7 Reconsidering "Excellence"

Natural and Social Science Approaches to Livestock Research at ILRI

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What we now know as ILRI – the International Livestock Research Institute – had a bifurcated beginning, born out of two institutions that were launched to tackle the problem of unproductive African livestock in quite different ways. The International Laboratory for Research on Animal Diseases (ILRAD) focused on medical solutions: "[to] serve as a world center for the improvement of animal production by developing means of conquering major animal diseases, particularly those associated with pathogenic protozoa which seriously limit animal industries in many parts of the world."[1] Meanwhile, the International Livestock Centre for Africa (ILCA) was to develop applied solutions for livestock systems: "research programs designed to solve the basic production and socioeconomic problems that are serving as constraints to livestock development."[2] The history of these two institutions, one focused on the micro and the other on the macro, and their subsequent merger, raises a number of questions about the notion of "excellence" as it relates to science policy, particularly in an African context. It raises questions about what types of knowledge are valued, what knowledge is valued for, and ultimately who values that knowledge. It speaks to the history of the institutionalization of veterinary science in and for Africa, as well as to broader challenges within the Consultative Group on International Agricultural Research (CGIAR) as it continually seeks to reinvent itself in the face of political, economic, scientific, and organizational challenges.

In this chapter, we show how the establishment of ILRAD and ILCA, as two research centers with two fundamentally different research agendas, influenced the ways in which human–livestock relationships, diseases

[1] W. Pritchard, A. Robertson, and R. Sachs, "Proposal for an International Laboratory for Research on Animal Diseases," Report Commissioned by the Rockefeller Foundation and Consultative Group on International Agricultural Research (CGIAR), 1972.

[2] G. H. Beck et al., "An International African Livestock Centre: Task Force Report," 1971, ILCA Library, accession number 35311.

in livestock, and research excellence were conceptualized by CGIAR in sub-Saharan Africa. After a brief discussion of the notion of scientific research excellence, followed by historical introductions to the institutions at the heart of our analysis, we draw in the second half of this chapter on two contemporary case studies – one examining the development of transgenic, trypanosome-resistant cattle, and the other exploring the establishment of CGIAR Research Programs (CRPs) and the outcomes of an agricultural research for development (AR4D) program – to show how the legacy of ILRI's predecessors has continued to shape, influence, and define the trajectory of its projects. We conclude that it is important to recognize how institutions and funding bodies conceptualize excellence, as this shapes the way in which knowledge is produced and how research impact is ultimately perceived.

Natural Science, Social Science, and Centers of Research Excellence

In her account of international medicine, the historian Deborah Neill traces the emergence of the new field of "tropical medicine" in the late nineteenth and early twentieth centuries.[3] As Neill highlights, this field was driven by transnational collaboration borne out of European colonialism and new scientific networks. Tropical medicine was one key backdrop for the establishment of livestock research in Africa. A second was the pursuit of agricultural research as international aid. As other contributions to this volume describe, the perceived successes of crop development and dissemination at the International Maize and Wheat Improvement Center (CIMMYT) and the International Rice Research Institute (IRRI) had led by the late 1960s and early 1970s to what John McKelvey, an entomologist and associate director for agricultural programs at the Rockefeller Foundation, called "institute fever": a growing investment in international institutes as tools to drive modernization and development, using science.[4] Thus ILRAD and ILCA, as with other earlier CGIAR institutions, were established in order to produce scientific solutions to address agricultural issues, and ILRI inherited that legacy.

Since its founding, ILRI, like many other CGIAR centers, has presented itself as a center of research excellence. Yet, as researchers have shown, what excellence is and how it is defined remains contested. Excellence carries significant weight in terms of recognition, policy,

[3] D. Neill, *Networks in Tropical Medicine: Internationalism, Colonialism, and the Rise of a Medical Specialty, 1890–1930* (Stanford: Stanford University Press, 2012).
[4] J. J. McKelvey, *Reflections: Living and Traveling in the 20th Century* (Brookfield, NY: Worden Press, 2000).

funding, prioritization, and practice. Its framing can be influenced more by politics and policy – donor priorities, for example – than any impartial assessment of quality, and indeed assessment of quality is itself often subjective.[5] Furthermore, assessment based on supposedly objective measures introduces other biases, for example, privileging outcomes that can be counted.[6] As Lucas M. Mueller likewise chronicles in Chapter 5, this volume, there are strong associations between investment in scientific excellence and economic development in its broadest sense, in terms of both wealth producing the best science and scientific investment producing economic growth.[7] This introduces a spatial element into understandings of excellence that maps onto political economic geographies and draws from existing narratives of institutional excellence. The latter often revolve around perceptions of the primacy of certain disciplines, for example the natural sciences over the social sciences, or basic over applied sciences.[8]

Scientific excellence is incredibly complicated: it is contested in multiple ways; it is subjective; it is hierarchized and creates its own hierarchies; and no matter how good the science may be, its outcomes are uncertain. The notion of scientific excellence has nonetheless led to decades-long intense interest in finding institutional mechanisms to concentrate and harness international scientific activity, build research capacity, and drive innovation both globally and specifically in Africa.[9] In many respects, CGIAR and its institutes exemplify this interest.

The pursuit of scientific excellence has had implications for CGIAR research. Within CGIAR centers, scientific solutions have historically been presented as the ultimate answer to agricultural problems. This aligned with a dominant conceptualization of science as global in reach and therefore, to varying degrees, unconcerned with local realities. Agricultural problems were subsequently framed as technical issues that

[5] D. Sridhar, "Who Sets the Global Health Research Agenda? The Challenge of Multi-Bi Financing," *PLoS Med* 9, no. 9 (2012): e1001312; K. H. Hove, "Does the Type of Funding Influence Research Results – and Do Researchers Influence Funders?" *Prometheus* 36, no. 2 (2020): 153–172.

[6] D. W. Aksnes, L. Langfeltd, and P. Wouters, "Citations, Citation Indicators, and Research Quality: An Overview of Basic Concepts and Theories," *Sage Open* 9, no. 1 (2019): 1–17.

[7] D. King, "The Scientific Impact of Nations," *Nature* 430 (2004): 311–316.

