The Impact of the International Livestock Research Institute

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A short summary slide deck

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For the High-level Roundtable on "The impact of livestock research on sustainable development – looking back to accelerate future food system transformation"

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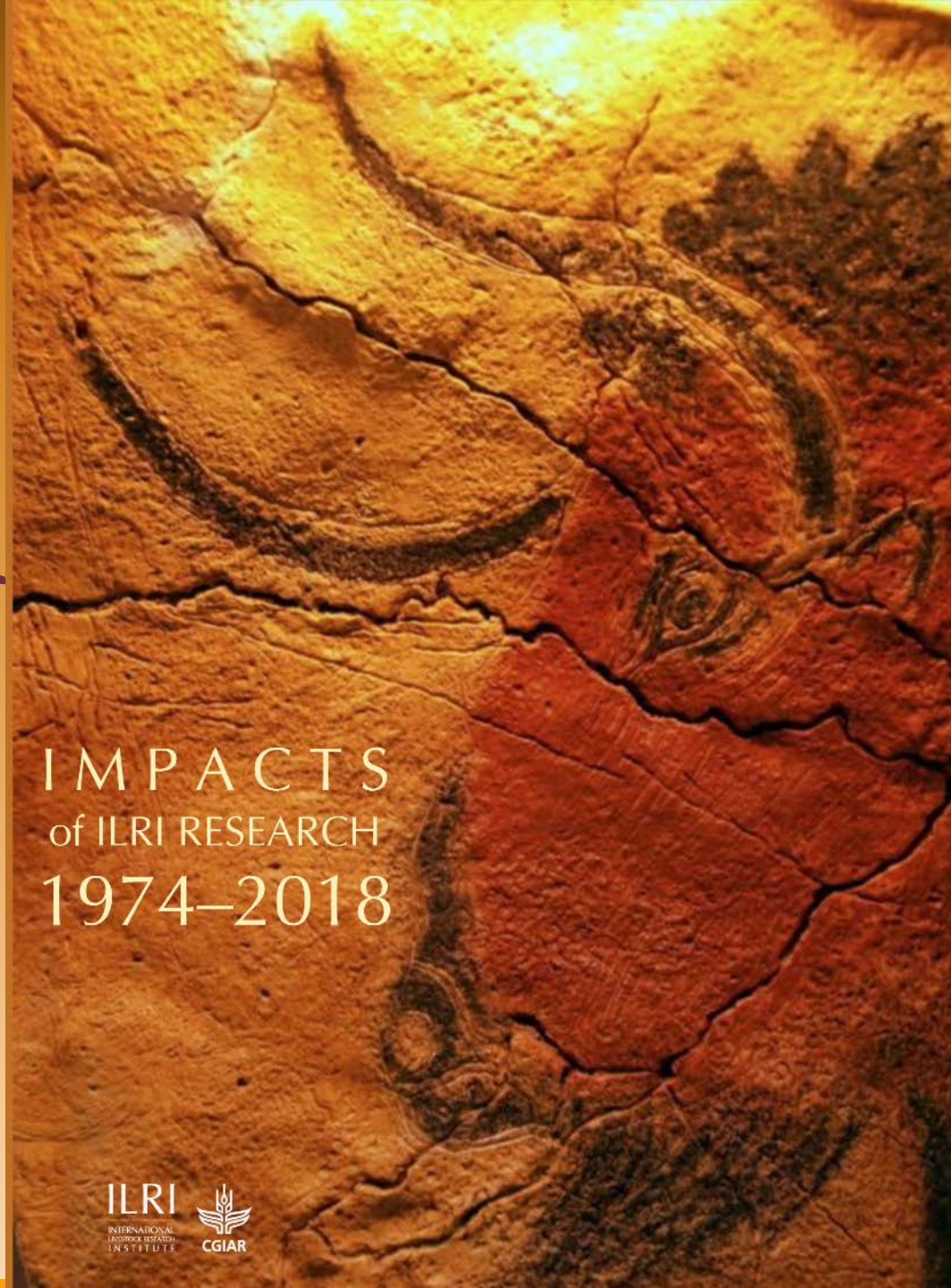


Overview of the book

This book focuses on achievements, failures and impacts of the International Livestock Research Institute (ILRI) and its predecessors, the International Livestock Centre for Africa (ILCA) and the International Laboratory for Research on Animal Diseases (ILRAD). Scientific review of impacts and research more than an institutional history. Each chapters focuses on: what were the research problems? How relevant were those problems? What were the principal scientific achievements? What were the principal development achievements? What were the principal capacity development achievements?

