness of Vitamin B12 requirements and the role of supplementation remains limited.

Vitamin B12 is one illustration of a broader pattern in modern food systems: Attempts to meet human nutritional needs through intensified animal production often generate new public-health risks, whether through infectious disease, antimicrobial resistance, or diet-related chronic disease. These are not separate failures – they are expressions of the same system

> ***The doctor of the future will give no medicine but interest their patients in the care of the human frame, in diet, and in the cause and prevention of disease.***
>
> **– Thomas Edison**

Systemic Vulnerabilities in Health and Food Systems

These systemic failures are reflected in concrete weaknesses across food, health, and education systems. The same gaps that enable excessive antibiotic use and environmental exposure also limit the translation of nutrition and public-health evidence into practice.

These vulnerabilities are embedded in wider food systems that prioritise scale and efficiency over nutrition, animal welfare, and sustainability. In doing so, they shape dietary inadequacy, environmental exposure, and growing reliance on medical interventions, including antibiotics usage. As climate stress intensifies pressures on food production and livelihoods, these structural weaknesses further amplify risks to public health.

At the same time, these food systems are major drivers of environmental breakdown. The global food system contributes approximately one-third of total greenhouse gas emissions, with more than half originating from animal agriculture. Compared with plant-based foods, animal-based products require substantially more land and freshwater, generate far higher greenhouse gas emissions, and accelerate biodiversity loss and environmental degradation.

Together, these dynamics reveal a single, interconnected crisis – where the same systems driving diet-related disease, infectious disease risk, and AMR are also destabilising the climate and natural ecosystems. Understanding this shared foundation is essential to addressing India's health emergency and building resilient, future-ready food systems.

Image Credit: Pexels.com

3

Animals, Agriculture, and the Climate Crossroads

Climate change is increasingly shaping food systems, ecosystems, livelihoods, and the lives of animals. The ways in which food is produced, processed, and consumed influence greenhouse gas emissions, land and water use, ecological stability, and rural resilience. Globally, and in India, animal agriculture plays a particularly significant role in shaping these outcomes.

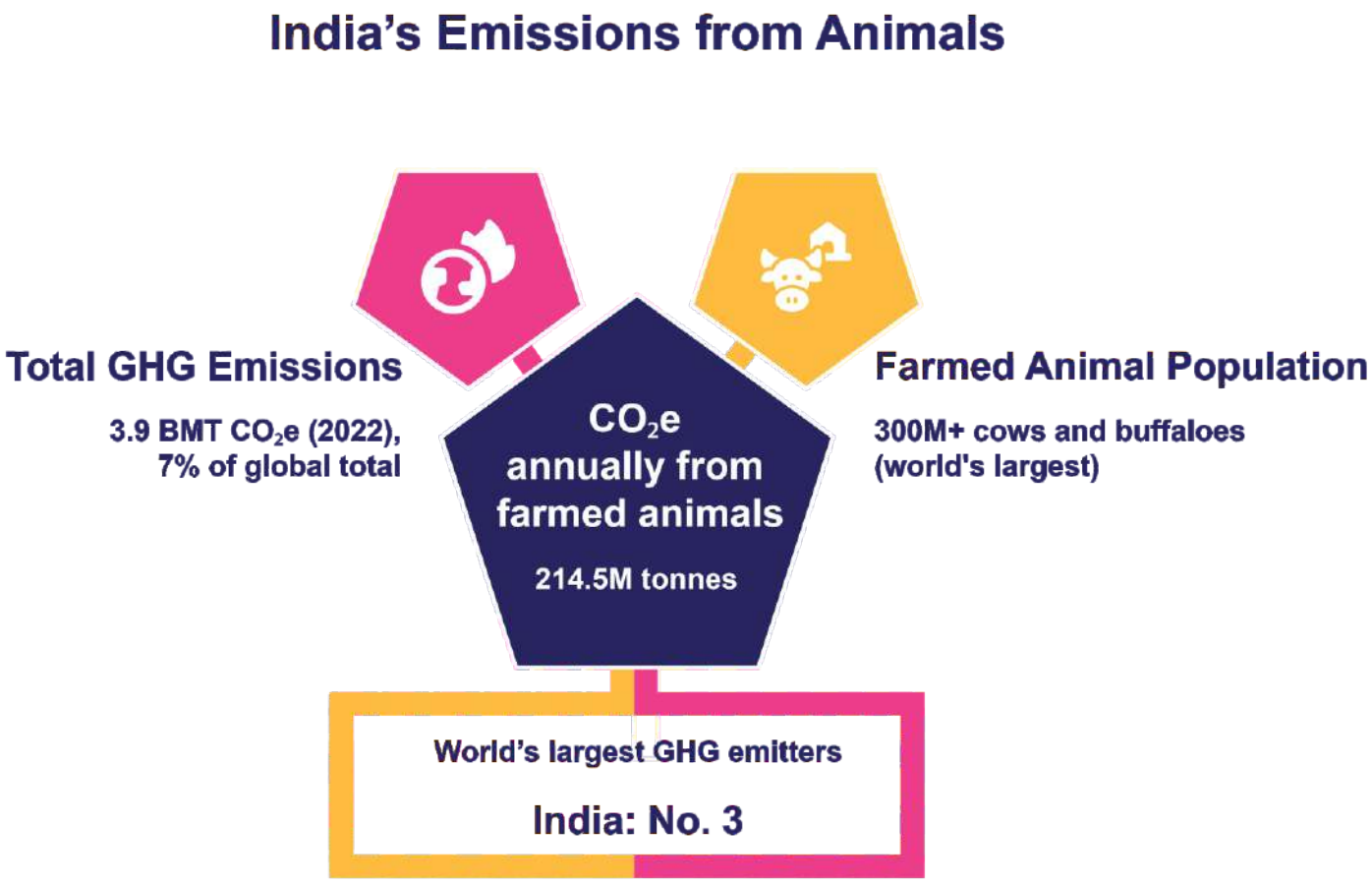
According to Recipe for a Livable Planet: Achieving Net Zero Emissions in the Agrifood System (World Bank, 2024), the global agrifood system generates almost one-third of total greenhouse gas emissions – averaging around 16 gigatons annually – underscoring the central role of food systems in climate mitigation.

Modern food systems have been built around scale and efficiency, with animals treated primarily as units of production rather than as sentient beings. This framing has enabled practices that intensify environmental harm while rendering animal suffering largely invisible. As climate impacts accelerate, the same systems that drive emissions increasingly expose both humans and animals to heightened risks, demonstrating how animals are both contributors to, and casualties of, the climate crisis.

More Than Half of Farm Emissions Come from Enteric Methane (54.8%)

Image Credit: We Animals

A cow on a family owned dairy farm stands tethered next to a large heap of cattle waste