[8] R. Tijssen, "Re-valuing Research Excellence: From Excellentism to Responsible Assessment," in E. Kraemer-Mbula, R. Tijssen, M. Wallace, and R. McLean, eds., *Transforming Research Excellence: New Ideas from the Global South* (Cape Town: African Minds, 2020), pp. 59–78.

[9] T. Hellstrom, "Centres of Excellence and Capacity Building: From Strategy to Impact," *Science and Public Policy* 45, no. 4 (2018): 543–552; R. Tijssen and E. Kraemer-Mbula, "Research Excellence in Africa: Policies, Perceptions, and Performance," *Science and Public Policy* 45, no. 3 (2017): 392–403.

could be dealt with in isolation, for instance in a laboratory or field trial, and solutions were perceived to be easily disseminated, often through a relatively apolitical process of diffusion. This understanding of science as globally applicable has had significant repercussions, particularly for social scientists, whose findings and solutions are almost always tailored to specific, bounded contexts. Records show that social scientists were late to join agricultural research programs, and that, when they did, their work was often perceived to be of less importance than contributions from other scientific disciplines.[10] As the Dutch sociologist D. B. W. M. van Dusseldorp noted in 1977, for every thousand natural scientists working in agricultural research, there was fewer than one social scientist.[11]

These tensions, framed and mediated by dominant perspectives of scientific excellence, are encapsulated in the history of ILRI and its precursors. We now turn to the institutional history of ILRI with a view to illustrating how, at least in part, ILRI has had to manufacture and negotiate the complex contours of "scientific excellence" and the demand for scientific solutions as it sought to fulfill its important and ambitious mandate.

The International Laboratory for Research on Animal Diseases

Historians of veterinary medicine have shown the close links between the establishment of veterinary systems and colonial expansion in sub-Saharan Africa.[12] This is evident when examining diseases of cattle, such as trypanosomiasis, which was perceived as threatening to the stability of colonial rule.[13] As historians have described, trypanosomiasis, which is caused by a parasite and spread by the tsetse fly, was troubling for colonial authorities as it caused serious illness and death in both humans and cattle. The pervasiveness of trypanosomiasis across much of sub-Saharan Africa prompted imperial governments to invest substantial sums of money in parasitology and tropical medicine in attempts to

[10] D. E. Horton, *Social Scientists in Agricultural Research: Lessons from the Mantaro Valley Project, Peru* (Ottawa: IDRC, 1984).

[11] D. B. W. M. van Dusseldorp, "Some Thoughts on the Role of Social Sciences in the Agricultural Research Centres in Developing Countries," *Netherlands Journal of Agricultural Science* 25, no. 4 (1977): 213–228.

[12] W. Mwatwara and S. Swart, "'If Our Cattle Die, We Eat Them but These White People Bury and Burn Them!' African Livestock Regimes, Veterinary Knowledge and the Emergence of a Colonial Order in Southern Rhodesia, c. 1860–1902," *Kronos* 41, no. 1 (2015): 112–141.

[13] The same was true for East Coast fever (ECF – see below in this chapter). See T. T. Dolan, "Dogmas and Misunderstandings in East Coast Fever," *Tropical Medicine & International Health* 4, no. 9 (1999): A3–A11.

control the prevalence and spread of the disease.[14] Thus, parasitology was to a large extent spurred on by colonialism, as parasitic diseases risked the spread and profitability of colonial investment. It nevertheless remained relatively isolated as a field of study and efforts to control trypanosomiasis in the colonial period were ultimately unsuccessful. This left an enduring problem for researchers to solve.

By the early 1970s – as philanthropies, international organizations, and aid agencies formalized the system that would become CGIAR, and experts gathered at sites like Bellagio to determine its portfolio of institutions and research programs (see Lucas M. Mueller, Chapter 5, this volume) – parasitology appeared on the brink of profound change. Within and beyond the field, there was a belief that the benefits of recent biological research, especially molecular biology, could make an important contribution to parasitology and the control of parasite-borne diseases. To the experts organizing CGIAR, it appeared that a research center focused on animal diseases would be a potential opportunity to bring the benefits of modern parasitology to those living in developing countries.

At the successive Bellagio meetings, participants debated what the exact function and focus of a livestock disease research center – soon to be known as ILRAD – would be. Ultimately the decision was taken that the center's initial emphasis would be on haemoprotozoan diseases – commonly known as blood parasites – and immunological aspects of African animal diseases. As the entomologist and early proponent of an international center on animal diseases, John McKelvey, described:

> to focus sharply on one, possibly two, diseases [East Coast fever, or ECF, and African animal trypanosomiasis, or AAT], and on one problem, immunization techniques, to combat the diseases would afford greater chance of success than to range widely over many problems of cattle production in Africa. The Rockefeller Foundation successes in the medical sciences, combating yellow fever, for example, and in the agricultural sciences, maize and wheat improvement, reinforced this belief.[15]

The focus of ILRAD was therefore on parasitic diseases that have well-known causes, a tight focus intended to guarantee success. McKelvey's nod to the Rockefeller Foundation's prior public health successes points to other anticipated payoffs of this focus. Protozoa also affect many people in the developing world, and thus the suggestion was that with

[14] Maryinez Lyons, *The Colonial Disease: A Social History of Sleeping Sickness in Northern Zaire, 1900–1940* (Cambridge: Cambridge University Press, 1992); I. Maudlin, "African Trypanosomiasis," *Annals of Tropical Medicine and Parasitology* 100, no. 8 (2006): 679–701.

[15] J. M. McIntire and D. Grace, *The Impact of the International Livestock Research Institute* (Nairobi: CABI International, 2020), p. 13.

the right sort of investment a considerable improvement could be made for human lives as well as livestock. The challenge would prove formidable.

