



RESEARCH
PROGRAM ON
Livestock



Samuel Nding'u, a young dairy entrepreneur near Nairobi in Kenya, delivers milk at his cooperative.
Photo: ILRI/Georgina Smith

CAPACITY DEVELOPMENT REVIEW AND SYNTHESIS FOR THE CGIAR RESEARCH PROGRAM ON LIVESTOCK (2017–2021)

AUTHOR

Nelson K. O. Ojijo¹

¹. Independent reviewer

December 2021

CGIAR is a global partnership that unites organizations engaged in research for a food-secure future. The CGIAR Research Program on Livestock provides research-based solutions to help smallholder farmers, pastoralists and agro-pastoralists transition to sustainable, resilient livelihoods and to productive enterprises that will help feed future generations. It aims to increase the productivity and profitability of livestock agri-food systems in sustainable ways, making meat, milk and eggs more available and affordable across the developing world.

The Program thanks all donors and organizations who globally supported its work through their contributions to the CGIAR Trust Fund.

© December 2021



This publication is licensed for use under the Creative Commons Attribution 4.0 International Licence. To view this licence, visit <https://creativecommons.org/licenses/by/4.0>.

Unless otherwise noted, you are free to share (copy and redistribute the material in any medium or format), adapt (remix, transform, and build upon the material) for any purpose, even commercially, under the following conditions:

i **ATTRIBUTION.** The work must be attributed, but not in any way that suggests endorsement by the publisher or the author(s).

Citation: Ojijo, N.K.O. 2021. *Capacity development review and synthesis for the cgiar research program on livestock (2017–2021)*. Nairobi, Kenya: ILRI.

Photo: ILRI/Apollo Habtamu



ACKNOWLEDGEMENTS

This research was conducted as part of the CGIAR Research Program on Livestock and is supported by contributors to the CGIAR Trust Fund. CGIAR is a global research partnership for a food-secure future. Its science is carried out by 15 Research Centres in close collaboration with hundreds of partners across the globe. www.cgiar.org

Sincere gratitude goes to various persons who guided and supported this review in several ways and at different stages, including Thomas Randolph, director of the CGIAR Research Program on Livestock; Iddo Dror, program leader, Impact at Scale; Helen Atshul, performance and partnerships manager; flagship leaders; cluster leaders; country project coordinators in Ethiopia, Uganda, Tanzania, Tunisia, and Vietnam; Caroline Kanyuru, monitoring and evaluation (M&E) officer; and Mamusha Lemma, capacity development and innovation expert. We are also grateful to the various project beneficiaries in Ethiopia and Tunisia for sparing time to recount their experiences with us. Any errors of omission or commission in this report remain the responsibility of the consultant.

Contents

List of figures and tables

Abbreviations and acronyms

Executive summary vi

Background and scope of the review

Approach and methodology

Key findings and recommendations

Introduction 1

Objectives and scope of the evaluation 2

CGIAR conceptualization of capacity development 3

Approach, design, and methods 5

Limitations 9

Progress monitoring and quality assurance 10

Synthesis of CapDev implementation 11

Overview

CapDev implementation by flagship

Results of the review of CapDev implementation by the various flagships 32

Is the Livestock CRP delivering quality capacity development interventions aligned with its capacity development strategy?

How well were capacity development interventions implemented and adapted as needed in the Livestock CRP? Lessons learned and best practices to inform future programming

To what extent have the planned capacity development outputs and outcomes been achieved by 2021?

Are any positive results likely to be sustained? In what circumstances?

How valuable were the results to the national partners and/or organizations involved?