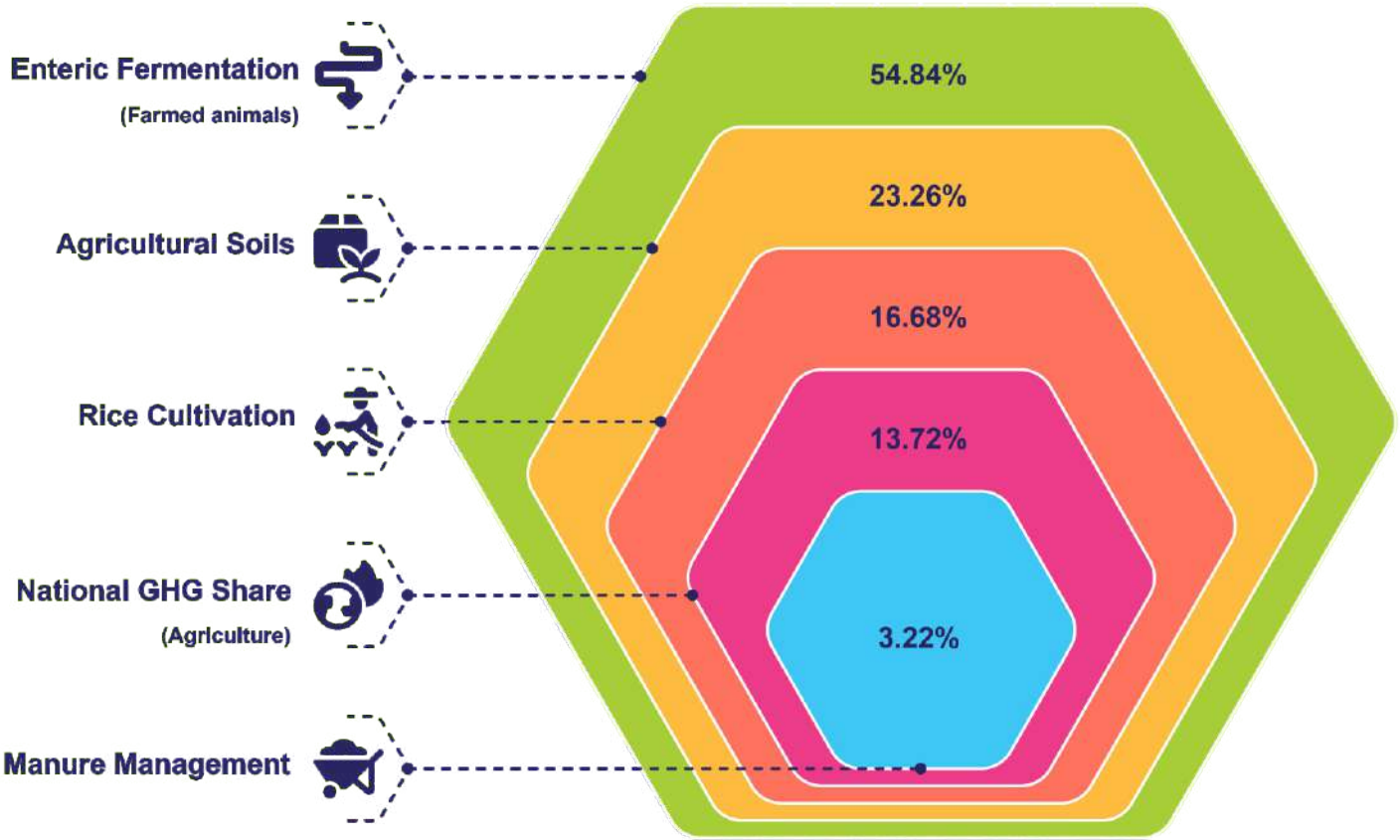
India hosts the world's largest farmed animal population, with over 300 million cattle and buffaloes. Farmed animals in India contribute approximately 214.53 million tonnes of CO_2-equivalent annually, including an estimated 80-115 million metric tonnes CO_2e from methane (CH_4) generated through enteric fermentation and manure management.

According to India's Fourth Biennial Update Report (BUR-4) to the United Nations Framework Convention on Climate Change (UNFCCC), agriculture accounted for 13.72% of national greenhouse-gas emissions in 2020. Within the sector, enteric fermentation alone contributed 54.84% of agricultural emissions, followed by 23.26% from agricultural soils, 16.68% from rice cultivation, and 3.22% from manure management, highlighting the dominant role of farmed animal-related methane within agricultural emissions.

In 2021, India became the world's third-largest GHG emitter, with a footprint of 3.78 billion metric tons (BMTs), following China and the United States. According to EDGAR (Emissions Database for Global Atmospheric Research), India's emissions in 2022 reached 3,943 million metric tons of CO_2e, representing 7.33% of global greenhouse gas emissions.

Ruminant animals account for most of the methane from farmed animals, with indigenous cows and buffaloes together contributing over 80% of animal agriculture methane nationally.

Agricultural Emissions Breakdown (2020)



At the local level, these national patterns are mirrored in production systems. A 2022 village-level study of a mixed crop and animal farming system found that animals accounted for about 60% of total agricultural greenhouse gas emissions, while crops contributed around 40%. Within animal agriculture systems, approximately 80% of emissions arose from methane produced through enteric fermentation in cows and buffaloes, with manure contributing the remainder. Crop-related emissions were driven mainly by nitrous oxide from synthetic fertilisers (around 60%), with methane from rice cultivation contributing approximately 25%.

Image Credit: Anamika Rana

A dairy colony where blocked drainage allows untreated bovine waste to accumulate on roads for months, turning public spaces into environmental contamination zones

Cutting Methane Could Reduce Emissions by 45% This Decade

India's emissions from animal agriculture remain a major contributor to greenhouse gases, with rising demand for animal protein increasing pressure on the sector. Several mitigation strategies have been identified to reduce emissions.

The Methane Story

1 Tonne CH_4 = 84 × CO_2

(over 20 years)

Methane is a potent, short-lived climate pollutant with a much higher warming effect than carbon dioxide over shorter time periods. According to the Intergovernmental Panel on Climate Change (IPCC), over a 20-year period, one tonne of methane causes about 84 times as much warming as one tonne of carbon dioxide.

The IPCC notes that the size of the remaining carbon budget and the ability to meet temperature goals depend on reductions in non-CO_2 greenhouse gases, including methane.

UNEP Global Methane Assessment:
Human-caused methane emissions could be reduced by up to 45% this decade

The United Nations Environment Programme's (UNEP) Global Methane Assessment finds that human-caused methane emissions could be reduced by up to 45% this decade. Key actions include fixing oil and gas leaks, capturing landfill gas, and improving animal and manure management across the fossil fuel, waste, and agricultural sectors.

Agriculture – particularly animal agriculture – accounts for a substantial share of global anthropogenic methane emissions. According to the UNEP Global Methane Assessment, agriculture accounts for about 40% of human-caused methane emissions globally, with enteric fermentation from farmed animals representing the largest share within the sector.

Enteric fermentation in ruminants, along with manure management, accounts for most methane emissions from animal agriculture systems globally.

In India, where enteric fermentation accounts for over half of agricultural emissions, these trends are especially significant.

While fossil fuels remain the dominant source of total greenhouse-gas emissions globally, methane reduction is identified as one of the most effective ways to slow the rate of warming in the near term.

Since methane has a much shorter atmospheric lifetime than carbon dioxide – about 12 years – reducing methane emissions can deliver measurable climate benefits within the next few decades.

Addressing methane emissions is closely tied to production systems that use animals. The IPCC identifies improvements in animal feeding, breeding, manure management, and herd health as key mitigation options within the agriculture sector.

Climate Change Threatens India's Smallholder Animal Agriculture Systems

Rising temperatures, altered rainfall patterns, and increasing heat stress are already affecting the productivity, reproduction, and survival of animals, while changing disease dynamics and declining forage quality threaten food security. These impacts affect smallholder farmers, who own about 80% of animals in agricultural systems in India.

Globally, animal agriculture supply chains account for approximately 14.5% of total anthropogenic greenhouse-gas emissions.

Global Impact of Animals in Agricultural Systems
14.5% of total global
anthropogenic GHG emissions

A study in Nature Food finds that animal-based foods account for approximately 57% of global food-related greenhouse gas emissions, compared with about 29% from plant-based foods.

Image Credit: We Animals

Massive build-ups of poultry manure beneath sheds releases ammonia and other hazardous gases into the environment