Immunology as a key to combating cattle diseases was the livestock equivalent of the "isolable problem" of raising cereal yields that had been identified in the first international agricultural research centers as a means to combat rural poverty and underdevelopment. A vaccine would be a quick, transformative solution. As a later ILRAD annual report stated, "Vaccines are a more sustainable way of controlling disease than vector control using insecticides or parasite control using drug treatments, which have contaminative, drug residue or drug resistance side effects."[16] There was sustained confidence both within ILRAD and CGIAR more generally about what the institution could achieve. In 1971, planners imagined that a vaccine for ECF, a disease caused by a protozoan parasite (*Theileria pava spp.*) and typically spread by a tick bite, could be commercially available relatively quickly: "one half or perhaps three fourths of the research towards vaccine production has been accomplished but to complete the final stages of this research will probably require five to ten years."[17] After the ECF vaccine was complete, ILRAD researchers would focus on AAT. ECF vaccine development was seen as a "short-term program" and trypanosomiasis research as a "long-term problem."[18]

To meet its research goals, ILRAD brought together an elite group of international scientists to focus on the development of molecular tools and novel vaccines. As other researchers have noted, administrators within CGIAR believed that the best method for producing scientific solutions to problems was to give research centers and the scientists working within them independence and flexibility.[19] Thus, ILRAD functioned as an independent research center, with scientists in theory shaping its research independently from CGIAR influence. This allowed ILRAD to remain an "island of excellence," with its ambitions to produce excellent applied sciences for the benefit of developing country livestock systems.[20]

[16] *ILRAD 1988: Annual Report of the International Laboratory for Research on Animal Diseases* (Nairobi: ILRAD, 1989), p. 1, https://hdl.handle.net/10568/49681.
[17] CGIAR Technical Advisory Committee, "East Coast Fever and Related Diseases: A Technical Conference" (Rome, Italy, 1971), March 8, 1971, 285–286, https://hdl.handle.net/10947/486.
[18] Ibid., 286.
[19] J. Chataway, J. Smith, and D. Wield, "Shaping Scientific Excellence in Agricultural Research," *International Journal of Biotechnology* 9, no. 2 (2007): 171–187.
[20] Ibid.

Both ECF and AAT were – perhaps ambitiously in retrospect – perceived by CGIAR administrators and ILRAD staff as diseases that could be controlled through new molecular techniques and would be synergistic in terms of the skills required, even if ECF was the "short-term program" and trypanosomiasis the "long-term problem." Earlier research on the causative protozoan agents of the two diseases (trypanosomes and theileria) had shown that while it was possible to immunize livestock against reinfection with the specific strain used in the vaccine, this did not confer immunity to other strains of the parasites.[21] This meant that ILRAD would have a more ambitious mandate from the other early CGIAR centers, which were primarily established to conduct translational research – for example by adopting established breeding techniques to create new rice or wheat varieties. ILRAD, too, had a translational mandate, but it also had substantive fundamental research to undertake, namely establishing the nature of immunity against the parasites in question and the mechanisms causing the failure of earlier immunization efforts.

Scientists who worked at ILRAD have suggested that in terms of African development goals, AAT and ECF may not have been the most appropriate diseases for the institution to have focused its attention on.[22] The reasons for this were twofold: one, there was little evidence that these were the top two diseases of concern for the majority of East African livestock farmers; and two, AAT and ECF proved to be much more difficult to develop vaccines for than other diseases – particularly those caused by bacteria or viruses.[23] Moreover, while ILRAD's scientists were focused on research programs that were both original in concept and highly experimental in method, something was missing. As a 1972 taskforce organized by CGIAR and led by the Australian agricultural scientist Derek Tribe reported:

> The primary cause of the disappointing growth in animal productivity in tropical Africa has been the failure to integrate the biological, economic and sociological components of research and development programmes . . . Technical answers are available to many of the specific problems facing livestock development in Africa. The major constraint lies rather in the difficulty of introducing change into existing socio-economic systems, combined with inexperience in adapting technologies to suit local conditions.[24]

[21] McIntire and Grace, *Impact of the International Livestock Research Institute*, p. 14.
[22] B. D. Perry, "The Control of East Coast Fever of Cattle by Live Parasite Vaccination: A Science-to-Impact Narrative," *One Health* 2 (2016): 103–114; ILRI, *Strategic Planning Process* (Nairobi: ILRI, 1999), p. 99.
[23] ILRI, *Strategic Planning Process*, p. 99.
[24] D. Tribe et al., "Animal Production and Research in Tropical Africa," Report of the Task Force commissioned by the African Livestock Sub-Committee of the Consultative Group on International Agricultural Research (CGIAR), 1972, ILCA, accession number 00129.

In other words, even where potentially valuable tools and knowledge were available, they were not in use. This observation, and others like it, led to the establishment of ILCA in 1974.

The International Livestock Centre for Africa

Situated in Addis Ababa, Ethiopia, the International Livestock Centre for Africa (ILCA) was founded in the belief that existing solutions to Africa's livestock problems were not being applied because of a significant lack of research on, and knowledge about, local livestock systems.[25] CGIAR administrators saw an opportunity to bridge that knowledge gap. As initially imagined, the function of the new center would be "to assemble a multi-disciplinary team of scientists to develop research programs designed to solve the basic production and socio-economic problems that are serving as constraints to livestock development."[26]

In its early years, ILCA staff conducted systems surveys that described the major agro-ecological zones of sub-Saharan Africa and their production systems. This approach involved scientists working in interdisciplinary teams to study livestock production systems holistically, identifying and testing possible innovations, and defining high-priority areas for more intensive research.

The organization and operation of ILCA was significantly influenced by "systems thinking," which developed throughout the 1970s in response to the perceived failure of conventional scientific methods in addressing agricultural issues, particularly in developing countries.[27] Systems thinking moved researchers outside of the confines of the laboratory to consider the ways in which components of complex systems interact and influence one another. The formation of ILCA was, therefore, an acknowledgment that in order to develop sustainable and long-term solutions for unproductive livestock systems, a more comprehensive approach was needed. As the 1972 taskforce led by Tribe stated:

> The first task of the interdisciplinary team would be to gain a basic appreciation of the major livestock production systems of Africa, by the study of all available

[25] *Improving Livestock Production in Africa: Evolution of ILCA's Programme 1974–94* (Addis Ababa: ILCA, 1994), https://hdl.handle.net/10568/5456.
[26] Ibid., p. 1.
[27] D. Gibbon, "Systems Thinking, Interdisciplinarity and Farmer Participation: Essential Ingredients in Working for More Sustainable Organic Farming Systems," in *Proceedings of the UK Organic Research 2002 Conference* (Aberystwyth: Organic Centre Wales, Institute of Rural Studies, University of Wales, 2002), pp. 105–108.

literature, a review of ongoing research programmes, and widespread travel and survey. From the base the team will then be expected to devise its own programme of studies.[28]

Following this vision, the newly created ILCA established a network of sites in tropical Africa to monitor livestock production systems. This network approach to "systems thinking" similarly impacted the establishment of the Africa Rice Center, as Harro Maat describes in Chapter 6, this volume. ILCA's zonal research teams measured the productivity of cattle, sheep, and goats. The first baseline surveys "diagnosed" general factors constraining animal production in the various zones.[29] These included low dry-season feed quality, inadequate water supplies, and competition between people and calves for limited milk supplies in arid pastoral systems. The surveys also focused on animal diseases and animal mortality, poor feed quality, the availability of animal draught power, and inefficient water conservation and utilization. The initial activities carried out by ILCA researchers, such as literature analysis and field surveys, were not bounded by common delineations, such as language and region. This early work pursued a "problem analysis" as a basis for developing interventions at the farm level, undertake more intensive studies, and assess systems-level production alternatives.