How capacity development activities can be carried out in the future 49

Needs assessments and strategy

Monitoring, cross-learning and evaluation

Organizing principles or system concepts

Scale of focus and subsidiarity

Equity

Funding/budgets

Overall conclusions and recommendations 52

Synthesis of CapDev actions

Key points from CapDev review

Lessons and best practices

Suggestions for Future CapDev

Appendices 56

List of figures and tables

Table 1	Prioritized CapDev areas for livestock CRP	4
Table 2	A generalized approach to the evaluation	4
Table 3	OECD evaluation framework	6
Table 4	Design matrix for executing the evaluation questions	7
Table 5	CapDev implementation by various Flagships	12
Table 6	One-off formal training under the Livestock Genetics Flagship in 2019	12
Table 7	One-off formal trainings under the Livestock Genetics Flagship in 2020	13
Table 8	Academic trainings under the Feeds and Forages Flagship	17
Table 9	One-off trainings under the Feeds and Forages Flagship	19
Table 10	Participatory trials and studies under the Feeds and Forages Flagship	21
Table 11	Academic trainings under the Livestock and Environment Flagship	23
Table 12	One-off trainings under the Livestock and Environment Flagship	26
Table 13	Knowledge exchange activities in Tunisia	28
Table 14	One-off trainings under Livestock Livelihoods and Agri-Food Systems	29
Table 15	Prioritization of CapDev strategic elements	33
Table 16	Extent of implementation of CapDev activities by Flagships	35
Table 17	Usage statistics of training tools developed by the Livestock Health Flagship	39
Table 18	Use statistics for some tools developed by the Livestock and Environment Flagship	40
Table 19	Training participants in Livestock CRP target countries	51
Figure 1	CGIAR's Conceptualization of Capacity. Development	3
Figure 2	Participation in CapDev activities by country. CapDev—capacity development	11
Figure 3	Value of production and sales from crops, livestock, and off farm activities	32
Figure 4	How Flagship CapDev actions were informed by the Livestock CRP CapDev Strategy. CapDev—capacity development. CRP—CGIAR Research Project	34
Figure 5	CGIAR's Results Framework for CapDev. CGIAR—Consultative Group on International Agricultural Research. CapDev—capacity development	46
Figure 6	Three spheres of changes engendered by project interventions	46

Abbreviations and acronyms

AIS	Agricultural Innovation Systems
AKIS	Agricultural Knowledge and Information System
AFAWA	Animal Feed Analysis Web Application
ABS	Access and Benefit Sharing (with respect to livestock research)
AFAWA	Animal Feed Analysis Web Application
ASF	Animal-Source Food
BBSRC	Biotechnology and Biological Sciences Research Council
BSc	Bachelor of Science
EMBRAPA	Brazilian Agricultural Research Corporation
CapDev	Capacity Development
CBBP	Community-based Breeding Program
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Center for Tropical Agriculture
CLEANED	Comprehensive Livestock Environmental Assessment for improved Nutrition, a secured Environment and sustainable Development
CLEANED-R	Comprehensive Livestock Environmental Assessment for improved Nutrition, a secured Environment and sustainable Development, in R Programming Language
CLEANED-X	Comprehensive Livestock Environmental Assessment for improved Nutrition, a secured Environment and sustainable Development, in MS Excel
COVID-19	Coronavirus Disease—2019
CNAs	Capacity needs assessments
CCROs	Certificates of customary rights of occupancy
CLEANED	Comprehensive Livestock Environmental Assessment for Improved Nutrition, a Secured Environment and Sustainable Development (along Livestock Value Chains)
CoPs	Communities of Practice
CBBP	Community-based Breeding Program
CSO	Civil Society Organization
CRP	CGIAR Research Program
ECF	East Coast Fever
EADD	East Africa Dairy Development
ECF	East Coast Fever
EIAR	Ethiopian Institute of Agricultural Research
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
EMBRAPA	Brazilian Agricultural Research Corporation
FP	Flagship Program
FTF	Farmer-to-Farmer
FEAST	Feed Assessment Tool
G-FEAST	Gendered Feed Assessment Tool
GHG	Greenhouse gases
IBLI	Index-based Livestock Insurance
ICARDA	International Center for Agricultural Research in the Dry Areas
ICT4Ag	Information and Communication Technology for Agriculture
IGFRI	Indian Grassland and Fodder Research Institute