Approximately 80% Of the World's Soybean Crop Is Used for Animal Feed

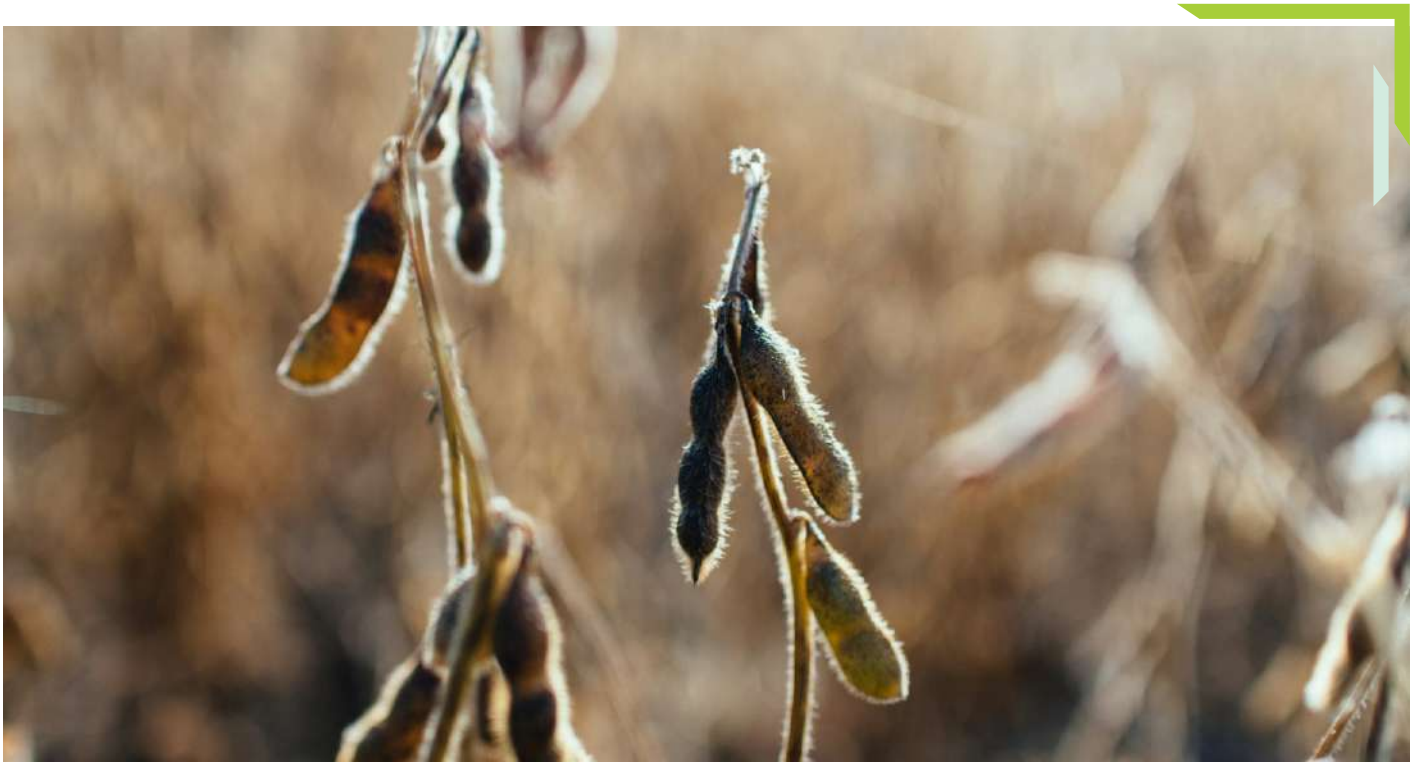
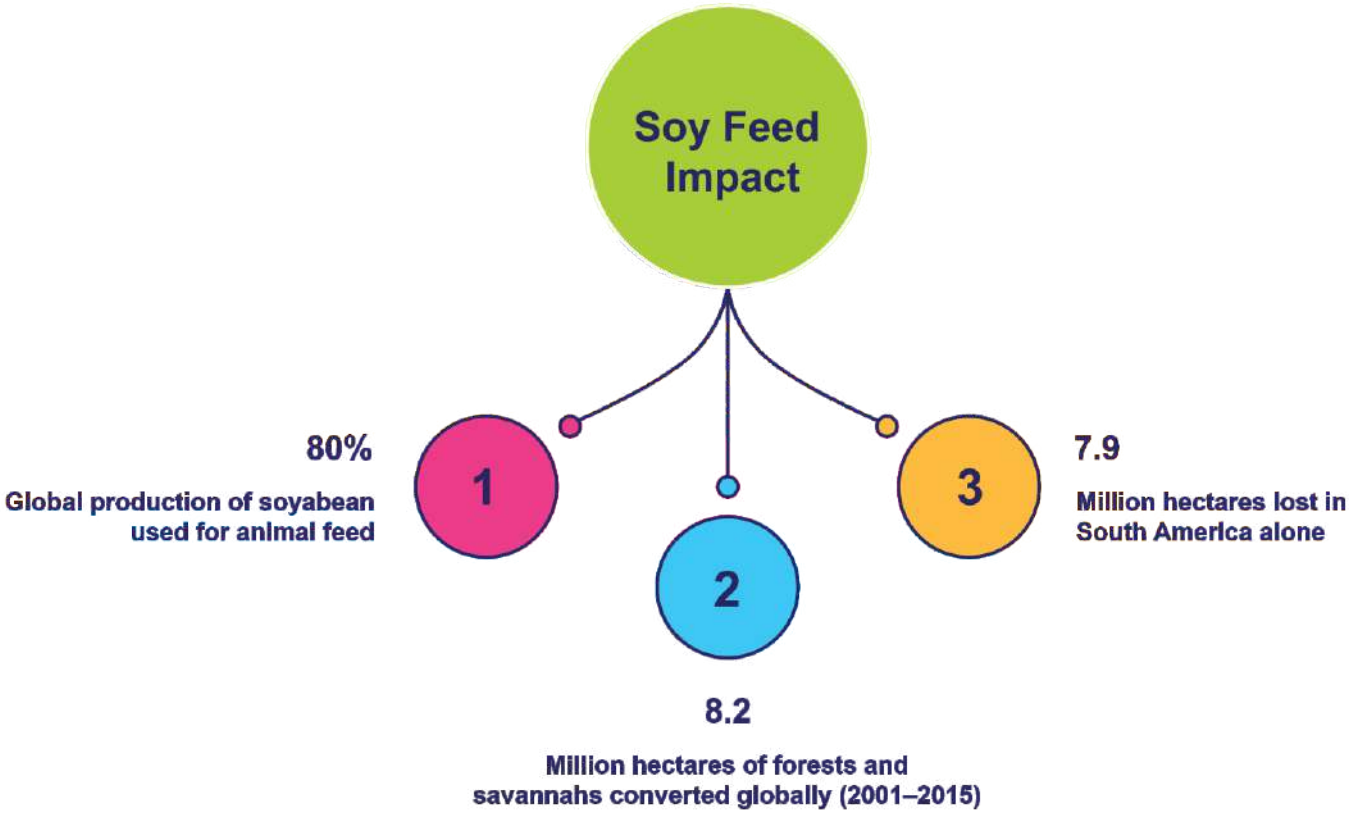


Image Credit: Unsplash.com

Soy beans in a field that are ready for harvest

Beyond emissions, animal agriculture also places heavy demands on land, water, and nutrient resources. Approximately 80% of the world's soybean crop is used for animal feed, supporting meat, dairy and egg production. This increasing demand has had significant ecological impact, driving the conversion of over 8.2 million hectares of forests and savannahs globally between 2001-2015, with 7.9 million hectares lost in South America alone.



These global feed and land-use patterns have direct implications for carbon storage. Land-use change associated with agricultural expansion releases carbon stored in vegetation and soils and reduces future sequestration potential. IPCC's Sixth Assessment Report identifies land-use change as a major driver of AFOLU (Agriculture, Forestry, and Other Land Use) emissions.

Beyond emissions and land use, the scale of modern dairy production generates significant environmental externalities at the local level. **In India, dairy farms with more than 500 cows or buffaloes are classified under the 'Red' category – denoting high pollution potential** – by the Central Pollution Control Board (CPCB), placing them among the most environmentally impactful industrial categories in the country.

Pollution Index (PI) is calculated based on expected impacts on air emissions, water pollution and hazardous waste generation

The category of the sector is decided based on the following ranges of PI:

i. Red: PI> 80,
ii. Orange: 55 ≤ PI < 80,
iii. Green: 25 ≤ PI < 55,
iv. White: PI < 25;

125 sectors are classified under 'red category' including dairy having bovines >500

Animals Bear the Burden

Rising temperatures expose animals in agricultural systems to chronic heat stress, reduce productivity, and increase susceptibility to disease. Extreme weather events – including floods, droughts, and heatwaves – cause direct mortality among farmed animals and wildlife alike, while habitat loss linked to deforestation and land conversion further compounds these pressures.

Climate change therefore affects animals not only because of production systems but as living beings experiencing direct physiological stress, displacement, and heightened vulnerability.