Nevertheless, ILCA's first quinquennial institutional review, completed in 1981, strongly suggested the institute should move away from systems description and place more emphasis on component research.[30] These analyses would build on the identification of constraints to livestock productivity up until that point by exploring options for overcoming these constraints. This was especially important, as early research had shown that, somewhat contrary to prior proclamations, introduced technologies generally did not offer any great advantages over traditional methods, given the economic and ecological constraints facing many African producers.[31] ILCA teams thus focused their attention on designing and researching possible improvements. These included the use of crossbred cows for dairying and cattle for traction, incorporating legumes into the cropping system, making better use of Indigenous feeds, alley cropping, establishment of "fodder banks" of leguminous pasture for dry-season grazing, selective harvesting and handling of crop residues to improve livestock nutrition and soil management, and improving the drainage of soils prone to waterlogging.

[28] Tribe et al., "Animal Production and Research in Tropical Africa."
[29] G. Gryssels, J. McIntire, and F. Anderson, "Research with a Farming Systems Perspective at ILCA," *ILCA Bulletin* no. 25 (1986): 17–22.
[30] Ibid. [31] Ibid.

In some respects, ILCA was the antithesis of ILRAD. ILCA grew out of systems thinking recognizing Indigenous knowledge systems and the importance of local context. ILRAD had been founded on faith in cutting-edge science and universalizable technologies. Yet ILCA, like ILRAD, struggled to produce solutions. As William Pritchard, a renowned leader in tropical veterinary medicine, later observed, many of the challenges that ILCA faced stemmed from its adoption of systems thinking.[32] The systems approach was conceptual rather than organizational; it suggested an approach to research as opposed to a method for developing interventions. It did not necessarily lead to solutions to problems.

Moreover, while the research conducted within ILCA was intended to reflect and build upon real farming systems, the performance of the center was still measured against conventional scientific criteria. Accounts of ILCA staff expressing frustration that the reality of smallholder farming systems affected the operation and outcomes of their trials suggest that research ambitions and development objectives did not always align.[33] Consequently, with an underlying expectation of precision knowledge and scientific productivity, as opposed to systems understanding and on-farm benefits, the contribution of social scientists in ILCA's multidisciplinary teams was eventually limited to economists only.[34]

Thus, while one might simplistically characterize the research targets of ILRAD as "upstream" and ILCA as "downstream," one could equally argue that both were high-concept approaches. In either case, both institutions and approaches struggled to gain currency and momentum within the core business of CGIAR.

"Isolable Problems" versus "Systems Thinking"

In 1987, an external review of ILCA commissioned by the CGIAR's Technical Advisory Committee (TAC) recommended that the institute further narrow its focus to avoid spreading its resources too thinly over a broad spectrum of activities.[35] ILCA's original mandate stood, but it was asked to work more closely with and to strengthen the capacity of national agricultural research systems. In addition, ILCA was advised to focus its work on six narrowly defined "thrusts." These were three

[32] P. Gardiner, Interview, ILRAD, Nairobi, February 24, 1991. Interview transcript shared with James Smith.
[33] A. Waters-Bayer and W. Bayer, "Driving Livestock Development through Multidisciplinary Systems Research: An Impact Narrative," ILRI Research Brief, 2014.
[34] Ibid.
[35] CGIAR Technical Advisory Committee, "Report of the Second External Program Review of the International Livestock Centre for Africa (ILCA)," December 1987, 4, https://hdl.handle.net/10947/1275.

"commodity thrusts" (cattle, milk, and meat; small ruminant meat and milk; and animal traction, with an aim to increase production and outputs), and three "strategic thrusts" (animal feed resources; trypanotolerance; and livestock policy and resource use).[36] With one exception, the thrusts were focused on animal production, health, nutrition, and genetics, all of which could be measured scientifically.

Meanwhile, at ILRAD change was also on the horizon. Although there had been some progress in ILRAD's research and training programs in its first decade, there was a sense that its short- and medium-term priorities needed revision. As was true at ILCA, much of ILRAD's early success was about basic rather than applied research, as evidenced by the centrality of the yearly tally of academic publications to successive annual reviews. Mapping this research productivity onto disease control priorities was very much secondary, a reflection of the institute's initial upstream focus. Furthermore, although research on ECF moved at a faster pace than trypanosomiasis research in the 1980s, as expected, ECF vaccine development nevertheless lagged behind the earlier, rather ambitious, timescales. It was only in 1989 that a review group recommended the establishment of a project area on vaccine formulation.[37] By comparison, trypanosomiasis research remained at a much earlier stage.

There was, therefore, a noted lack of progress in ILRAD's vaccine program, alongside a lack of strategic direction within ILCA's applied research that the instantiation of research "thrusts" attempted to correct. At the same time, Africa's food needs were rapidly growing and financial possibilities were shifting – with donor priorities focusing increasingly on the environment and funding in general constrained by global recession.[38] External assessments of animal agriculture in sub-Saharan Africa (conducted by the Winrock International Institute for Agricultural Development and supported by many of CGIAR's major donors) argued for a sharper focus of activities.[39] This layering of concerns, both within and beyond CGIAR livestock centers, began to point towards their closer collaboration. Similar suggestions were made at the 1992 CGIAR annual meeting in Washington, DC, where it was recommended that ILCA and

[36] S. Watanabe, "ILCA's Strategy for Improving the Output of Livestock in Sub-Saharan Africa based on Six Research Thrusts, " *Tropical Agriculture Research Series* 25 (1992): 92–103.