ILRI	International Livestock Research Institute
IPM	Integrated Pest Management
ICT4Ag	Information and Communication Technology for Agriculture
ICARDA	International Center for Research in the Dry Areas
CIAT	International Center for Tropical Agriculture
ILRI	International Livestock Research Institute
JVLUP	Joint Village Land Use Planning
KAP	Knowledge, Attitudes, and Practices
LVIF	Livestock Vaccine Innovation Funds
LMIS	Livestock Management Information System
MA	Master of Arts
MSc	Master of Science
MARLO	Managing Agricultural Research for Learning and Outcomes
MEL	Monitoring, Evaluation, and Learning
MSPs	Multi-stakeholder platforms
NGO	Non-governmental organization
NAMA	Nationally Appropriate Mitigation Action
NARES	National Agricultural Research and Extension System
NARS	National Agricultural Research System
NIRS	Near Infra-Red Spectroscopy
OECD DAC	Organisation for Economic Co-operation and Development's Development Assistance Committee
OIC	Occidental Insurance Company, Kenya
OICR	Outcome-Impact Case Reports
PhD	Doctor of Philosophy
Pro-WEAI	Project-level Women's Empowerment in Agriculture Index
RHoMIS	Rural Household Multi-Indicator Survey
SLU	Swedish University of Agricultural Sciences
SNNPR	Southern Nations, Nationalities, and People's Region (in Ethiopia)
SOC	Soil Organic Carbon
SOFT	Selection of Forages for the Tropics
SMEs	Small and medium enterprises
SELIA	Socio-economic and Livelihood Impact Analysis
SLU	Swedish University of Agricultural Sciences
TOC	Theory of Change
ToT	Training the trainers
TGFT	Tropical Grasslands—Forrajes Tropicales, a journal
WELI	Women's Empowerment Livestock Index

EXECUTIVE SUMMARY

Background and scope of the review

The Consultative Group on International Agricultural Research (CGIAR) Research Program on Livestock (Livestock CRP) focuses on meeting the increasing demand for animal-source foods by transforming smallholder and pastoral livestock systems. The goal of the CRP is to create a well-nourished, equitable, and environmentally healthy world through livestock research for development. The current Livestock CRP cycle terminates at the end of this year, 2021. It was therefore deemed necessary to conduct a summative review and synthesis of the numerous capacity development (CapDev) activities implemented by the various Flagships of the Livestock CRP over the period 2017 to 2021 for accountability, learning, and planning purposes. The review was intended to shed light on the success and outcomes of CapDev interventions, the overall difference that the interventions have made, how effective they have been against set outcomes, key lessons learnt, and whether the outcomes were sustainable. The study design was based on evaluation questions provided by the International Livestock Research Institute (ILRI).

Approach and methodology

We employed flagship-based narrative synthesis of CapDev actions, while the Organisation for Economic Co-operation and Development's Development Assistance Committee (OECD DAC) performance criteria (relevance, efficiency, effectiveness, impact, and sustainability) provided the framework for the evaluation. The approach included both quantitative and qualitative data capture techniques, and involved document review, online surveys, and online key informant interviews. The target respondents for the interviews and surveys were mainly project implementers and direct beneficiaries. Semi-structured questionnaires were used for the online surveys and key informant interviews. Quantitative data derived from the interview responses are presented in tables and figures. Oral interviews were transcribed and coded into NVivo software for qualitative analysis.

We selected the themes based on their relevance to the key research questions. Structured summaries were extracted and reinforced, in some cases, by direct quotations from respondents. We also applied systematic investigations using case studies and most significant change methodology in order to document the intended and non-intended outcomes for some selected interventions.

Key findings and recommendations

Synthesis of CapDev actions

- A total of 265,823 individuals (24% women) participated in CapDev activities implemented by the Livestock CRP between 2018 and 2021. Kenya registered the highest number of CapDev participants followed, in decreasing order, by the Livestock CRP priority countries of Uganda, Tanzania, and Ethiopia.
- All outputs/deliverables/milestones from the Livestock CRP annual reporting cycles were scored for the extent to which they integrated CapDev actions, i.e., not applicable (n/a), not targeted (0), significant (1), and principal (2). Between 2017 and 2020, of the deliverables that were scored as either significant or principal for CapDev, 73% were significant and 27% were principal. Overall, the flagships on Feeds and Forages (FP3) and Livestock and Environment (FP4) jointly accounted for 71% of the total CapDev deliverables over the four years. The programmatic interventions by the Livestock Livelihoods and Agri-food Systems (FP5) had the least degree of integration of CapDev actions, followed by Livestock Genetics (FP1).
- The CapDev interventions were comprised of long-term academic trainings at Bachelor of Science (BSc), Master of Science (MSc), and Doctor of Philosophy (PhD) levels; short-term trainings like one-off workshops and training visits; and other engagements with a bearing on CapDev such as knowledge exchange (i.e. focus group discussions,

roundtable discussions, or policy dialogues), trials and studies (i.e. participatory trials and studies), and co-creation events (i.e. taskforce meetings). The trainees included CGIAR and national partner researchers, policy makers and regulators, extension agents, farmers, and other value chain actors.