From Emissions to Solutions

Image Credit: Pexels.com

Sliced plant-based sausage and other plant-forward alternatives are a way to reduce the environmental impact of diets

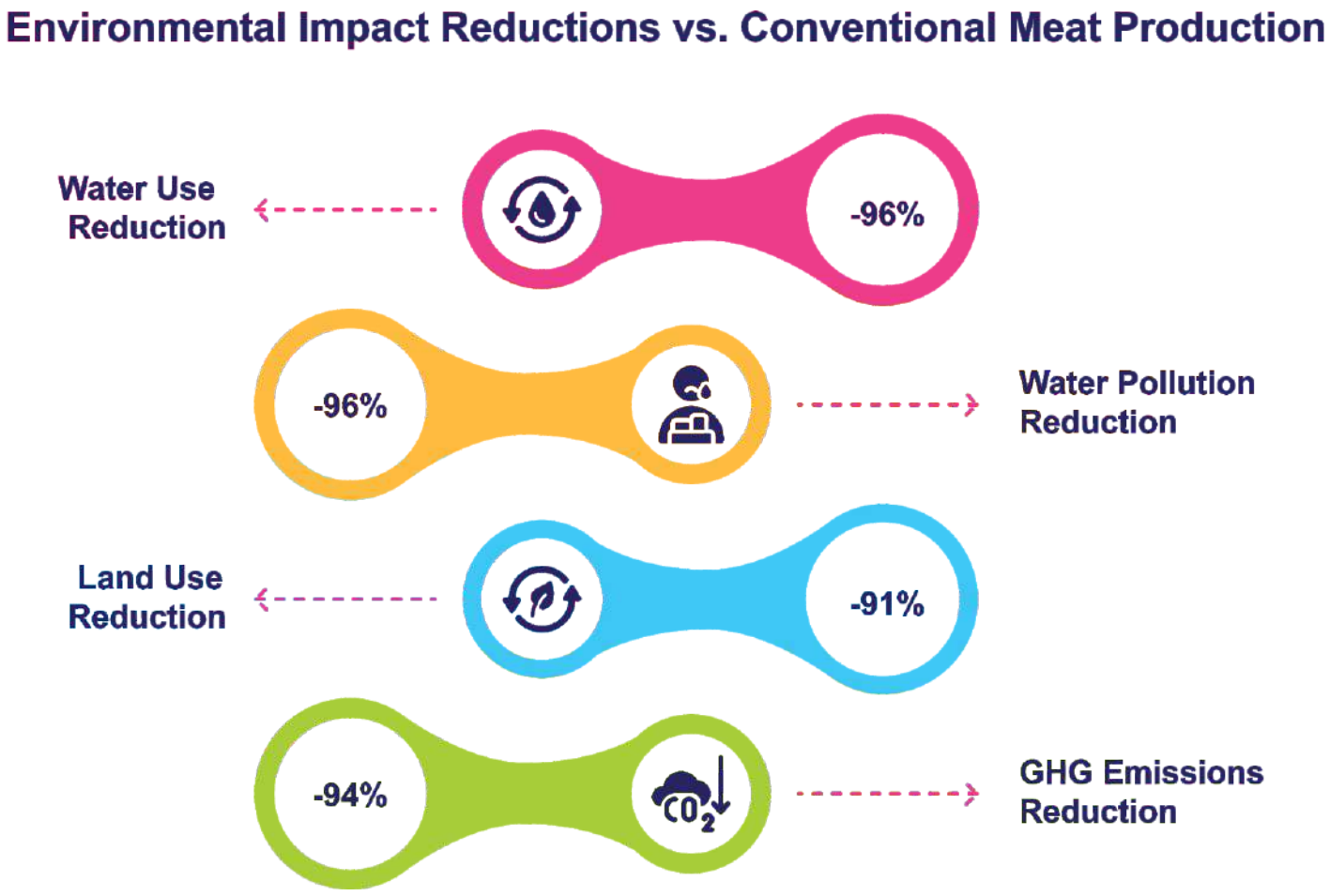
Transitioning toward plant-based dietary patterns – centred on foods already familiar to most Indian households – offers a powerful pathway for reducing the environmental impacts of diets, as plant-based foods generally require less land and water and emit fewer greenhouse gases than animal-based foods.

Pulses, legumes, *dals, chana, rajma*, and peas – long the backbone of traditional Indian diets – are among the most environmentally sustainable protein sources. Pulses obtain much of their nitrogen from the air through biological nitrogen fixation in their root systems, enriching soil fertility and reducing the need for chemical fertilisers.

The Physicians Association for Nutrition endorses legumes, pulses, nuts, seeds, tofu, tempeh, and whole grains as the "healthiest and more environmentally sustainable protein options".

India's national dietary guidance reflects this emphasis on plant proteins. The Indian Council of Medical Research's National Institute of Nutrition (ICMR-NIN) "Balanced Plate" model recommends pulses, beans, and other plant sources as primary protein components of daily meals, underscoring that plant-based eating is a mainstream public-health recommendation rather than a niche dietary choice.

Global scientific consensus reinforces this shift. The EAT-Lancet Commission concluded that **feeding the world's population within planetary boundaries requires a substantial reduction in red meat consumption and a transition toward plant-based foods** – vegetables, fruits, whole grains, legumes, and nuts.



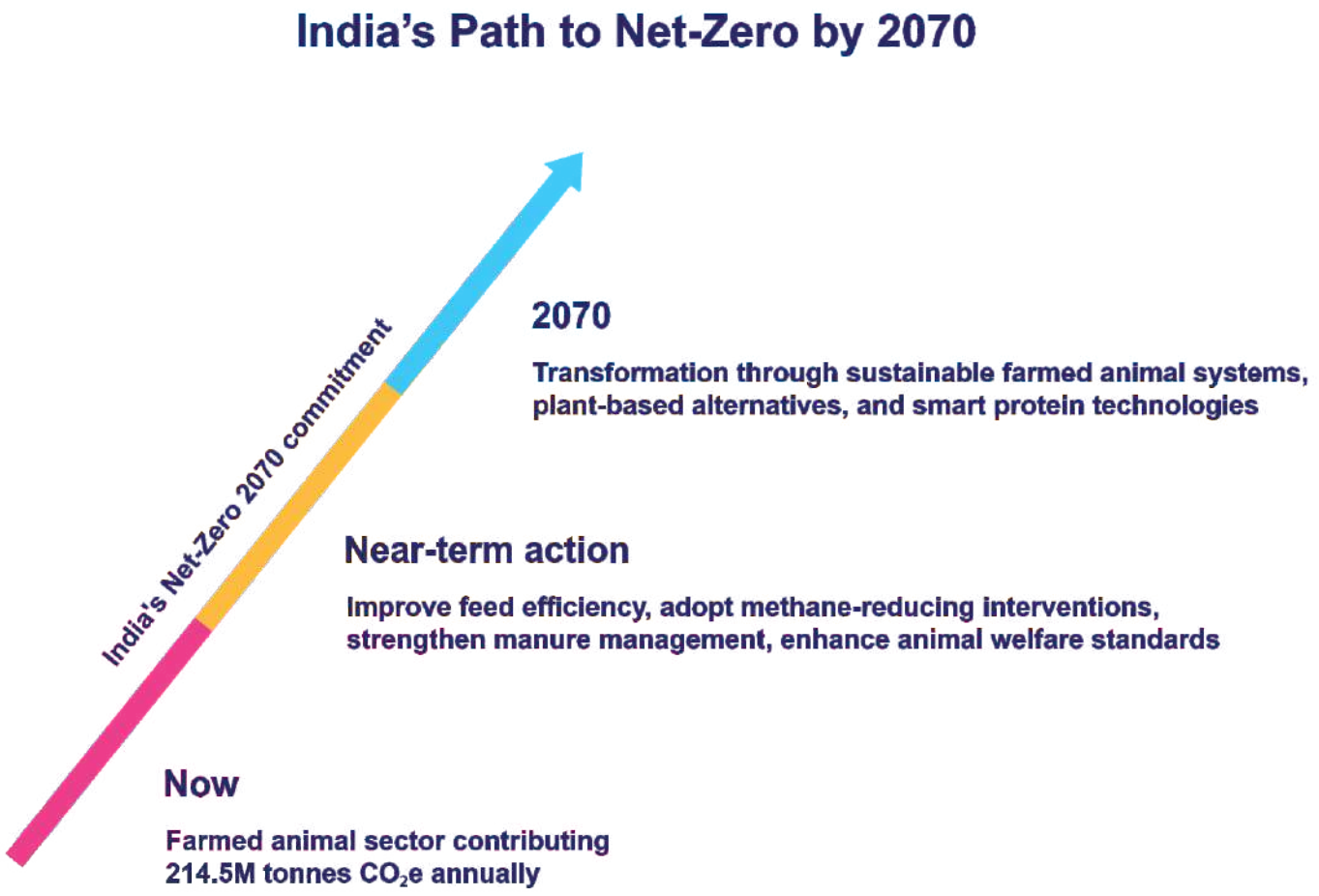
Another approach receiving increasing attention is the development of plant-based meat alternatives.