Selected achievements

- Contributing to the global movement to reduce policy barriers to growth of African agriculture.
- Providing the analytic base and advice or the reform of Kenyan dairy marketing, producing national benefits in net present value terms of US$230 million.
- Description of refining policy responses to the rapid expansion of global livestock trade beginning in the 1990s.
- Developing the analytic and operational basis of an index-based livestock insurance policy, which is now in commercial use in eight counties of Kenya.
- Development of livestock masters plans to enable a policy and regulatory environment that allows animal agriculture to contribute to growth and poverty reduction.
- Advancing the introduction of a gender perspective into programmes across CGIAR, which forced changes in the design and conduct of research programmes that lessened the bias against the economic potential of women, which is particularly acute in the livestock sector given the importance of animal production to women's wealth and income.

Introduction: The evolution of IARC livestock research, 1975-2018

The international community invested more than US$1.8 billion in global livestock research from 1975 to 2018. Most of this investment has been publicly financed in one institution – what is now ILRI – and most of that investment has been in sub-Saharan Africa.

The impact of ILRI research is therefore an important subject, given the size of the investments, the effects of livestock production and consumption on income, wealth, the environment and health, both human and animal, and the potential benefits of research for production costs, consumer welfare and the environment.

This introduction traces the creation, evolution and achievements of ILRI and its predecessors as background to the thematic chapters that explore impacts in specific scientific fields. The chapter begins by introducing the scale of the livestock research problem in sub-Saharan Africa in the mid-1970s at the time of the creation of ILRI's predecessors, the International Livestock Centre for Africa (ILCA) and the International Laboratory for Research on Animal Diseases (ILRAD) and the subsequent changes in demography, land use and input use as they affected ruminant livestock production and productivity.

The chapter then describes the history of the international livestock research institutions in sub-Saharan Africa, focusing on ILRI (1995–present), ILCA (1974–1994) and ILRAD (1973–1994), with some reference to the Centro Internacional de Agricultura Tropical (CIAT), International Center for Agriculture Research in the Dry Areas (ICARDA) and other international institutions. In describing that history, it discusses their research priorities, budgets, institutional evolution and achievements from 1975 to 2015. It then frames the thematic parts of the book, which evaluate ILRI's scientific and development impacts.

The remaining parts of the book cover the major themes of ILRI's work.

1. Livestock Genetics and Breeding

Five challenges informed the historical research priorities in livestock genetics and breeding at ILRI:

- Develop vaccines against African animal trypanosomiasis and theileriosis (East Coast fever)
- Understand trypanotolerance - genetic tolerance in animals against trypanosome parasites
- Understand the genetics of environmental adaptions in African livestock, especially diseases and climate challenges
- Exploit the genetic diversity of indigenous African livestock
- Amass research data on the breeds and genotypes to inform cross-breeding programmes

Genetic research ➤ created unprecedented levels of awareness of the unique potential of African and Asian livestock, an awakening that led to improved conservation and use of indigenous animals

Genetics and genome mapping ➤ helped to unravel the history of African and Asian livestock and to identify new opportunities in dairy and poultry businesses

Advanced reproductive technologies ➤ generated the first cloned African indigenous transgenic livestock, a Boran bull

2. Control of Pathogenesis in Animal African Trypanosomiasis: A search for answers at ILRAD, ILCA and ILRI 1975-2018

African animal trypanosomiasis (AAT), a serious disease of the tropics and subtropics, can kill 50–100% of cattle within months of exposure.

The disease is caused by parasites transmitted by the tsetse fly vector and predominantly occurs in sub-Saharan Africa, where the annual cost has been US$1.3 billion.

Animal trypanosomiasis can be managed with using three strategies:
(i) vector control/eradication;
(ii) use of trypanocides; and
(iii) use of trypanotolerant breeds of cattle

Laboratory work ➢ established the first methods for cultivating bloodstream stages of the trypanosome parasite, which causes sleeping sickness, opening up research in many fields over the next decades
Molecular work ➢ established that development of a conventional vaccine against the trypanosome parasite was unlikely due to its elaborate genetics, which were then used as models for gene expression research
Immunology work ➢ led to the world's most advanced understanding of the bovine immune system and its response to parasites

3. Tsetse and trypanosomiasis control in West Africa, Uganda, and Ethiopia: ILRI's role in the field

African animal trypanosomiasis (AAT) occurs wherever the tsetse fly vector exists in sub-Saharan Africa, affecting ruminants, camels, horses and pigs. 67 million cattle – around 27 per cent in Africa - live in tsetse-infested areas.

AAT involves three species of parasite, namely *Trypanosoma congolense*, *T. vivax* and *T. brucei*. *T. vivax* can also be transmitted mechanically by biting flies, and thus is also found in tsetse-free regions and in Central and South America.