[37] ILRAD, *Annual Scientific Report 1989* (Nairobi: ILRAD, 1990), p. 2, https://hdl.handle.net/10568/91143.

[38] D. Byerlee, "The Search for a New Paradigm for the Development of National Agricultural Research Systems," *World Development* 26, no. 6 (1998): 1049–1055.

[39] Winrock International, *Assessment of Animal Agriculture in Sub-Saharan Africa* (Morrilton, AR: Winrock International Institute for Agricultural Development, 1992), https://hdl.handle.net/10947/186.

ILRAD work towards "closer cooperation through joint program committees and cross board membership" and that "joint funding opportunities should be explored."[40] A further external review published in January 1993 suggested that ILCA focus primarily on applied research on crop-livestock farming systems and build collaborative research networks and livestock research capacity in Africa's national agricultural research systems.[41] The days of ILCA as a center focused on broadly surveying African livestock production systems and setting research agendas appeared to be numbered.

Meanwhile, ILRAD was being asked to respond to similar externalities. Its 1993 medium-term plan signaled the coming change when it noted "Depending upon the levels of funding obtained, ILRAD and ILCA foresee increased collaboration, utilizing the complementary expertise and approaches of both institutes, in areas of mutual concern."[42]

When CGIAR had established ILRAD and ILCA in the early 1970s, those involved considered it likely that the two centers ultimately would come together as a unified research institute. Indeed, the gestation of the centers had included discussions about whether there should be two centers in the first place. It was not until two decades later, however, in the early 1990s, that the merger was set in motion. In May 1993 CGIAR took the decision to unify the centers, setting up a committee "to identify priority activities for international livestock research, which would be managed through a single institution and be constrained by the current proportion of CGIAR resources allocated to livestock."[43]

ILRI was established in September 1994. It had a huge task, as its remit would no longer be limited to Africa but encompass global needs. The institute came into existence during a period of flux and resource constraints within CGIAR and the broader donor community, and it had to deal with the realities of merging two fundamentally different entities. The merger was fraught with difficulty. With differing mandates, research cultures, and disciplinary representation, staff later commented that inviting ILRAD employees to support ILRI was "like asking turkeys to

[40] "CGIAR International Centers Week, Washington, DC, October 26–30, 1992: Summary of Proceedings and Decisions," January 1993, 9, https://hdl.handle.net/10947/280.

[41] ILCA, "Report of the Third External Programme and Management Review of International Livestock Centre for Africa (ILCA)," January 1993, https://hdl.handle.net/10947/1571.

[42] ILRAD, *ILRAD 1994–1998 Medium-Term Plan for Research on Livestock Diseases* (Nairobi: ILRAD, 1993), p. 19: https://cgspace.cgiar.org/handle/10568/49797.

[43] ILRI, *A Global Livestock Research Institute* (Nairobi: ILRI, 1995), pp. 2–3.

vote for Christmas."[44] A 2000 external report commissioned by the CGIAR TAC stated that it recognized the continued difficulties in unifying ILCA and ILRAD, with the "two centers [maintaining] widely different cultures."[45] In 2001, the ILRI annual review attempted to reframe these challenges as a reason for institutional pride:

> It is no mean achievement to have successfully made the transition despite the dramatic external and internal changes that ILRI had to withstand. From 1995 to 2001, when drastic falls in funding for international agricultural research and the change from dependency on unrestricted grants to reliance on project funding severely taxed the morale and programmatic integrity of all CGIAR centres, ILRI handled in addition the evolution out of two centres that could hardly have been more different in goals, culture and modes of operation.[46]

The merger, although partially demanded by cutbacks in CGIAR's budget, was perhaps premature. It was not ideal to merge primarily through financial exigency rather than strategic choice. ILRI was largely unable to exploit its new comparative advantages as it might have hoped, hampered by the sheer complexity of its vaccine-based research agenda and by the organizational challenge of effectively drawing together the existing scientific and systems-thinking approaches.

In addition to working within the organizational legacies of ILRI's two constituent institutions, ILRI administrators and staff, like others in the CGIAR system, had to work through the much longer legacies of conducting scientific research for development. As the historian Deborah Fitzgerald observes, "While some have argued that the technologies exported to developing countries are inappropriate, one might extend the argument by locating the inappropriateness in the institutional structures and ideologies from which these technologies have emerged."[47]

Building on this observation, we offer two case studies below to demonstrate how the legacies of ILCA and ILRAD, as two separate research institutions, continue to have repercussions for more recent ILRI projects. In the first case study, we discuss the development of transgenic, trypanosome-resistant cattle. We suggest that the roots of this work reflect the science-led values and notions of excellence as defined within

[44] O. Nielsen, "The Consultative Group on International Agricultural Research (CGIAR): The International Livestock Research Institute (ILRI)," *The Canadian Veterinary Journal* 40, no. 9 (1999): 642–644, at 642.

[45] CGIAR Technical Advisory Committee and CGIAR Secretariat, "Report of the First External Programme and Management Review of the International Livestock Research Institute (ILRI)," June 2000, 8, https://hdl.handle.net/10947/552.

[46] ILRI, *ILRI Annual Report 2001: The Poor and Livestock Mapping: Targeting Research for Development Impact* (Nairobi: ILRI, 2002), p. 3, https://hdl.handle.net/10568/49691.

[47] Deborah Fitzgerald, "Exporting American Agriculture: The Rockefeller Foundation in Mexico, 1943–1953," *Social Studies of Science* 16, no. 3 (1996): 457–483.

ILRAD. In the second case study, based on ethnographic research conducted in 2015, we present research on the pig value chain in Uganda. Here we highlight the similarities between the project and the systems-led research undertaken by ILCA. These case studies, in turn, demonstrate the ways in which the historical lineages of ILCA and ILRAD, and the prior concepts of research excellence and science for development on which those institutions were premised, have continued to influence and affect ILRI research after the merger in 1994.