Plant-based meat products – meat-like foods that replicate the taste and texture of animal-derived meat but are made from plant-derived ingredients – are increasingly seen as a pathway to reduce reliance on conventional animal agriculture. According to a 2021 MarketsandMarkets report, the global plant-based meat market is projected to grow from $7.9 billion in 2022 to $15.7 billion by 2027 at a compound annual growth rate of 14.7% (MarketsandMarkets, Plant-Based Meat Market Report, 2021).

Analyses of the environmental impacts of plant-based meat indicate that production can use up to 96% less water and up to 91% less land than conventional meat production. Further, plant-based systems may cause up to 96% less water pollution and emit up to 94% fewer greenhouse gas emissions, depending on the product and life-cycle assessment boundaries (Good Food Institute, "What is plant-based meat?").

Footnote: These estimates are based on life-cycle modelling studies and depend significantly on energy sources and production scale.

The United Nations Environment Programme's Global Environment Outlook 7 (GEO-7) – the most comprehensive scientific assessment of the global environment to date – identifies reduced conventional meat consumption as one of the most effective food-system interventions for delivering environmental benefits across climate, land, water, and biodiversity systems. The report emphasises that demand-side dietary shifts, alongside improvements in production efficiency, are essential for achieving global environmental and climate targets.



With India setting a target of achieving net-zero carbon emissions by 2070, experts are looking at promoting sustainable animal agricultural systems. This includes improving feed efficiency, adopting methane-reducing interventions, strengthening manure management, enhancing animal welfare standards, and aligning production more closely with sustainable dietary patterns.

Transforming food systems will require investment in smart protein technologies, support for farmers transitioning toward more plant-based production, and the promotion of affordable, high-quality alternatives that reduce pressure on animals, ecosystems, and the climate.

Image Credit: Canvas V

Plant-based options are increasingly becoming available at most restaurants; on the other hand, many staple Indian dishes are easy to convert to plant-based

4 Pathways Forward: Building a One Health Future for India

The evidence is clear. India faces interconnected crises in public health, climate stability, and animal welfare – manifestations of food systems that have evolved over decades to prioritise volume over welfare, short-term output over long-term sustainability, and economic efficiency over ethical responsibility. Non-communicable diseases (NCDs) account for 63% of all deaths in India, with cardiovascular diseases alone causing 27% of all deaths. Livestock contribute 214.5 million tonnes of CO_2-equivalent emissions annually. Approximately 2 billion animals endure systematic suffering in production systems designed to treat them as units rather than as sentient beings.

These are not separate challenges requiring separate solutions. The One Health framework recognises what conventional approaches obscure: Human health, animal welfare, and environmental sustainability are inseparable. When animals are confined in conditions that compromise their welfare, when production systems rely on routine antibiotics to manage disease pressures created by overcrowding, and when methane emissions and liquid pollution from intensive agriculture accelerate climate change and degrade the environment, the consequences are what we are now experiencing. These are predictable consequences of systems designed without consideration for the wellbeing of animals, people, or the planet.

What would it look like if our interventions made welfare outcomes visible, shifted economic incentives, built institutional capacity, and created systemic changes across governance, economics, law/ policy, and culture? The question is not whether transformation is necessary, but how do we enable it systematically, rapidly, and at scale.

Addressing these crises requires action across three interconnected fronts: Systemic reform, market interventions, and governance and implementation. This chapter traces each – from embedding welfare into institutions and shifting food markets, to breaking silos and operationalising **National One Health Mission** (NOHM) – before setting out a vision for what transformation looks like over the decade ahead.

The Highest-Impact Levers for Transformation

The fundamental challenge is that we have built systems where animal suffering is structurally invisible and economically rewarded. Progress requires interventions that make welfare outcomes visible, shift economic incentives, and build institutional capacity. The most effective levers operate simultaneously across governance, economics, law, and culture, creating systemic pressure until welfare becomes the default.

1. Embed Welfare into Institutions: India possesses extensive institutional infrastructure that reaches animals but does not prioritise their welfare. The highest-impact lever is embedding welfare mandates, metrics, and accountability into existing systems. Consider the National Dairy Development Board's network reaching 17 million farmers. If welfare standards – proper veterinary care, limitation on forced lactation cycles, care for unproductive animals, humane handling protocols – became a prerequisite for milk procurement, the entire sector's incentive structure would shift.

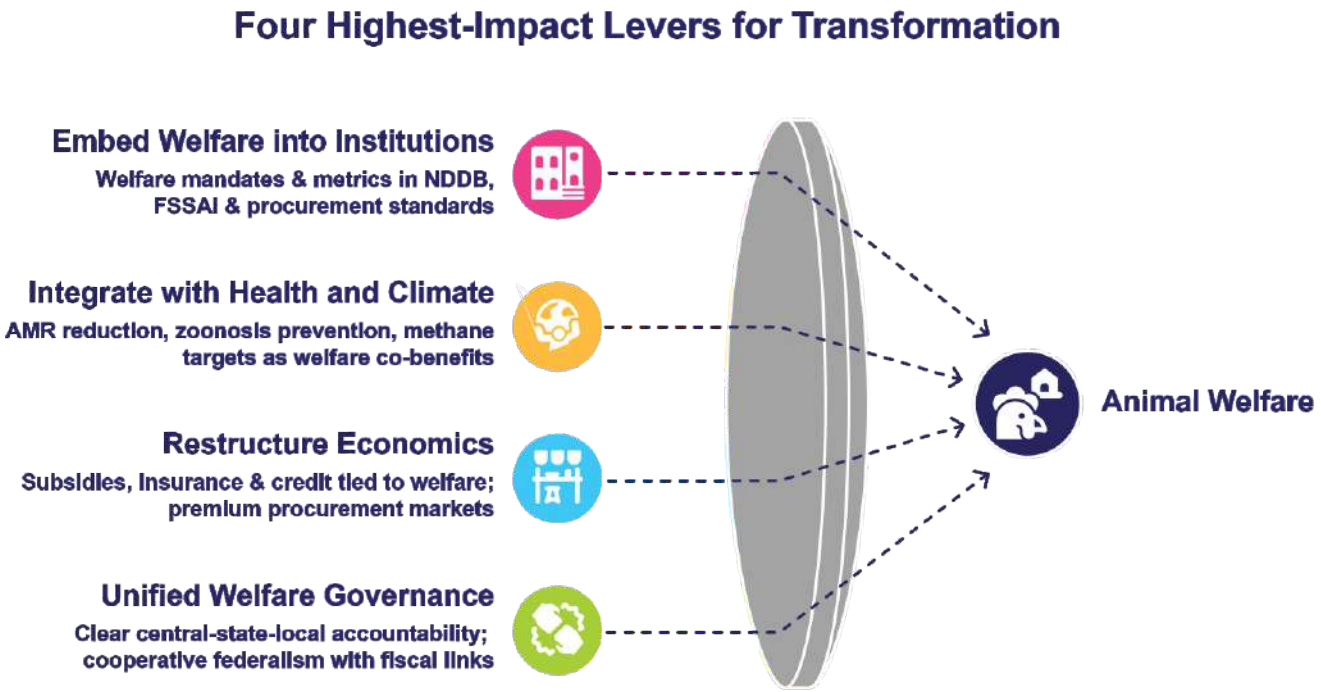
2. Integrate with Health & Climate: Animal welfare is not competing with urgent health and environmental concerns – *it is essential to solving them*. When framed correctly, welfare improvements unlock budgets, political will, and public support already directed at health, environment, and food security.