Two related parasites, *T. brucei subsp. gambiense* and *T. brucei rhodesiense*, cause human African trypanosomiasis (HAT), also known as sleeping sickness. Livestock and wildlife act as reservoirs.

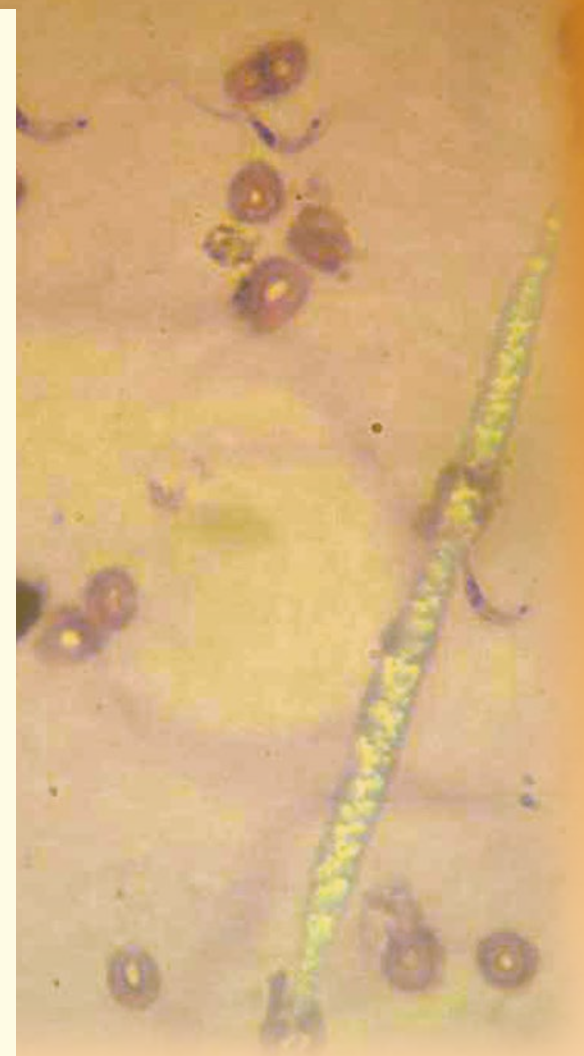
Trypanosomes undergo antigenic variation and each species has an unknown number of strains. Hence, no vaccine is currently available.

This chapter reviews the earlier field work of ILRAD followed by ILRI after 1994 in East and West Africa, including the engagement of those institutions with regional and global initiatives.

African animal trypanosomiasis, commonly called sleeping sickness ➤ arguably the single most important disease of the single most important livestock species (cattle) in Africa, creating annual losses as high as one-third of the continent's livestock GDP

Trypanosomiasis research ➤ promoted use of cattle breeds that tolerate infection with the causative parasite, community-based control of the tsetse fly vector of the parasite, and rational drug use to reduce parasite resistance to trypanocides

Field research on trypanosomiasis ➤ determined that rational use of curative and preventive trypanocidal drugs is the most sustainable and scalable control option



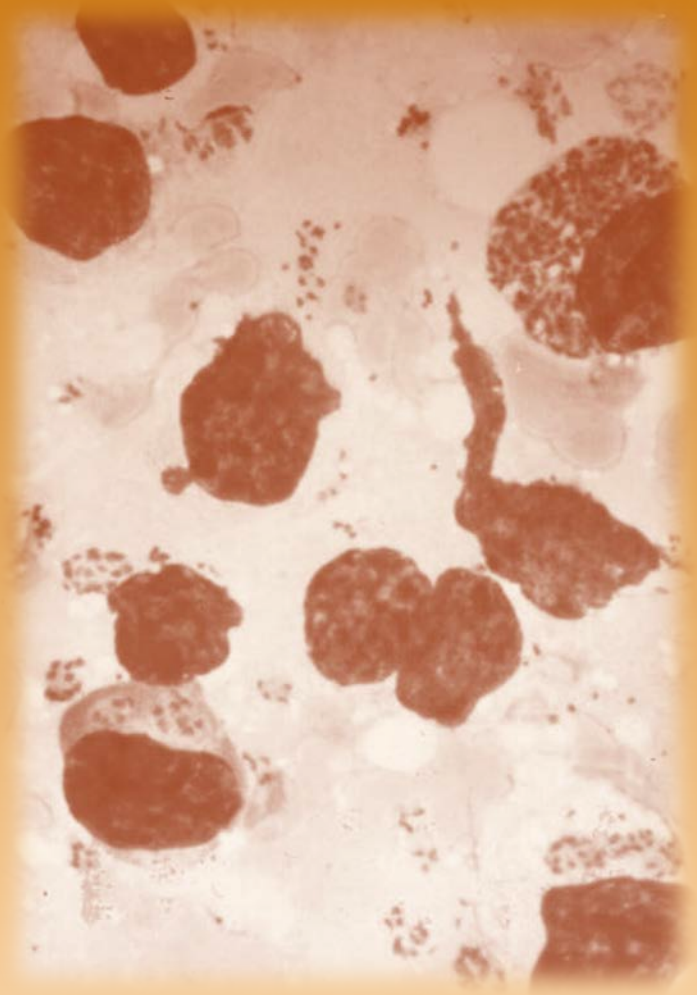
4. Impact assessment of immunology and immunoparasitology research at ILRAD and ILRI

