

# Farming systems for One Health

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*'One Health' is a comprehensive and integrative framework that recognizes the intricate connections between the health of humans, animals, and the environment. This multidisciplinary approach emphasizes collaboration across various sectors and disciplines, operating at local, national, and international levels. Its ultimate aim is to ensure optimal health outcomes for humans, animals, plants, and the ecosystems they share. In an era of increasing global interdependence, One Health represents a critical paradigm for addressing complex health challenges that transcend traditional boundaries.*

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**I**N the concept of One Health, the health of each component such as humans, livestock and environment are equally important. But to describe the concept, it is better to start with human health. It is the complete physical, mental, and social well-being, not merely the absence of disease or infirmity. It encompasses the dynamic interactions between biological, psychological, and environmental factors that influence an individual's overall functioning and quality of life. Human health can be defined broadly in three dimensions such as physical health, mental health and social health. These can be further defined as follows.

**Physical health:** The optimal functioning of the body's systems, including the absence of illness or injury and the ability to perform daily activities effectively.

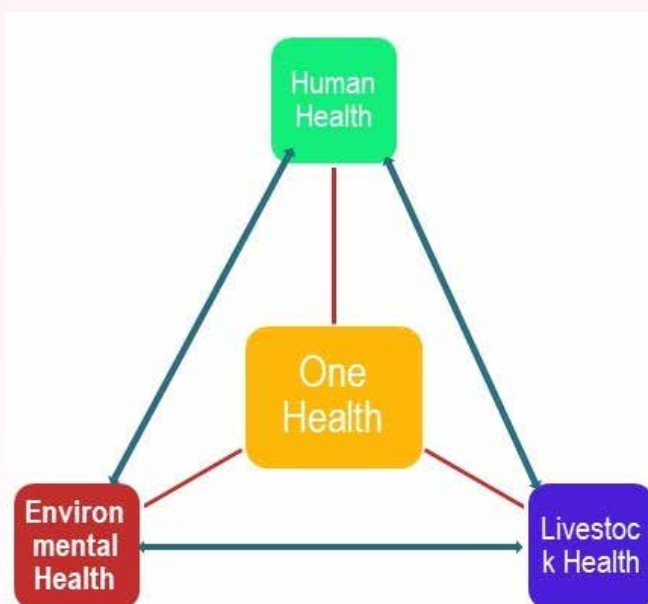
**Mental health:** Emotional, psychological, and cognitive well-being, enabling individuals to cope with stress, maintain relationships, and make decisions.

**Social health:** The ability to interact positively with others and engage in meaningful societal roles and relationships.

A holistic approach to human health recognizes its interconnectedness with animal health, ecosystem integrity, and societal well-being, as emphasized in frameworks like the One Health concept. This approach underscores the importance of promoting sustainable practices, equitable healthcare access, and global collaboration to achieve optimal health outcomes for all.

Human health is influenced by various determinants

such as lifestyle, socio-economic conditions, and environmental factors besides genetics. All first three, i.e. lifestyle, socio-economic conditions, and environmental factors which a human face on a daily basis is primarily affected by their income and its certainty. Indian farming is characterized by very meager monthly income of less than ₹ 10,000 due to small and fragmented landholdings and inefficiency in



Interconnectedness of human health, environmental health and livestock health

resource utilization. Over 85% of farmers are classified as small and marginal, owning less than 2 hectares of land. The average size of operational holdings has declined from 2.28 hectares in 1970-71 to 1.08 hectares in 2015-16, reflecting increased fragmentation due to population growth and inheritance practices which makes the farm income generated, insufficient to cover the rising costs of inputs, healthcare, and education.

Farming forms the backbone of human survival, supporting food security, livelihoods, and economic development while profoundly impacting environmental and animal health. Within the One Health framework, farming occupies a central stage as it bridges the interconnected domains of human, animal, and environmental health. Sustainable agricultural practices not only nourish growing populations but also safeguard ecosystems and mitigate risks of zoonotic diseases, antimicrobial resistance, and biodiversity loss. As the world's population soars, farming must evolve to balance productivity with sustainability, ensuring long-term resilience and harmony across health systems.

India, with its agrarian heritage and diverse farming practices, stands as a crucial player in advancing the One Health agenda. The nation is home to approximately 17% of the global population and contributes significantly to global food production, particularly in staples like rice, wheat, and pulses. However, the challenges of climate change, over-reliance on chemical fertilizers, water scarcity, and deforestation have underscored the urgent need for transformative agricultural policies. Indian farming has the unique potential to integrate traditional wisdom with modern innovations, such as organic farming, agroforestry, and climate-smart techniques, to address these challenges holistically. Moreover, India's livestock sector plays a dual role in supporting rural economies and global protein supplies but must contend with zoonotic disease risks and greenhouse gas emissions.

Through a proactive One Health approach, Indian farming can serve as a model for sustainable development. By promoting biodiversity conservation, reducing overuse of antibiotics, and adopting eco-friendly practices, the agricultural sector can mitigate the risk of pests and diseases while enhancing ecosystem resilience. As a global leader in policy innovation and grassroots mobilization, India has the opportunity to influence sustainable farming systems worldwide, aligning human and planetary health for a more secure and prosperous future.