Across Asia, the most compelling One Health examples arise where animal welfare improvements reduce stress, disease pressure, and chemical dependence, producing measurable benefits for public health, food safety, and antimicrobial resistance (AMR).

Animal welfare is a determinant of disease emergence and amplification. Chronic stress in farm animals leads to immunosuppression, increasing susceptibility to endemic disease and raising reliance on antibiotics. Intensive industrial systems have been repeatedly identified by the Food and Agriculture Organisation of the United Nations (FAO), the United Nations Environment Programme (UNEP), and World Organisation for Animal Health (WOAH) as high-risk environments for disease emergence, mutation, and rapid spread, including avian and swine influenza strains.

During the 2017 fipronil egg contamination crisis, which affected South Korea, Taiwan, and parts of Europe, contamination was directly linked to chemical parasite control practices in poultry systems. **Cage-free systems were not implicated in contamination cases in Taiwan**, which aligns with findings showing that systems enabling natural parasite control reduce reliance on hazardous chemicals, lowering risks to consumers and workers.

The WHO calls for ending routine antibiotic use in healthy animals, identifying prevention through better husbandry and



welfare as essential to tackling AMR. Climate commitments require reducing animal agriculture emissions – bovine enteric fermentation alone account for 54.84% of India's agricultural GHG emissions.

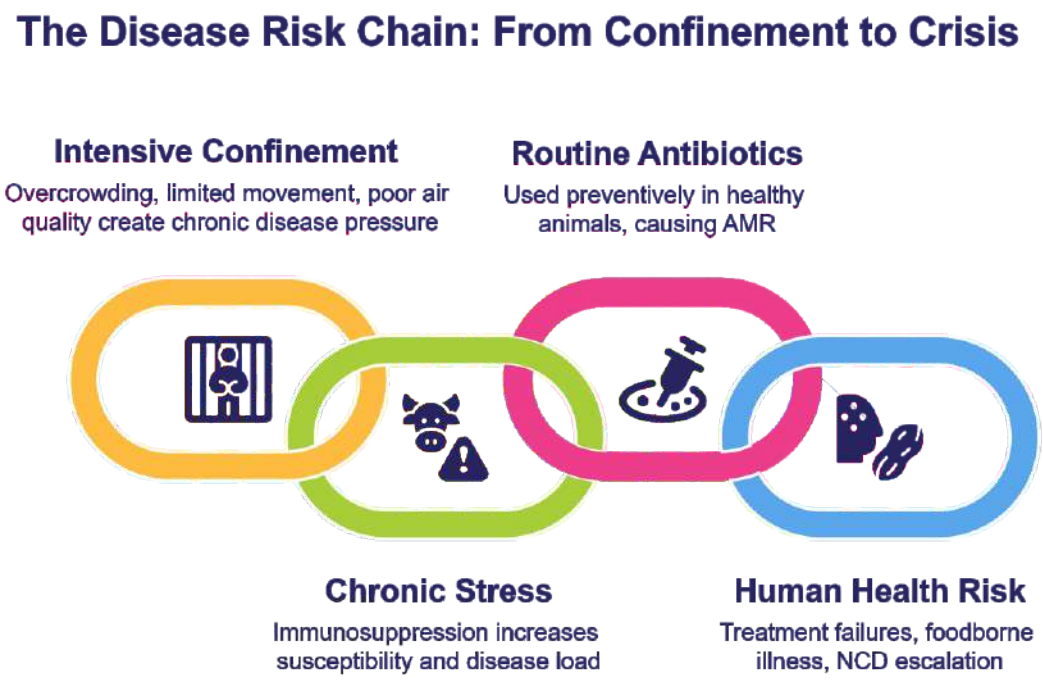
The scale of this challenge is significant. According to the UN FAO, Indian per capita poultry meat consumption alone is projected to increase by 850 per cent by 2040. The 2024 World Bank report, 'Recipe for a Livable Planet,' ranks alternative proteins second globally for climate mitigation potential, at 6.1 $GtCO_2eq$ per year – outranked only by afforestation/ reforestation – underscoring the urgency of shifting India's protein systems.

Around 70% of global antibiotics are used in livestock production, driving antimicrobial resistance (AMR) that could cause up to 10 million deaths annually by 2050.

A joint report by the International Livestock Research Institute (ILRI), Consultative Group on International Agricultural Research (CGIAR), and UNEP identifies two of the seven most likely causes of the next pandemic as increasing demand for animal protein and industrial animal farming – risks that are directly addressable through welfare reform and protein system diversification.

3. Restructure Economics: Farmers operate within economic constraints making welfare improvements financially unviable without external support. The lever is restructuring economics: subsidy criteria rewarding welfare practices, procurement policies creating premium markets, insurance recognising lower disease risks, credit access tied to welfare compliance, and transition support for farmers moving to higher-welfare systems. Policy reforms should include sustainable farming incentives, subsidies for plant protein clusters, and inclusion of plant-based proteins indefence sector procurement, mid-day meals, in the Integrated Child Development Services Scheme (ICDS), and *anganwadi* programmes.

4. Unified Welfare Governance: Change requires central, state, and local governments each playing distinct roles with adequate resources. Clear accountability defining each tier's responsibilities creates the foundation for systemic change.



Translating Commitment into Immediate Action

These systemic levers require translation into specific, implementable interventions. The following actions can begin immediately within existing institutional frameworks.

Shifting Food Markets Through Institutional Demand: The fastest way to shift a food system is for the state to become the primary customer. When public institutions – railways, canteens, mid-day meals – are mandated to source a percentage of plant-forward, climate-resilient proteins like millets and pulses, we create a stable market that incentivises farmers to shift from resource-intensive animal agriculture. Institutional procurement shifts are among the most scalable interventions for reducing agricultural methane.

Priority interventions include plant-forward procurement and menu standards in colleges and universities, hostels, workplaces, and public canteens; scaling weekly default programmes using campaigns such as the Green Tuesday model (a campaign designed to help corporates and educational institutions reduce their environmental footprint by making small changes in the food they serve), institutionalising plant-based mass-catering training, and adopting accreditation, annual reporting, and recognition systems that sustain participation and normalise plant-forward leadership across institutions.

Policy Instruments for Market Transformation: Tax incentives, including lower GST rates, can make plant-based alternatives more competitive within existing market structures. Integrating plant-based meals into institutional settings can help normalise these foods at scale. Incorporating plant proteins into public nutrition schemes such as the Public Distribution System and mid-day meal programmes links sustainability objectives with public health outcomes. Clear sustainability labelling supports informed consumer choice, while corporate commitments expand product availability and reinforce market transition.

Image Credit: Rubina Iyer

Hens in a cage-free poultry farm allowing them to exhibit their natural behaviours like nesting, perching, dust bathing and foraging

Eleven WHO South-East Asia Member States are implementing National AMR Action Plans embedding multisector (including animal health) engagement

Breaking Institutional Silos: Effective implementation will require overcoming bureaucratic silos through cooperative federalism – incentivising states via central grants linked to measurable One Health compliance metrics. Beyond national implementation, global and regional frameworks reinforce the same integration logic.

The WHO-FAO-UNEP-WOAH Quadripartite One Health framework, renewed through 2030, integrates human health, animal health, environmental integrity, and food systems.

Eleven WHO South-East Asia Member States are implementing National AMR Action Plans embedding multisector (including animal health) engagement.

Climate policy is emerging as a silo-breaking lever as heat stress and climate volatility are now recognised as accelerants of disease and AMR risk in animals. Effective collaborations require clear goals, administrative coordination, practical pathways from policy to scale, economic framing including costs of inaction, and industry participation structured to support rather than dilute reform.

High-Impact Interventions Across Multiple Domains: Asia-focused One Health analysis identifies targeted interventions capable of delivering rapid and scalable impact across food, health, and climate systems. One category focuses on strengthening food safety through targeted consumer information, structured surveys, and formal transparency questioning.

The other centres on economic-linked interventions, using cost–benefit analysis to demonstrate that governments or consumers will pay more when risks remain unresolved.

The inefficiency of the current system is stark: According to the World Resources Institute, producing one calorie of chicken meat requires nine calories of crop feed.