In tropical Africa, African animal trypanosomiasis constitutes a major obstacle to the development of animal production, causing major economic losses as the animals suffer emaciation and anaemia, resulting in reduced meat and milk production and draught power. Mortality in cattle can reach a rate of 50–100% within months of exposure and there are substantial losses from the exclusion of cattle from regions where the disease is prevalent.

Theileriosis, commonly known as East Coast fever (ECF), is another parasitic disease which is fatal to cattle and is also caused by a protozoan parasite, *Theileria parva*. ECF occurs in 12 countries in eastern, central and southern Africa, where the tick vectors of this parasite are found. ECF causes major economic losses by affecting both dairy cattle and young Zebu cattle in pastoralist systems and ranches, causing mortality, stunting of calves and reduced milk production, which reduces household food and nutritional security. Indirect losses include the lack of adoption of more productive breeds of cattle and the costs associated with ECF prevention and control.

The classic form of ECF control has been to spray acaricides to kill the ticks. Beginning in the 1970s an immunization procedure was developed against ECF, which involved inoculation with live *T. parva* sporozoite forms and simultaneous treatment with a dose of the antibiotic oxytetracycline. The development of a vaccine to protect cattle against ECF was one of the founding aims of the International Laboratory for Research on Animal Diseases (ILRAD), a forerunner of ILRI.

Bovine immunology and immunoparasitology ➢ developed a comprehensive suite of monoclonal antibodies and other tools to better define the bovine immune system.
Bovine immunology and immunoparasitology ➢ identified the mechanisms of immunity that kill protozoan parasites or limit their growth and led to refinement and use of an infection-and-treatment method for immunizing cattle against East Coast fever.
Veterinary immunology tools and outputs ➢ elucidated some components and functions of the bovine system before their discovery in mice or humans and showed the way forward for human malarial vaccine research.



5. Veterinary epidemiology at ILRAD and ILRI 1987 – 2018 - A Review

Effective detection and control of animal diseases depends on a solid understanding of their dynamics and impacts, through scientifically sound qualitative and quantitative methods by trained personnel.

Veterinary epidemiology characterizes patterns of animal diseases in the resolution of animal and human health problems. This discipline exploits an increasing inventory of tools for effective data gathering, assembly and analysis, modelling and reporting, all targeted at decision making by producers, governments and international development agencies.

Integrating epidemiology with agricultural economics and other social sciences provides a uniquely effective tool for evaluating disease constraints on broader development agendas, for assessing their absolute and relative economic importance, and for evaluating the costs and benefits of alternative intervention options at different levels from farm to global.

Furthermore, veterinary epidemiological and economic impact sciences are key components in a number of the global grand challenges relating to disease control, climate change and food security.

Integration of veterinary epidemiology and agricultural economics ➢ provided reliable assessments of tropical livestock disease burdens and their impacts on broader development agendas

Veterinary epidemiology ➢ provided reliable assessments of the costs and benefits of implementing different methods of controlling tropical livestock diseases

Veterinary epidemiological and economic impact sciences ➢ increased understanding of infection dynamics and generated a wealth of methodologies and approaches that have since been applied in every corner of the world

6. The Management and Economics of East Coast Fever

ECF has been controlled predominantly through acaricide application, but this treatment is expensive and not always successful. An alternative option is for farmers to keep local breeds of cattle, which tend to be more disease resistant but less productive than exotic breeds. It is widely accepted that vaccination is the most attractive control option.

At about the time of ILRAD's establishment in 1973, a vaccination procedure was being developed at the East African Veterinary Research Organization (EAVRO) at Muguga, Kenya. Whilst safe and very effective when administered correctly, the production and delivery of this live ECF vaccine is complicated, expensive and time consuming, and at the time of ILRAD's founding, there were doubts as to whether such a procedure was commercially viable.