### Origins and evolution of One Health

The concept of One Health dates back to the 1970s when Robert Schneider and his team conducted groundbreaking studies on cancer incidence in companion animals to draw parallels with human cancer risks. These investigations laid the foundation for a broader understanding of the interconnectedness between human and animal health. In 1978, Calvin Schwabe's seminal book, *Cattle, Priests, and Medicine*, articulated this interconnectedness and introduced the

term 'One Medicine,' which would later evolve into 'One Health.'

The concept gained further prominence in 2007 when the American Medical Association formally endorsed a One Health resolution, underscoring its relevance in modern healthcare and public health strategies. However, the COVID-19 pandemic marked a pivotal moment for One Health. The World Health Organization (WHO) recognized the urgent need to adopt this framework to address the multifaceted interactions between humans, animals, plants, and ecosystems. The pandemic highlighted how disruptions in one domain can have cascading effects, emphasizing the importance of holistic approaches to global health.

### Environmental health: Safeguarding our planet

Environmental health forms the bedrock of the One Health paradigm, encompassing terrestrial and aquatic ecosystems that are increasingly imperiled by human activities such as urbanization, industrialization, and climate change. These stressors disrupt ecosystem services, including air and water purification, soil fertility, and biodiversity, all of which are essential for sustaining life.

### Key models and challenges

To assess and manage ecosystem health, scientists utilize frameworks like the Vigor–Organization–Resilience (VOR) model. This model evaluates an ecosystem's productivity, biodiversity, and resilience, providing valuable insights into its ability to withstand and recover from disturbances. However, significant gaps remain in quantifying the direct impacts of human activities on ecosystems, complicating efforts to devise effective conservation strategies.

### Climate change and biodiversity loss

Climate change and biodiversity loss stand as two of the most urgent global challenges. Rising temperatures, deforestation, and habitat destruction not only endanger countless species but also heighten the risk of zoonotic diseases—diseases transmitted from animals to humans. Biodiversity plays a vital role in combating climate change by sequestering carbon and nitrogen, thereby helping to mitigate global warming. However, the rapid rate of deforestation, particularly in countries like India, which saw a significant increase between 1990 and 2020, highlights the pressing need for sustainable policy measures to protect natural habitats and preserve biodiversity.

### Livestock health: A pillar of rural economies

Livestock health is integral to economic stability, food security, and the livelihoods of millions, particularly in low- and middle-income countries (LMICs). Livestock accounts for approximately 33% of global protein intake, with demand increasing rapidly. However, the livestock sector also contributes significantly to greenhouse gas emissions, exacerbating climate change and threatening the very systems it supports.

### Zoonotic diseases and antimicrobial resistance

Approximately 75% of emerging infectious diseases, including avian influenza, brucellosis, and tuberculosis, originate in animals. These zoonotic diseases underscore the profound interconnections between human and animal health. Additionally, the misuse and overuse of antibiotics in livestock farming have accelerated the emergence of antimicrobial resistance (AMR). If unchecked, AMR could lead to a global health crisis, with an estimated 10 million deaths annually by 2050.

### Human health: A historical and cultural perspective

The harmony between humans and nature has been a cornerstone of traditional health philosophies worldwide. Indian farming communities, for instance, have long emphasized the balance between humans, animals, and the environment, aligning with ancient practices that advocate holistic well-being. From Hippocrates' promotion of healthy diets and exercise to the principles of Ayurveda, these traditions resonate with the One Health ethos.

However, the modern era has witnessed a growing disconnect between humans and their environment. Urbanization, deforestation, and unsustainable consumption patterns have disrupted this balance, leading to adverse health outcomes for both humans and ecosystems. Addressing these challenges necessitates coordinated, multisectoral efforts that integrate traditional wisdom with modern science.

### Interlinkages and the path forward

Indian farming lies at the heart of the One Health concept, exemplifying the intricate interlinkages between human health, animal health, and the environment. The challenges of Indian agriculture

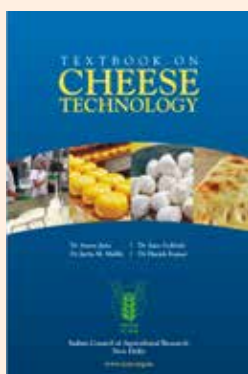
such as small landholdings, declining productivity, and environmental degradation amplify the need for a unified approach to address zoonotic diseases, climate change, and biodiversity loss. The promotion of biodiversity conservation through afforestation and wildlife corridors can enhance ecosystem resilience, directly supporting farming systems by maintaining soil health and regulating pest populations. Transitioning to sustainable agriculture, particularly for small and marginal farmers, is critical to reducing environmental damage caused by intensive practices and minimizing greenhouse gas emissions. Moreover, public awareness campaigns tailored to farming communities can emphasize the importance of adopting eco-friendly methods, reducing the misuse of antibiotics, and protecting natural habitats. Integrating these efforts into cohesive policies will ensure that health, environmental, and economic goals align to safeguard the future of Indian farming and its pivotal role in the One Health framework.

### SUMMARY

The One Health framework provides a comprehensive approach to tackling some of the world's most urgent challenges. By embracing proactive, inclusive, and collaborative strategies, societies can work toward a healthier and more sustainable future. With its vast biodiversity and rich cultural heritage, India holds a unique position to spearhead global efforts in applying One Health principles. Through unified action, we can secure the health and well-being of our planet and its people for generations to come.

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