- The technical area of specialization of trainees from national partners aligned with the research priorities of the sponsoring Flagships, as expected; but it was unclear to us whether there were distinct criteria or a distinct basis for deciding on the level of study (BSc, MSc, or PhD), gender, target countries, or even partner organizations within the target countries from which the training beneficiaries were selected. In a similar vein, McHugh and Bennet (2020¹) observed in their report CGIAR Research Program 2020 Reviews: Livestock, that 'for postgraduate researchers, we find the general approach to developing skills ad hoc and project driven. Each student's experience is different and highly dependent on their host organization or personal background. We conclude that more could be done to create a collegiate postgraduate learning experience in CGIAR and in CRPs with a set of learning activities that are more closely aligned with national postgraduate programs and aims'. Thus, a more systematic and targeted channelling of academic trainings to the national partners would ensure relevance, create clear exit strategies, impart efficiencies in the scaling up of technologies and tools, and ensure sustainability of impacts from CRP interventions.
- The one-off trainings were on technologies, methods, and practices of relevance to the objectives of the Flagships. Most of them concerned the deployment and piloting of various decision-support and extension tools (including manuals and guides). The usage statistics for some of the tools can be proxied by the online downloads and views data. However, for better tracking of their use in the future, the CGSpace online repositories for the tools could be configured to document additional user statistics. For example, those viewing or downloading the tools could be asked to provide information such as their vocation (e.g., researcher, student, or private sector) and the purpose for the download.

Key points from CapDev review

Alignment of interventions with CapDev strategy

- All prioritized activities in the CRP CapDev Strategy were firmly rooted in the CGIAR's overarching CapDev Framework. However, there was an apparent disparity between strategy and practice at the CRP level since the CapDev activities implemented by

some of the Flagships were either not informed or only slightly informed by the priorities of the CapDev Strategy. A few Flagships, though, had activities that were reportedly completely informed by the CapDev Strategy.

Implementation and adaptation of CapDev interventions

- At least in the priority countries of the Livestock CRP (i.e., Ethiopia, Tanzania, Uganda, and Vietnam), CapDev activities were implemented as part of an integrated country work plan. As per the CGIAR requirements, the planning and reporting system used by the CRP does not include information on specific CapDev activities at the annual planning stage. Instead, it was based on deliverables such as proof of the completion of an activity or set of activities. The reports were, however, required to indicate if any of the deliverables involved trainees and, if so, to specify the number, gender, and types of these trainees. In the Managing Agricultural Research for Learning and Outcomes (MARLO) report, all reported Flagship activities were self-scored by project coordinators as to whether the activity which the deliverable evidences had a specific focus on CapDev. This possibly introduced a degree of subjectivity in the reported levels of CapDev actions.
- CapDev was a vision in the mind of the Flagship leaders, but generally did not have specific delivery targets, at least at the annual planning stage. Moreover, the degree of Flagship engagement with the CapDev Unit team to jointly identify the CapDev elements for implementation was, in most cases, unclear. Thus, CapDev was either expected as an incidental outcome to a main activity or implemented as an unplanned sub-activity, depending on the exigencies of the Flagship, with no clear linkages to the CRP CapDev strategic priorities.
- In many of the countries, project activities were bilaterally funded; but there were no clear linkages between bilateral projects and country-level intermediate indicators to allow aggregation of results. Program output indicators (e.g., number of CapDev participants) were not clearly linked to bilateral project output indicators, and this probably led to under-reporting on deliverables. However, in some cases, alignment with the country's strategic areas was one way of adapting CapDev actions to country context.

Extent of achievement of CapDev outputs

- As indicated above, the planning and reporting system used by the Livestock CRP does not include information on specific CapDev activities and associated targets at the annual planning stage. This may pose a challenge for the evaluation of implementation effectiveness. However, based on perceptions of the implementing teams, the extent to

1. CAS Secretariat (CGIAR Advisory Services Shared Secretariat). 2020. CGIAR Research Program 2020 Reviews: Livestock. Rome, Italy: CAS Secretariat Evaluation Function. <https://cas.cgiar.org/>

which various Flagships completed implementation of the CapDev activities was different depending on the target country. This was gauged by the responses offered by the Flagship and Cluster leaders to the following question: 'To what extent were you able to implement the intended CapDev activities in each of the targeted countries?'