Transgenic, Trypanosome-Resistant Cattle

Despite a long history of scientific attempts to control the different species and subspecies of *Trypanosoma* parasites, trypanosomiasis remains a major challenge for many countries in sub-Saharan Africa. As we described above, scientists at ILRAD attempted to develop a vaccine to control trypanosomiasis; however, no product ultimately came to fruition during the institute's independent existence – nor have they since. Thus, the current techniques used to prevent the spread of the disease predominantly focus on the tsetse-fly vector, with control programs involving methods such as the release of sterile male tsetse flies and the continued and increasingly innovative use of insecticides to limit tsetse populations.[48] For example, in multiple African countries, tsetse control programs have deployed "Tiny Targets," small, blue pieces of insecticide-impregnated cloth that attract and kill tsetse.[49]

In 2013, responding to the continued failures to eliminate trypanosomiasis, two scientists, Jayne Raper of City University of New York and Steve Kemp of ILRI in Nairobi, proposed genetic modification to produce cattle with 100 percent resistance to all species of trypanosomes.[50] The project, known as the Mzima project, received initial funding from the US National Science Foundation and was presented as a means through which to reshape livestock systems in Africa.[51] The subsequent

[48] A. M. Abd-Alla, M. Bergoin, A. G. Parker et al., "Improving Sterile Insect Technique (SIT) for Tsetse Flies through Research on Their Symbionts and Pathogens," *Journal of Invertebrate Pathology* 112 (2013): S2–S10.

[49] J. B. Rayaisse, F. Courtin, M. H. Mahamat, M. Chérif, W. Yoni, N. M. O. Gadjibet, M. Peka, P. Solano, S. J. Torr, and A. P. M Shaw, "Delivering 'Tiny Targets' in a Remote Region of Southern Chad: A Cost Analysis of Tsetse Control in the Mandoul Sleeping Sickness Focus," *Parasites & Vectors* 13, no. 1 (2020): 1–16.

[50] M. Yu, C. Muteti, M. Ogugo, W. A. Ritchie, J. Raper, and S. Kemp, "Cloning of the African Indigenous Cattle Breed Kenyan Boran," *Animal Genetics* 47, no. 4 (2016): 510–511.

[51] ILRI, "Mzima Cow Project: A Transgenics Approach to Introducing Resistance to Trypanosomiasis Translating Genetic Research to Adoption and Social Value," poster, March 12, 2018, https://hdl.handle.net/10568/91998.

research involved a number of international partners based in the United Kingdom (the Roslin Institute at the University of Edinburgh), United States (City University of New York and Michigan State University), and Kenya (ILRI).

ILRI was tasked with developing the technologies, skills, and infrastructure required to undertake the majority of the work in Kenya. ILRI's production of Tumaini ("Hope" in Swahili), the first cloned bull in Africa, was subsequently described by ILRI scientists as the first step towards producing trypanosome-resistant cattle, as the cloned bull opened up "the possibility of making genetically modified Kenyan Boran (see below) with foreign genes or desired traits."[52] The next step was subsequently to produce Boran cloned cattle with modified genes that would naturally confer resistance to trypanosomiasis. Scientists planned to achieve this by inserting baboon genes into cow genomes. Baboon genes were selected because, as Jayne Raper had established, they contain trypanosome lytic factors (TLFs) – a serum that has the ability to kill both animal and human infective trypanosomes.[53] In relation to previous ILRAD and ILRI research, the attempted development of the trypanosome-resistant cow represented a significant shift. Earlier scientific work on trypanosomiasis focused on the pathogen or the vector, whereas the Mzima project focused on the cow itself.

Some cattle breeds – notably the West African N'Dama – possess some natural resistance to trypanosomiasis. However, N'Dama were considered too small and unproductive to provide a solution for controlling the disease. Instead, the scientists working on the project selected the much larger Boran cattle, an Indigenous breed of East African zebu (*Bos indicus*) reared almost exclusively in Kenya. In its 2015 corporate report, ILRI stated that the final step of this long-term project was to introduce trypanosome-resistant cattle to breeding schemes across Africa.[54] The report set out that this research subsequently offered "a reliable, self-sustaining and cost-effective way of protecting tens of millions of African cattle against disease."[55] Yet the Mzima project is underpinned by an understanding that its transformed cow can be developed and integrated

[52] M. Yu et al., "Cloning of the African Indigenous Cattle Breed Kenyan Boran," *Animal Genetics* 47 no. 4 (2016): 510–511.
[53] R. Thomson, P. Molina-Portela, H. Mott, M. Carrington, and J. Raper, "Hydrodynamic Gene Delivery of Baboon Trypanosome Lytic Factor Eliminates Both Animal and Human-Infective African Trypanosomes," *Proceedings of the National Academy of Sciences* 106, no. 46 (2009): 19509–19514.
[54] ILRI, *Corporate Report 2014–2015* (Nairobi: ILRI, 2015), p. 45, https://hdl.handle.net/10568/68631.
[55] Ibid.

into a range of different contexts.[56] This assumption does not take into consideration that Boran cattle, although deemed more suitable by ILRI scientists, require different levels of care from other types and that this may be at odds with the ways in which people currently live with their cattle. As trypanosomiasis is not confined to one area but instead affects farmers across a number of countries in sub-Saharan Africa, the cow selected for development into a disease-resisting technology matters. For instance, despite both being zebu cattle breeds, the predominant breed of cattle reared in Sudan, Kenana cattle are reared for dairy, while Boran cattle are reared for beef.[57] A milking cow and a beef-producing cow have different roles in farmers' lives and may be valued differently. This, however, was not taken into account by scientists working on the Mzima project. As a 2017 report from a workshop on the Mzima Cow Strategy highlighted, "the exact effect of the transgene on milk and meat production is currently not known and must be carefully assessed in impact and safety studies."[58] Thus, while ILRI may well produce a trypanosome-resistant cow, scientists' seemingly singular pursuit of a biotechnological achievement at the expense of other considerations means that if it comes to fruition the final cow may not be suitable for every farming context. In short, the production of Tumaini raises questions about how scientific outputs translate into society, and whose benefit they serve. By proposing the development of trypanosome-resistant cattle, ILRI scientists conceptualized the cow as a technology that could be developed in the laboratory and integrated into farmers' lives. Yet a cow is not just ground-breaking science: it is also an animal that is understood in diverse ways across different contexts.

There are important continuities between the Mzima project and the ILRAD research projects of the 1970s and 1980s. Specifically, a group of international scientists were brought together to develop a magic-bullet technology that could be scaled up and integrated into existing livestock systems. As in the case of ILRAD vaccine development, the objective was to produce research excellence in the form of a cutting-edge scientific solution, without sufficiently exploring the applicability and acceptability of the output beyond the laboratory. The insurmountability of technical

[56] See M. Green, "Dairying as Development: Caring for 'Modern' Cows in Tanzania," *Human Organization* 76, no. 2 (2017): 109–120.