East Coast fever research ➢ played pivotal roles in reducing the lethal cattle disease East Coast fever in the 12 African countries where it is endemic and in producing a commercial 'live' vaccine against the disease

East Coast fever research ➢ enabled immunization of hundreds of thousands of cattle at risk of East Coast fever among Africa's poor pastoral herders and dairy farmers

East Coast fever research ➢ sequenced the genome of the causative parasite—only the second apicomplexan protozoan ever to be sequenced—which was an essential step in enabling the screening of parasite antigens of potential use in vaccines

7. Transboundary Animal Diseases

Transboundary animal diseases (TADs) are high-impact, highly contagious diseases. TADs often cause high morbidity and mortality in susceptible animal populations, as well as serious economic and also public health consequences.

This chapter covers TADs that do not infect humans but do affect food and nutrition security and trade that the ILRI has been working on since the 1990s.

These are:

- African swine fever (ASF)
- Mycoplasma disease (both contagious bovine pleuropneumonia (CBPP) and contagious caprine pleuropneumonia (CCPP)
- Peste des petits ruminants (PPR)
- Newcastle disease (ND)

Other TADs, which were to a lesser degree the focus of ILRI research, are briefly mentioned (including FMD, classical swine fever (CSF) and rinderpest).

Diagnostics and molecular epidemiology ➢ investigated ASF, CBPP, and PPR in addition to making strategic inputs to foot-and-mouth disease, classical swine fever, ND and other transboundary diseases

Diagnostics and molecular epidemiology ➢ advanced diagnosis and vaccine development and construction of biological components using synthetic biology to identify vaccine candidates for CBPP and CCPP, ASF and PPR

Diagnostics and molecular epidemiology ➢ generated a thermostable vaccine under production in Africa that will play a major global role in protecting sheep and goats against peste des petits ruminants because the vaccine does not require a cold chain

8. Zoonoses

Zoonoses are diseases that are transmissible between humans and animals through either direct contact or by way of food, water or the environment. Around 60% of all human diseases and around 75% of emerging human infectious diseases are zoonotic. Zoonoses have high impacts on human health, livelihoods, animals and ecosystems.

The first global syntheses on the impacts of zoonotic diseases, led by ILRI, estimated that in the least-developed countries, 20% of human sickness and death was due to zoonoses or diseases that had recently jumped species from animals to people. Zoonoses sicken several billion people each year and kill millions, mostly in low- and middle-income countries (this was pre-Covid 19 estimates). The World Bank has estimated that emerging zoonoses cost around US$7 billion a year.

Some zoonoses are considered neglected, classical or endemic, and others as new or emerging. Many zoonoses, both neglected and emerging, are food-borne; this chapter focuses on zoonoses that are not transmitted primarily through food.

'Zoonotic' diseases, transmissible between humans and animals, ➤ make up around 60% of all human infectious diseases and 75% of emerging human infectious diseases

Zoonoses research ➤ estimated that diseases transmitted from animals, including livestock, sicken several billion people each year and kill millions, mostly in lower income countries

Veterinary and One Health approaches ➤ estimated the burden and risk factors for neglected as well as emerging zoonoses, identified their drivers and developed strategies for reducing those risks

9. Food Safety and Nutrition

‘Is our food safe?’ is a fundamental concern of consumers, especially as populations urbanize and food systems develop.

Food safety science – drawing on health, agriculture, technology, marketing and psychology – emerged as a separate discipline in the latter half of the last century. Food safety is relevant to domestic and international markets and involves private and public sectors as well as civil society.

Recent evidence suggests that the health burden of food-borne disease (FBD) is comparable to that of three major diseases – malaria, human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) and tuberculosis.

Most of the unsafe food health burden is due to contaminated fresh foods purchased from informal markets, and livestock products – milk, meat, offal and eggs – are especially risky.

As our understanding of the importance of FBD, and its complicated links with livestock development, has increased, so too has research conducted by ILRI and other research organizations in this area.

Veterinary epidemiologists ➢ elevated the importance of food safety and food safety science in low-to middle-income countries, where the health burden of food-borne disease is (shockingly) comparable to that of malaria, HIV/AIDS and tuberculosis.
Veterinary epidemiologists ➢ determined that the unsafe food health burden in developing countries is due largely to contaminated fresh foods purchased from informal markets, with livestock products–milk, meat, offal and eggs–as especially risky.
Veterinary epidemiologists ➢ focused on food safety in the ‘informal markets’ of developing countries, becoming the lead researchers globally in this emerging area.