77% of global agricultural land is used to either grow crops to feed animals or for grazing – which provides only one-third of global protein supply. Redirecting even a fraction of this productive capacity toward alternative proteins would yield significant gains for food security, emissions, and welfare simultaneously.

77% of global agricultural land is used to either grow crops to feed animals or for grazing – which provides only one-third of global protein supply

Climate action should focus on interventions that deliver multiple, demonstrable benefits – not just carbon reductions. Strengthening welfare standards can reduce antibiotic use and antimicrobial resistance (AMR). Corporate climate pledges can accelerate diversification and scaling of plant protein options aimed at flexitarians, particularly among higher-income consumers.

Health and nutrition interventions must address rising AMR linked to food and farming systems, alongside infections, foodborne disease, and non-communicable diseases (NCDs) associated with excessive or processed meat consumption. This requires resetting India's nutritional guidance to moderate meat consumption as incomes rise, mandating transparent reporting on NCD and infectious disease trends, limiting the density of quick-service outlets, and elevating affordable local pulses within modern diets.

Cost-effective solutions such as subsidies to make plant proteins affordable and widely available trigger broader policy signals. Targeted education helps policymakers see the opportunity cost of meat-heavy diets – not just in terms of loss of productivity due to illness, but also how they use up land, water, and feed that could deliver more affordable protein and better nutrition for people.

Operationalise the National One Health Mission (NOHM): Accelerating the operationalisation of the National One Health Mission (NOHM) through integrated surveillance and laboratory systems can strengthen India's response to zoonotic risks and antimicrobial resistance. As noted by the Plant-Based Foods Industry Association, coupling NOHM implementation with FSSAI-approved support for plant proteins can help reduce zoonotic risks by lowering dependence on animal-based food systems.

Image Credit: Pexels.com

Chickpeas are a nutrient-dense plant-protein, providing fibre, iron, folate and magnesium, making them a sustainable staple of plant-based nutrition

Complementary policy levers include using *Pradhan Mantri Kisan Sampada Yojana* incentives to expand plant-based processing infrastructure and grow the urban market by 20%; updating FSSAI labelling rules so plant-based products can use familiar dairy terms; and integration of nutritional literacy into primary education curricula. If these measures are built into existing national schemes and institutions, they are easier to implement and fit better within current government systems.

Challenges and Barriers to Transformation

However, effective implementation will require addressing economic, institutional, and behavioural constraints that shape implementation.

Economic and Financial Constraints: Farmers operate within tight economic margins that make welfare improvements or system transitions financially unviable without structured incentives and market support. Cold chain deficits, high capital expenditure, affordability barriers, pressure from the meat industry, and the need for farmer retraining make it harder to scale and diversify plant proteins.

Institutional and Governance Barriers: Bureaucratic silos and data-sharing gaps slow the rollout of the National One Health Mission. This fragmentation is compounded by India's federal structure, where agriculture is a state subject while standards are Central, creating jurisdictional inertia. Overcoming this requires cooperative federalism that incentivises states to prioritise compliance through aligned fiscal and policy mechanisms.

Institutional alignment is necessary but not sufficient; implementation is also shaped by economic and social realities that influence political and administrative action.

Social and Cultural Resistance: At the societal level, consumer behaviour and cultural norms play a central role in determining the pace of transition. Willingness to shift toward plant-forward diets is shaped by multiple factors. Health and environmental concerns are leading motivators, with animal welfare reinforcing long-term commitment. However, affordability, taste, and accessibility are critical to sustained adoption. Structural food environments often make conventional animal products more visible, convenient, and affordable, limiting those who want to eat plant-based from making the switch.

Institutional exposure and market availability play a decisive role in normalising plant-based options. Where institutions integrate plant-forward meals into routine offerings, adoption becomes easier and more socially accepted. Without parallel improvements in affordability, supply chains, and product visibility, consumer demand alone may be insufficient to drive systemic transition.

Behavioural and Market Barriers: Taste remains a non-negotiable threshold – no amount of sustainability or ethics messaging succeeds if food fails the palate. Price and affordability act as key barriers beyond urban youth. Dietary change is most sustained when food is culturally familiar, practical, and aligned with lived realities.

Sustained behaviour change depends less on persuasion than on systems that make better choices the default. Building those systems defines the pathway to long-term transformation.

Designing the Next Decade of Change

Over the next decade, success will mean that animal welfare becomes an operational reality embedded in governance, economics, law, and culture – not an aspiration requiring constant advocacy.

Plant-forward Food Systems: Success will require food systems to shift toward plant-forward models that are mainstream, affordable, and convenient. Diversified, climate-smart agriculture will need to move beyond rice-wheat dominance, supported by circular supply chains that reduce waste to 5% while boosting nutritious outputs such as pulses and fermented proteins.

Institutional demand will be central to this transition. A 50% increase in plant-based consumption across public and private institutions would replace significant animal-based meals, while FMCG companies reformulate products and substitute animal-derived ingredients. Expanded and affordable plant-based supply, rising by 50%, would enable retailers to increase shelf space and lower price barriers, reinforcing market shift.

These structural shifts in production, procurement, and supply reshape dietary patterns at scale, creating the conditions for measurable public health gains.

Public Health Transformation: Achieving measurable reductions in diet-related disease burdens will require the normalisation of plant-rich dietary patterns and expanded food literacy. Lower rates of diabetes and cardiovascular disease, driven by greater consumption of whole plant foods, would strengthen nutritional security.

Integrated surveillance systems would need to enable predictive electronic health records and AI-supported outbreak prevention, while effective One Health integration would aim to reduce zoonotic outbreaks, demonstrating the interconnected gains of system redesign.

Asia-focused One Health analysis identifies success as the adoption of science-based, EAT-Lancet-aligned national nutritional guidance influencing corporate, institutional, and public practices; declining non-communicable diseases linked to high meat diets; decoupling rising incomes from rising meat consumption through socialised plant-forward norms; and demonstrable reductions in antimicrobial resistance (AMR) and antibiotic use in animals, verified through transparent national surveillance systems.

Health metrics, in this context, become evidence of systemic transformation rather than isolated medical intervention.

From Welfare Aspirations to Welfare Infrastructure: Achieving meaningful animal welfare progress over the next decade will require sustained reductions in demand for animal products, accompanied by a shift in social norms toward recognising animals as sentient beings. As consumption patterns change, industrial animal production would need to contract, with welfare embedded in food policy, corporate practice, and consumer expectations.