[57] O. Mwai, O. Hanotte, Y. J. Kwon, and S. Cho, "African Indigenous Cattle: Unique Genetic Resources in a Rapidly Changing World," *Asian-Australasian Journal of Animal Sciences* 28, no. 7 (2015): 911–921, at 911.

[58] C. Canales, N. Manson, and B. Jones, *Mzima Cow Strategy & Theory of Change: Translating from Genetic Research in Africa to Adoption and Social Value: Workshop Report*, Genetics for Africa – Strategies and Opportunities (Nairobi: ILRI, 2017), https://sti4d.com/wp-content/uploads/2022/06/report-mzima-workshop.pdf.

hurdles may be another continuity. Although ILRI staff were able to clone Tumaini, they were unable to develop a transgenic cow as planned. Thus, despite initial optimism about the benefits that novel scientific techniques could bring to disease control efforts, the problem of trypanosomiasis endures.

Smallholder Pig Value Chains in Uganda

In 2010, CGIAR's Funder Forum indicated that its research was not sufficiently translating into development outcomes.[59] In response, and in recognition that research alone was not generating impact, CGIAR introduced cross-institutional CRPs in 2011.[60] The CRPs were intended to act as a mechanism for funding AR4D programs, bringing together experts from across the (then) fifteen CGIAR centers to design and implement large-scale interventions. Prior to the introduction of the CRPs, ILRI had already begun to recognize that nontechnical innovations were needed in its livestock development programs, particularly to translate research into development impact.[61] As a result, ILRI administrators had already reincorporated a multidisciplinary systems approach, earlier adopted by ILCA, and social scientists had started to be reintroduced into ILRI's research teams.

CGIAR designated each center to lead a CRP, with ILRI leading on the CRP Livestock and Fish. ILRI subsequently created nine country-based hubs, with research in each hub focused on a single species or commodity. These research sites were to "serve as laboratories for characterizing and assessing smallholder value chains."[62] When ILRI staff were asked about the CRP Livestock and Fish, many spoke positively about its introduction and how it would affect the impact of their research.[63] As a veterinary epidemiologist in Nairobi asserted, "Old ILRI was all about writing papers, conducting research, developing careers that way. Science is now being used in a new way, to create development impact."[64]

[59] CGIAR, *A Strategy and Results Framework for the CGIAR* (Washington, DC: CGIAR, 2011), p. 3, www.iwmi.cgiar.org/About_IWMI/PDF/CGIAR_SRF_2011.pdf.
[60] Ibid. [61] Waters-Bayer and Bayer, "Driving Livestock Development."
[62] D. Baker, A. Speedy, and J. Hambrey, *Report of the CGIAR Research Program on Livestock and Fish Commissioned External Evaluation of the Program's Value Chain Approach* (Nairobi: ILRI, 2014), p. viii.
[63] For her Ph.D., Rebekah Thompson undertook thirteen months of ethnographic research in Uganda (January–December 2015 and October–November 2017). For her Master's research, Thompson spent one month (April–May 2014) at the ILRI office in Nairobi, Kenya and one week at the ILRI office in Addis Ababa, Ethiopia (May 2014), studying the history of ILRI and AR4D programs.
[64] Thompson interview with ILRI staff, ILRI office Nairobi, Kenya, May 2014.

Figure 7.1. A Camborough pig on a farm in Mukono, about thirty-two kilometers east of Kampala, Uganda, 2015. The introduced breed is prized for being fast-growing and producing large litters, among other qualities. Photo by Rebekah Thompson.

In line with the expectations of the CRP Livestock and Fish, ILRI established several new offices and multidisciplinary teams, one of which was located in Kampala, Uganda. In Uganda, the first project funded under the CRP focused on pigs and aimed to catalyze the smallholder pig value chain – that is, the steps followed by small-scale farmers, traders, slaughterhouse workers, and butchers to raise, sell, and profit from pigs and pork products. This project, which was funded by the European Commission/International Fund for Agricultural Development and Irish Aid, focused its research activities on the pig value chain in three districts of Uganda (Mukono, Kamuli, and Masaka). In Uganda, pig farming has rapidly increased since the 1960s in concert with a rising demand for pork, particularly in urban areas (Figure 7.1). It is now recorded as having the highest per capita consumption of pork in East Africa.[65] With this social and economic backdrop, the main objectives for the project were to identify constraints and opportunities along the smallholder pig value chain, from

[65] K. Roesel, F. Ejobi, M. Dione et al., "Knowledge, Attitudes and Practices of Pork Consumers in Uganda," *Global Food Security* 20 (2019): 26–36.

farm to fork, and to design and test "best bet interventions."[66] Despite the importance of pigs for people's livelihoods in Uganda, until the introduction of the CRPs, pigs had not been central to research conducted by ILRI, ILCA, or ILRAD, with ILCA going as far as excluding pigs from all research projects during its years of operation (1974–94).[67] Thus, although pigs had been a major source of income and nutrition for people in Uganda, it was not until ILRI as a research institute began to perceive the pig value chain as a potential means of generating "impact" that the significance of pigs as objects of research in Uganda was recognized. This focus on pigs as potentially generating the right kind of research outputs simultaneously transformed pigs from a livestock animal into a research object and a development target.

When one of the authors visited the ILRI office in Kampala in 2015, it immediately became clear that all the work conducted through the office was on pigs. The walls were lined with posters of pigs and corresponding statistics from ILRI's research activities. As one of the staff members enthusiastically commented, "We speak pigs, we eat pigs, everything is pigs."[68] The research being carried out by ILRI staff at the site ranged from work on pig husbandry practices to pork consumption habits to trading patterns to slaughterhouse processes.

The multidisciplinary team in Uganda was composed largely of international staff. These staff members were expected to build relationships with a range of local partners, who in turn would translate the research conducted by ILRI into observable development outcomes. Straightforward on paper, establishing partnerships was difficult in practice. As an ILRI-employed capacity development consultant emphasized, "People are capturing certain knowledge but there is no situation in which to apply the knowledge. Then the knowledge goes to waste. Basically, the knowledge is not being applied."[69] Echoing this claim, ILRI staff often described local partnerships as unequal or "on and off," with this profoundly affecting the outcomes that they could expect, especially within the limited time periods dictated by funding bodies.