10. Ticks and Their Control

Ticks decrease livestock productivity due to blood loss and ‘tick worry’, the irritation resulting from their feeding activity. Other negative effects include the injection of toxins, transmission of endemic and emerging diseases (such as heartwater, African swine fever and Congo-Crimean haemorrhagic fever) and tick associated disease (such as dermatophilosis).

Tick-borne pathogens affect 80% of the world’s cattle and are ubiquitous in the tropics and subtropics. Countering these negative effects requires expensive control measures, estimated at over US$13.9 billion to control ticks and US$18.7 billion to control tick-transmitted pathogens in cattle alone.

Climate change and transboundary trade in livestock have recently begun to drive ticks into new areas.

In Africa, ticks and tickborne disease appear at the top of several rankings of important livestock diseases, including trypanosomiasis and East Coast fever (ECF), ranked high in ILRI prioritizations of livestock disease across regions and production systems of sub-Saharan Africa.

The most common control methods are the use of genetically resistant animals and the application of acaricides. Resistance to acaricides is a major and growing problem. An anti-tick vaccine is commercially available for only a single tick species. Pasture management also has a role in integrated control.

Tick-borne pathogens ➢ affect 80% of the world’s cattle population, are ubiquitous in the tropics and subtropics, and are hugely expensive to control

The Tick Unit ➢ advanced tick biology, tick population dynamics, and the impacts of ticks and tick control using chemicals, as well as development and deployment of an East Coast fever vaccine

Tick research ➢ advanced understanding of ‘endemic stability’, when rates of infection are sufficient to maintain a level of acquired immunity that minimizes clinical disease in a population, a concept that has since been applied more broadly in veterinary and human health.

11. Rangeland Ecology

Sub-Saharan Africa rangelands are vital to the livestock economy of the subcontinent. They cover roughly 9 million km2 or about 40% of the areas with potential for livestock production. The majority of African livestock live on rangelands at some point during the annual production cycles.

Most of the range is managed by mobile groups who constitute perhaps one-fifth of poor livestock owners in sub-Saharan Africa. Grazing areas have limited vegetative production because of low and variable rainfall – they receive less than 600 mm annual rainfall – shallow and eroded soils, and inadequate forage due to reduction and fragmentation of the rangeland areas resulting from cropland and urban expansions.

For all these reasons, it has been difficult to make sustained improvements in range productivity, even under controlled management, despite several decades of research and development interventions.

Most of Africa's cattle, sheep, goats and camels ➢ live on rangelands at some point, where they are managed by mobile herders who make up some one-fifth of Africa's poor livestock owners

Rangeland ecology ➢ has elucidated and defended the economic and biological rationale of extensive pastoralism, which often co-exists with, and benefits, wildlife, thereby helping to preserve pastoral livelihoods and landscapes as well as biodiversity, carbon sequestration and other ecosystem services provided by rangelands

Range and climate change science ➢ greatly refined estimates of the effects of grazing regimes on animal and rangeland performance and estimates of greenhouse gas emissions from range animals, plants, soils, water and infrastructure

12. Forage diversity conservation and use

An essential component of crop improvement is to manage biological diversity to ensure a pool of genetic material for selection and breeding for current and future needs.

With few tropical forage breeding programmes of limited species coverage, forage germplasm remains the basis for selection and development of new feeds. With increasing demands for feeds for livestock intensification and rapid rates of genetic erosion of forage diversity in many regions, the in-trust forage collections held in ILRI, the International Center for Tropical Agriculture (CIAT), now part of the Alliance of Bioversity International and CIAT, and the International Centre for Agricultural Research in Dry Areas (ICARDA) are crucial.

Knowledge of forage diversity will allow scientists to identify genotypes with higher potential and to support innovative genotype selection and breeding programmes.

In-trust collections of 1600 species of tropical forage grasses and legumes ➢ are essential for developing new and improved feeds for the growing livestock populations of developing countries

The forage genebanks ➢ have distributed some 138,000 forage samples to 188 countries, with all the materials made freely available for any agricultural research, breeding and training purposes

These tropical forage genetic resources ➢ have been essential for large-scale adoption of *Brachiaria* and *Panicum* in Latin America and the Caribbean, Napier grass in sub-Saharan Africa, and medics and vetch in the dry areas

13. The impact of CGIAR Centre research on use of planted forages by tropical smallholders

Livestock are an integral component of the smallholder mixed systems that dominate sub-Saharan Africa and South Asia. Livestock are often fed opportunistically and on poor-quality feed resources; a major constraint to productivity. This is exacerbated by a decline in grazing resources in response to the expansion of cultivated land and poor control over grazing.