- On this basis, the Livestock Genetics Flagship reportedly completed 80 – 100% of the CapDev activities in all the priority countries, at least by July 2021. The Livestock Health Flagship did not complete all the CapDev interventions in any of the three targeted countries of Uganda, Vietnam, or Mali. The Feeds and Forages program indicated an 80-100% completion rate in four of the nine targeted countries: Colombia, Kenya, Tunisia, and Vietnam. The Livestock and Environment Flagship targeted four countries, but only managed to complete the implementation of intended CapDev activities in two countries: Tanzania and Tunisia. The Livelihoods and Agri-Food Systems Flagship also targeted nine countries for delivery of CapDev interventions, but only three (India, Kenya, and The Gambia) registered completion of the activities. In addition, the priority countries of Ethiopia, Tanzania, Uganda, and Vietnam all registered CapDev activity completion rates of below 49%. Perceptively, this means that over 51% of intended CapDev activities were pending in these countries at the time this review was conducted; but we could not ascertain whether these pending activities were later implemented.
- Disruptions by the coronavirus disease –2019 (COVID-19) pandemic, delays in funding and getting ethical approval, late onset of implementation of some projects, engagement with new partners, and lack of implementation capacity (in The Gambia, for example, the lead scientist had left) were some of the reasons cited for non-completion of CapDev activities.

Gains and outcomes from CapDev

- The general approach to introducing the Feed Assessment Tool (FEAST) involved an initial training of master trainers. At every project site, the technical people participating in that project were enlisted for training on the tool, i.e., how to use it to process data, interpret data, and write reports. The trainees were then allowed to go out on their own to conduct the assessments to prove that they could use the tool and produce reports and recommendations on which interventions to follow up on. The master trainers would in turn cascade the training to other partners. As a result, the tool has been used in over 22 countries across Africa, Asia, and Latin America, and promoted independently by a range of civil society, non-governmental organizations (NGOs), and government and private sector organizations in various countries without any support from the CRP partners. Sustainability of FEAST use is likely in various contexts, and this could be aided by integrating additional components (e.g., soil analysis) and introducing it within an innovation platform setup.
- The success of the Rural Household Multi-Indicator Survey (RHoMIS) tool has relied on multiple trainings of, and outreach to, research and development organization partners. The RHoMIS innovators provide trainings to partners wishing to use the tool and support simple analyses to produce results quickly. By 2018, the RHoMIS tool had been adopted by 13 different research and development organizations to guide investments and generate information on 24,000 households in 31 countries.
- Community conversations are knowledge co-creation forums that have been successfully applied to guide discussions among rural farming communities in Ethiopia, focused around livestock health management, gender, and zoonotic disease risks. Capacity development has driven the success of the conversations. Training programs on the approach were organized for key partners. Internal capacity development of other team members in other projects were also organized to help them develop their own community conversation materials, demonstrate the community conversations techniques, provide the tools, and help participants to develop their own materials. There has been a continuous synthesis of experiences and refinement of technique as informed by learning from the field. Ultimately, a master training course on the community conversation approach in animal health was developed. Community conversations were piloted in the Livestock Health Flagship, but have since been taken up by the other Flagships. The facilitated conversations have been shown to have positive effects on knowledge, attitudes, and practices of participating farmers as well as behaviour change and transformation of gender relations at the household and community levels. The Ethiopian government is keen on mainstreaming community conversations in the national extension system.
- The International Center for Agricultural Research in the Dry Areas (ICARDA) facilitated collective action of youth groups for market-oriented sheep production in the highland regions of Ethiopia through communities of practice (CoPs). Specifically, the youth groups were trained on entrepreneurial skill development and dynamics of group formation. The sheep-fattening groups are highly motivated and doing well. Membership has grown by over 40% across three of ICARDA's intervention regions. Another outcome is with regard to how the self-propagating CoP concept around the youth groups has auspiciously evolved into platforms of cooperation among the implementing partners, an interesting case of 'reverse' capacity development. Initially, the implementing partners worked in silo mode and never related to

each other in any meaningful way; but now, they go to sites together and work together with the farmers. The CoPs have since been replicated in the other highland regions of Ethiopia where ICARDA is active mainly through peer-to-peer learning, with good results.