Funding was another major issue, and often discussed as a key reason why research was conducted with certain partners. Funding also explained why ILRI outputs regularly followed a similar format.

[66] W. O. Ochola, "Report of the Value Chain Assessment & Best Bet Interventions Identification, Workshop, Kampala, April 9–10, 2013," April 30, 2013, https://hdl.handle.net/10568/29031.

[67] R. Blench, "A History of Pigs in Africa," in R. M. Blench and K. MacDonald, eds., *Origins and Development of African Livestock: Archaeology, Genetics, Linguistics and Ethnography* (Oxford: Routledge, 2000), 355–367.

[68] Thompson Interview with ILRI staff, ILRI office Kampala, Uganda, February 2015.

[69] Thompson Interview with ILRI staff, ILRI office Kampala, Uganda, February 2015.

Funding partners in Europe dictated the form of outputs, typically publications and project reports. These outputs did not always meet expectations, even when they took the "right" form. While the Uganda team did successfully publish numerous papers and reports from different scientific studies conducted along the pig value chain, external evaluators maintained that the outputs from the CRP Livestock and Fish were lacking overall in terms of "high-quality" peer-reviewed publications and that it should be producing more "excellent rather than good or acceptable grey literature."[70]

In order to translate the content of their publications and reports into observable development impact on the ground, ILRI staff often held training sessions. In these sessions, relevant stakeholders were educated on topics such as biosecurity or food hygiene measures. Participants were also often provided with products that ILRI staff deemed they should find useful, including information sheets, bleach, fly nets, or "tippy taps" (a low-cost, hands-free device for handwashing). These interventions, in line with the broader objectives of the CRP Livestock and Fish, were also easily transferable into other contexts outside of Uganda.[71] However, when we visited pig farms and pork butchers in Uganda, it became evident that ILRI interventions were not consistently generating sustainable impact for people working along the pig value chain (Figures 7.2 and 7.3). Pork butchers, for example, described fly nets as obscuring customers' vision of the meat, and many butchers further explained that, as they were unable to read, they could not understand the text on food safety information sheets. The form that ILRI interventions were forced to take reduced the complexity of the pig supply chain and the relationships within it to a single workshop session or a training manual. As a result, people were often trained on "best practices" as defined by international organizations such as the United Nations Food and Agriculture Organization (FAO) or World Health Organization (WHO). These interventions, in turn, were used as evidence that ILRI research was generating development impact along the pig value chain.

To summarize: in Uganda, a research team comprised almost entirely of international staff adopted a transdisciplinary, systems approach in an attempt to transform the smallholder pig value chain. Yet the outputs generated did not consistently translate back into meaningful impact for stakeholders working with pigs. This sketch of their work shows how certain forms of outputs – most commonly the publications and reports

[70] CGIAR-IEA, *Evaluation of CGIAR Research Program on Livestock and Fish* (Rome: CGIAR, 2016), p. 12, https://iaes.cgiar.org//sites/default/files/pdf/LF-EVAL-Report-Volume-1_FINAL-1.pdf.
[71] Ibid., p. 2.

Figure 7.2 Pork products for sale in Mukono, Uganda, 2015. Photo by Rebekah Thompson.

Figure 7.3 Transporting pigs by bike in Uganda, 2017. Photo by Rebekah Thompson.

that transcended local contexts – were still perceived within CGIAR and by external funding bodies as markers of excellence. As a result, actual development outcomes were reduced to little more than a series of quick fixes that could be used as evidence of impact when reporting back to funding bodies.

The example of the smallholder pig value chain project in Uganda indicates how some earlier criticisms of ILCA continue to apply to contemporary ILRI projects. More specifically, "high-quality" peer-reviewed publications and globally transferable solutions still ultimately govern what is perceived to be excellence in terms of project outcomes. In practice, this means that ILRI's AR4D continues to be geared towards generating excellence in terms of solutions that can be inserted into any livestock system, rather than sustainable development that is tailored to local contexts.

Conclusion

In this chapter, we illustrated how the formation of ILRAD and ILCA carved two distinct trajectories – one focused on generating scientific solutions for veterinary medicine, the other on livestock systems research. Although distinct in their mandates, these two institutions merged in 1994, creating ILRI. We have shown that despite this amalgamation, there are continuities stretching from the distinct historical lineages of ILRAD and ILCA to recent projects carried out by ILRI. More specifically, we have demonstrated how research excellence within ILRAD and ILCA was shaped by the continued privileging of certain notions of science and the production of scientific solutions for agricultural problems within international institutions. ILRAD was set an almost impossible technical task, but the promise of advances in immunology gave it significant momentum in pursuit of its vaccines. By contrast, ILCA's systems approach was scientifically more feasible, yet its researchers struggled to gain recognition for the quality of their work. Ultimately the limits of both approaches were exposed, and this in turn rationalized the merger. ILRI continues to undertake important work, but the specter of "excellence" – what it is and who defines it – has continued to loom large.

Reflecting on this history, we contend that despite a renewed focus on generating impact from AR4D programs, as an institution ILRI has continued to strive for recognition as a global center of scientific excellence, shaped by notions of excellence ascribed by global institutions and ideas about cutting-edge science that can be abstracted from specific farming contexts and therefore adopted by researchers and policymakers

around the world. Yet, we argue that by framing excellence in terms of scientific solutions, ILRI staff have had little option but to overlook the complexities of livestock supply chains and the nuances of human–animal relationships in specific contexts. This limitation is entrenched further as ILRI is forced to look globally for its funding. As Derek Byerlee and Greg Edmeades (Chapter 9, this volume) similarly conclude with relation to CIMMYT, it is in some ways easier to attract funding by igniting donor interest in the biotechnological possibility of Tumaini than in worthy farmer-facing breeding programs for poultry and livestock that ILRI also leads, such as the African Dairy Genetic Gains program.

As we move into the next fifty years of CGIAR research, there is a pressing need to examine how excellence is conceptualized by CGIAR institutions, funding bodies, and researchers, and to recognize the implications that this conceptualization has for the ways research is conducted and the outputs it generates.