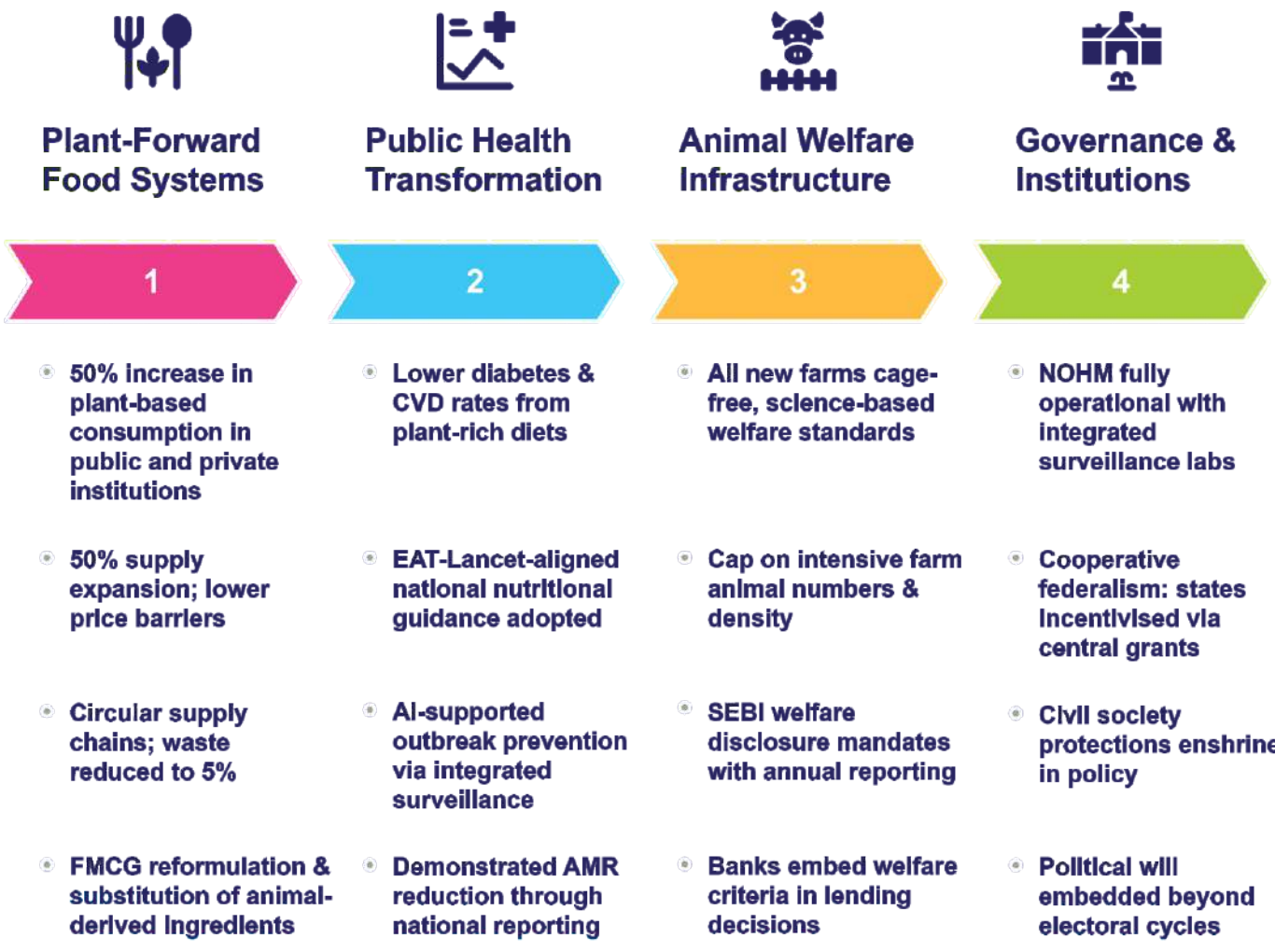
Regulatory reform would be central to this transition. A cap on the number and volume of intensively raised farm animals would shift production away from high-density industrial systems toward lower-volume, higher-welfare models aligned with EAT-Lancet principles.

All new farms would need to operate cage-free under science-based minimum welfare standards, ideally aligned to Farm Animals Responsible Minimum Standards. National regulations governing humane slaughter and production would require consistent enforcement, and the avoidance of mutilations and low-welfare procedures would become standard practice.

Financial and market accountability mechanisms would further entrench compliance. The Securities and Exchanges Board of India (SEBI) could mandate meaningful animal welfare disclosures with annual progress reporting, while banks incorporate welfare criteria into lending decisions. In this model, welfare compliance becomes economically reinforced rather than voluntarily declared.

Essential Structural Shifts: Taken together, these reforms point toward a deeper transformation: moving systems from welfare that occurs when convenient to welfare that is structurally embedded. Institutional durability – not temporary momentum – determines whether reform endures. Realising this shift will require embedding political will beyond electoral cycles, strengthening enforcement capacity at the ground level, restructuring economic incentives, integrating welfare across health and environmental governance, and safeguarding civil society's ability to act.

Vision for the Next Decade



How Change Happens: Consumer Behaviour, Markets, and Policy

Transformation requires understanding what actually drives change and how different forces interact. Structural reform shapes the environment, but dietary transition ultimately depends on how individuals respond within it.

What Motivates Dietary Transition: Individual preference operates within structural constraints. Current food environments make harmful choices default, convenient, and cheap. Before taste, price, or ethics matter, options must exist. Availability shapes preference – when nutritious, plant-forward meals are ubiquitous, they become normalised.

Health and sensory appeal – taste and texture – are the strongest drivers of willingness to shift in India, followed by animal welfare and ethics. Price and affordability act as key barriers. In the 2025 Food for People and Health motivation survey, leading stated motivators were environment/planet (40.5%), health (38.1%), and animals (18.9%).

From a clinical and public-health perspective, individuals are more motivated by improvements they can feel, such as more energy, weight loss, and improved glucose numbers, than by abstract long-term risk reduction. Dietary change is most sustained when food is culturally familiar and palatable. Population-level interventions such as subsidies, procurement policies, and taxation change behaviour more reliably than education alone because they alter the default environment. Community-based, peer-supported interventions improve adherence by reinforcing social accountability.

Healthful plant-forward diets emphasising whole grains, legumes, vegetables, fruit, and nuts are associated with meaningful reductions in cardiometabolic risk and lower incidence of type 2 diabetes. The latest ICMR-INDIAB analysis shows that modest substitution of carbohydrate with plant protein sources is associated with lower metabolic risk.

Image Credit: Rubina Iyer

A cage-free poultry farm made possible through sustained advocacy, sensitisation, and policy change pushing the industry beyond battery cages

Taste remains a non-negotiable threshold. India's advantage lies in its plant-rich culinary heritage; regional specialties built around pulses and vegetables represent indigenous wisdom increasingly displaced by fast-food homogenisation. The intervention is cultural reclamation: Positioning plant-forward eating as an upgrade associated with health, environment, and cultural pride rather than restriction.

When cultural motivation aligns with supportive market and policy conditions, change becomes self-reinforcing.

The Reinforcing Cycle: Consumer behaviour change, market response, and policy support interact in a reinforcing cycle. Behaviour change campaigns provide structured support, increasing trial of plant-based alternatives. Vegan Outreach's Food for People and Health (FPH) Programme data shows strong demand pull: 83.1% believe diet impacts animals, health, and environment, and 90.9% want to eat more plants.

Consumer demand stimulates product availability and innovation. Veganuary's 2026 campaign partnerships illustrate this market response: Nature's Basket running vegan workshops, Chaayos adding oat milk options, and Hilton Hotels partnering with GoodDot for Plant Protein Culinary Festivals.

Institutional support scales and stabilises transition. Vegan Outreach's **2024 FPH programme** reached 72,739 students across 1,062 National Service Scheme units. Green Tuesday operationalises this shift through menu redesign and training, reporting 80% partner renewal year-on-year.

Effective collaboration requires embedding health into food-policy decisions through Health-in-All-Policies approaches: Mandating health impact assessments for agriculture and food regulations and including clinicians on technical advisory bodies. Mandatory regulation often delivers the fastest gains – trans-fat bans and strict labelling produced measurable improvements. Chile's front-of-pack labelling and Mexico's sugar-sweetened beverage tax demonstrate how health evidence can legitimise fiscal tools. Protections from industry interference remain essential.

Policy, markets, and behaviour reinforce one another when aligned around clear incentives. When these forces converge, transformation becomes durable and self-reinforcing.

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From Crisis to Transformation

India possesses the institutional capacity, cultural foundations, and policy tools needed to lead this transition. *Ahimsa* runs through our philosophical traditions; our Constitution enshrines compassion for living creatures. Yet contradictions persist: Cultural reverence coexisting with industrial confinement.

Environmental justice, public health, and worker dignity are not parallel struggles; they reflect a shared structural failure in how animal production systems are designed. Animal freedom is inseparable from environmental justice, public health, and human dignity.

The pathways are clear: Embed welfare into institutions; integrate welfare into health and environmental priorities; restructure economic incentives; ensure coordinated governance; operationalise NOHM; strengthen transparency; and align procurement with reform.

These interventions reshape the system itself, moving from welfare that happens when convenient to welfare that is structurally embedded and compelled.

Continuation of current trajectories is unsustainable. Climate pressures, pandemic threats, and ecological degradation leave diminishing room for delay.

The evidence, expertise, institutional capacity, cultural foundation, and economic logic exist. What remains is sustained political commitment, adequate funding, and coordinated implementation across Central and State governments.

The transformation India needs is within reach. Whether it is realised deliberately or forced by crisis will depend on the choices made in the decade ahead.

Note

This chapter draws on expert inputs from the following organisations: Asia Research and Engagement (ARE), Good Food Institute (GFI), Humane World for Animals, Physicians Association for Nutrition (PAN India), People For Animals Public Policy Foundation (PFA PPF), Plant-Based Foods Industry Association (PBFIA), Veganuary, and Vegan Outreach.

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