- The ICARDA-led community-based breeding program (CBBP) has become the Ethiopian government's strategy of choice for small-ruminant genetic improvement. The CBBPs were introduced through training modules and have been very successful due to their participatory model. Implementation of the CBBP focused on building capacity of partners through short-tailored trainings. ILRI and ICARDA initially trained national partners, who in turn trained other value chain actors. Moreover, a module on CBBP was integrated into the livestock genetics curriculum of three Ethiopian universities and a tailored MSc training on breeding and genetics was introduced in two universities. The CBBP was incorporated in the Ethiopian livestock master plan and is now owned and promoted by the national systems, especially in the small ruminant sector.
- Capacity development was at the core of the successful adoption of joint village land use planning (JVLUP) to protect shared resources in Tanzania. Significant capacity building of partners (NGOs and government) was undertaken with strong influencing and awareness-raising activities that helped to strengthen support for replicating the approach in other areas. These included, among other things, training of staff and partners on gender and conflict management, undertaking of a civil society organization (CSO) national dialogue, learning visits to other countries, and hosting from other countries to learn about the JVLUP experiences. All of this helped to build the case for JVLUP and the issuing of group certificates of customary rights of occupancy (CCROs) to livestock keepers. So far, JVLUP includes grazing lands for local livestock keepers in four clusters of villages covering 175,000 hectares of grazing land.
- Under the Livestock CRP, business linkages in the pig value chain have expanded the horizons of many entrepreneurs. Multi-stakeholder platforms (MSPs)—social spaces for communicative stakeholder interactions—were created to provide business and networking opportunities and agribusiness linkages to emerging SMEs run by farmers and young entrepreneurs in the pork value chain in Uganda. The pig MSPs have enhanced peer learning and strengthened linkages between value chain actors. Capacity development in specific areas, largely undertaken by third parties (i.e., value chain actors previously trained by ILRI), have greatly facilitated actor linkages and success of agribusinesses. More than 1700 value chain actors were trained. The training mainly focused on the following: profitable pig breeds and breeding, pig housing

and management, feeds and feeding, closed cycle pig farming, and silage making, as well as animal health, vaccines, feeds and feeding, food safety, and marketing.

- An intervention designed to improve the hygienic handling and safe consumption of milk among the Borana pastoral community in Ethiopia had impressive results in terms of changes in the knowledge, attitudes, and practices (KAP) of women who produce and sell dairy products. The intervention consisted of 16 hours of training on good milk production practices and prevention of milk-borne diseases. A total of 120 women were trained and six months post training, the overall practice score increased from 49.5% at pre-training to 64.7%, a statistically significant change.

Lessons and best practices

- Key informants across flagships felt that lack of capacity of national partners was a drawback to technology uptake and scaling efforts. Thus, developing the capacity of national partners to independently execute research and undertake downstream scaling efforts should be prioritized in future CapDev interventions.
- The pooled funding projections in the CRP Proposals apparently did not materialize for most of the Flagships, which had to rely on ongoing bilateral agreements to fund CapDev and other activities. Some Flagships did not have suitably qualified technical personnel in some focus countries, and this was closely tied with the sector under-funding.
- Lack of trust as well as exploitative power relations were apparent among some stakeholders (e.g., in the pig value chain in Uganda). Adoption of innovation platforms as social spaces for facilitated dialogue by stakeholders on key issues would help address the power disparities that were apparent in the Ugandan pig value chain.
- Strong institutional partners, institutional structures, and the stage of development are key to programmatic success in target countries. The stage of development, for example, may partly determine where one stands with respect to readiness to take things up (i.e., technology uptake) and hence impact at scale.
- Medium and smallholder farmers are the main adopters of technologies for feeds and forages. This is an important lesson for targeting future upscaling efforts for feed and forage technologies.
- Community conversations that have registered remarkable successes at the grassroots level in small ruminant value chains could serve as a mechanism to instigate bottom-up change management to help navigate enduring system rigidities that undermine innovations in some countries like Ethiopia.