Cultivation of green forages specifically for feeding livestock is an important potential means of addressing the feed gap. The prominence of planted forages in smallholder farming systems varies hugely, and the extent of their cultivation in sub-Saharan Africa and to some extent Asia is lower than would be expected given their potential to alleviate the chronic feed gap. This chapter explores the potential and actual impact of planted forages and reviews success cases emerging from CGIAR research.

Feed research shows that ➢ with large feed gaps due to insufficient and low-quality feed for livestock a major problem in Africa and South Asia, planting green forages specifically for feeding livestock is increasingly important

Feed research ➢ greatly expanded use of multi-purpose trees in East Africa to feed dairy cows, *Brachiaria* spp. in Latin America, *Stylosanthes* spp. in China and Thailand and Napier grass and fodder hedgerows in East Africa

Feed research ➢ developed the Tropical Forages, Feed Assessment and other tools that enable communities to select the optimal planted forage options for their localities and circumstances.

14. Multi-dimensional Crop Improvement by ILRI and Partners: drivers, approaches, achievements and impact

Livestock provide food and income for almost 1.3 billion people across the world. Due to population pressure, land degradation and conversion from grazing to arable land, grazing areas have contracted, resulting in feed shortages. The conversion of grazing land is likely to be aggravated by climate change and the increasing demand for milk, meat and eggs.

Feed supply and demand scenarios for South Asia and sub-Saharan Africa have shown that crop residues (CRs) such as straws, stover and haulms commonly provide 50–70% of the feed resources in smallholder systems. Lignocellulosic biomass from forest, agricultural waste and CRs is the most abundant renewable biomass on earth. Attempts to improve CR biomass for fodder began a century ago with chemical, physical and biological treatments.

The lack of adoption of postharvest treatments of CRs gave way to a new model of improving the fodder value of CRs by selection and plant breeding and by identifying anti-nutritive factors in crop biomass. In the mid-1990s, ILRI and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) began a joint programme on improvement of grain and CR traits, focusing on sorghum (*Sorghum bicolor*) and pearl millet (*Pennisetum glaucum* (L.) R. Br.) in the semi-arid tropics of India.

This chapter therefore addresses the following questions. What is the extent of cultivar-dependent variation in CR fodder quality? Can these variations be exploited without detriment to grain yield? Have quality improvements in CRs from plant selection and breeding been achieved? Have such improvements made a field impact on crop and animal productivity?

With grazing areas contracting and demand for milk, meat and eggs increasing in South Asia and Africa ➢ crop residues such as straws, stover and haulms provide 50–70% of feed in smallholder systems

Feed research ➢ forced a reconsideration of the single-trait (i.e. grain) model in favour of the multi-trait and whole-plant (i.e. food and fodder) model, with the result that crop-improvement programs have reoriented their efforts towards whole-plant improvements

Plant breeders ➢ have produced crop cultivars with higher-quality crop residues in sorghum, pearl millet, groundnut, rice and maize in India, and in cowpea in West Africa

15. African Livestock Systems Research, 1975–2018

Livestock systems research (LSR) at ILRI sought to answer two questions:

- What are the major livestock systems in the sub-Saharan Africa tropics and subtropics?
- What technical and organizational changes can be introduced into these systems to make them productive?

This chapter reports the answers of decades of research at ILRI, its predecessors and its principal partners to these questions. The chapter continues to ask:

- What have been the scientific impacts of LSR since the 1970s?
- What have been the development impacts of LSR since the 1970s?
- Can the development impacts of LSR be distinguished from long-term trends in African livestock systems?

Livestock systems research ➤ mapped livestock systems in developing countries and advanced understanding of the evolution of both grazing and mixed crop-livestock production systems so as to prepare for appropriate technical interventions

Livestock systems research ➤ created and defended a new view of African grazing systems, showing the central importance of mobility in pastoralism and the complementarities of pastoral herding and wildlife conservation

Livestock systems research ➤ elucidated the roles of crop residues and manure in soil nutrient cycling and redressed a neglect by crop breeders of the feed value of food crops

16. Ruminant Livestock and Climate Change in the Tropics

The temperature and humidity changes associated with climate change will have direct and for the most part adverse effects on tropical animal productivity. Related changes in pasture and feed productivity will have further indirect adverse effects on productivity. These effects will reduce incomes to both specialized and mixed livestock producers.

At the same time, livestock production activities contribute to climate change. In the early 2000s, livestock production accounted for 18% of global greenhouse gas (GHG) emissions, with enteric emissions about 25% of the total, emissions from manure a further 24% and conversion of forests to pasture another 34%. Livestock also have negative environmental effects.

Per capita consumption of animal products is likely to increase by about 50% for low-income countries by 2050, implying rising livestock GHG emissions unless cost-effective mitigation options can be found.

Adaptation to climate change will become more challenging with growing GHG concentrations. At some point in this century, and in some regions, temperature and humidity increases will make livestock production biologically impossible. Well before that point, the adaptation costs are likely to outweigh economic benefits of producing livestock in many current producing regions.

Climate change research ➢ showed that livestock systems are both hurt by climate change (with higher temperature and humidity slowing animal growth and increasing animal susceptibility to disease) and contribute to climate change (with livestock emitting significant levels of greenhouse gases)

Climate change research ➢ identified options for livestock smallholders and herders both to adapt to and to mitigate climate change

Climate change research ➢ provided more reliable assessments of the greenhouse gas emissions from African livestock

17. Policy and Economics Research at ILRI: 1975–2018

The goals of livestock policy and economics research at ILRI have been to increase smallholder returns from animal agriculture by:

(i) analysing the productivity and targeting livestock-based technologies
(ii) identifying policy barriers that lower farm prices, raise input costs or lower the financial, information, and risk costs of new agricultural innovations
(iii) supporting institutions that improve productivity, create assets and improve the performance of value chains; and
(iv) creating a policy and regulatory environment that allows animal agriculture to contribute to growth and poverty reduction

Livestock policy and economics research ➢ produced a seminal study foretelling of a 'livestock revolution' based on global livestock trends: 'Livestock to 2020: The next food revolution'

Livestock policy and economics research ➢ defined a 'livestock pathway out of poverty' along the research-to-development continuum

Livestock policy and economics research ➢ used remote sensing and household survey data to develop, pilot and implement a novel index-based livestock insurance product for herders in the remote drylands of Kenya and Ethiopia

18. The Impact of ILRI Research on Gender

This chapter discusses the evolution of gender research at ILRI and its predecessors, and in the context of CGIAR.

Gender research at international agricultural research centres, although often ad hoc, has long sought to identify technical and policy measures to eliminate or reduce bias against women in agriculture. Specifically, research at ILRI has focused on gendered access to assets, such as livestock and land, and to technology needed to raise livestock and crop production.

As livestock often provide a significant share of women's employment and income, and are often an asset they have control over, identifying gender-based biases through research can be a powerful tool to improve the condition of women and improve the sector as a whole.

Gender research in livestock also enhances the effectiveness of interventions by increasing the relevance of livestock technologies to local communities by addressing needs of all farmers. Recent work also looks at how livestock can empower women by revealing social relationships and power dynamics in decision making that affect livestock interventions and how it is possible to build upon livestock as an asset for empowerment.

Gender research ➢ identified ways to build upon livestock households, assets, livelihoods, employment and systems for women's empowerment

Gender research ➢ revealed social relationships and power dynamics in household decision-making that affect the success or failure of livestock interventions and the empowerment or disempowerment of livestock women

Gender research ➢ produced evidence that livestock can be a cornerstone of economic empowerment for women and developed a Women's Empowerment in Livestock Index, which created a metric with which to assess progress

The Future of Research at ILRI

This book has presented the achievements and development impacts of livestock research conducted by ILRI, its predecessors the International Livestock Centre for Africa (ILCA) and the International Laboratory for Research on Animal Diseases (ILRAD), and selected partners over a 45-year period. These achievements and impacts are summarized in the Introduction to this volume and in the Executive Summaries of each chapter.

This final chapter looks at the future – what should ILRI do in the next 10 years? – by considering the challenges facing livestock research and livestock development and suggesting priorities for work in those areas.

The chapter considers future priorities for ILRI by reviewing the following:

- The contributions livestock make to human welfare.
- Global projections of animal product consumption, production and resource use.
- The research context for livestock in terms of global Sustainable Development Goals.
- Research challenges in the principal domains covered in this book – animal health and genetics, including livestock and human health; primary production, focusing on animal feed and forages; livestock systems, including policy and economics, climate change, and gender.
- The potential research contribution to the Sustainable Development Goals.
- Future operational issues for ILRI and partners.

Livestock research ➤ increased food and nutrition security among poor people in lower income countries
Livestock research ➤ increased prosperity among poor people in lower income countries
Livestock research ➤ helped poor people in lower income countries to improve the management of their natural resources.

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The International Livestock Research Institute (ILRI) is a non-profit institution helping people in low- and middle-income countries to improve their lives, livelihoods and lands through the animals that remain the backbone of small-scale agriculture and enterprise across the developing world. ILRI belongs to CGIAR, a global research-for-development partnership working for a food-secure future. ILRI's funders, through the CGIAR Trust Fund, and its many partners make ILRI's work possible and its mission a reality. Australian animal scientist and Nobel Laureate Peter Doherty serves as ILRI's patron.

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