- Tools developed by one flagship could easily have been deployed in another for greater efficiency. An example is the Integrated Package Tool developed by Livestock Health Flagship, which had components that could have been employed in the youth sheep-fattening enterprise in Ethiopia. However, the capacity to pick up innovations fermented in one flagship and inoculate them elsewhere within the CRP was lacking. The concept of site integration need not be only for co-delivery; it should really be about co-learning and co-design.
- By invoking systems thinking, which posits capacity as an emergent system attribute, CapDev —especially targeted at systems strengthening —should be increasingly viewed as a complex adaptive process (as opposed to a directed, linear and predictable one) to be approached by nuanced experimentation, learning, and reconfiguration rather than the exclusive implementation of predetermined activities. This demands time; yet the CRP is time-constrained to show results, especially to development partners, usually by the end of the cycle. Thus, a framework for the emergence of systemic capacity for agricultural innovations must be conceived, initiated, and steered by the national governments. External CapDev interventions such as those by the CRP will then only supply a necessary component of facilitation to an endogenously driven and ongoing wider process.

Suggestions for future CapDev

Approach to CapDev

- There is need for a paradigm shift in the way the CRP views CapDev of national partners within countries. Currently, CapDev is meant to help take the practices, technologies, and tools developed by the CRP to scale in the targeted countries largely through training, knowledge exchange activities, and participatory approaches like community conversations. These CapDev approaches principally stimulate capacity enhancement at the individual and perhaps organizational levels. However, ownership and sustainability of project results ultimately hinge on the existence of systemic capacity in a country. Ability to independently execute research, agility to spur local innovations, and resilience to shocks are some attributes of a viable systemic capacity. A few key informants talked about learning-by-doing as a means to strengthening partner capacity. Such an approach may potentially engender organic structural changes to a system. However, no clear details were adduced as to how this approach was implemented in practice nor how the results thereof were tracked.
- Additionally, taking the developed technologies and tools to scale entails more than knowledge of the technology or how to use a decision support tool; it is closely connected with the embeddedness of the technology or tool in the system or social structure. For example, the fact that some farmers were averse to the use of semen from cross-bred animals in some target countries is an issue of the institutional or social embeddedness of the semen technology. While the farmers were knowledgeable about the crossbreed semen technology, the Livestock Genetics Flagship needed to employ non-tangible aspects of CapDev through the African Dairy Genetic Gains program in order to navigate their resistance. An example of an effective approach would be a digital feedback system that provided evidence of genetic gains for crossbred animals directly to farmers.

Theory of change and CapDev

- The aims and purposes of CapDev are mentioned in the theories of change (TOCs) of the CRP and flagships. What was perhaps needed was a lucid domestication of the theory of change (TOC) at the flagship level, at least from a CapDev angle. Seemingly, the CapDev Strategy itself did not specify exactly how the prioritized activities contributed to the CRP or flagship TOCs. An internal conceptual disconnect is thus apparent between strategy and operationalization, which may mar implementation. This calls for strengthening the ownership of strategy and monitoring, evaluation, and learning (MEL) capacity within the CRP.

Monitoring and cross-learning

- Currently, CapDev actions are only attached ex post to the main Flagship activities and rated based on perception as to whether they were 'not targeted', 'significant', or 'principal'. Specific effects and experiences from the CapDev actions were not formally tracked, save for follow-up studies that implemented partners on KAPs for some interventions. Therefore, subject to proper budgetary outlay, a pragmatic approach to MEL is called for, based on reflection on practical experience in attempting to achieve CapDev goals.

Scale of focus and subsidiarity

- Uggle (2020²), in a review of the CapDev activities in the Livestock Health Flagship, asserted that the 'flagship should stick more consistently to the principle of 'training the trainers (ToT)' by primarily directing information and teaching efforts to regional partners and the animal health extension workers rather than directly to farmers'. This review

2. Uggle, A. 2020. Review of Capacity Development activities within the Livestock Health Flagship of the CGIAR Research Program on Livestock. Nairobi, Kenya: ILRI, Uppsala, Sweden: SLU. Available online at: <https://hdl.handle.net/10568/108470>.

sustains this view and reiterates that—based on subsidiarity—the role of the CRP should be to strengthen the macro-level systemic capacity for effective downstream delivery of development interventions. Efficiencies of going to scale can only be realized if partners at progressively lower levels are empowered to cascade the interventions. Indeed, leaving country implementation to those partners with comparative advantage ensures that

the CRP does not overstretch its implementation capacity. The caveat, however, is that if not tested and validated with farmers in design/pilot stages, many training the trainers (ToT) programs will fail as not fit for purpose. Further, ToT programs are not a panacea and, in general, are poorly conceived. In most cases, there is no funding to actually carry out work beyond the ToT.

INTRODUCTION

The Consultative Group on International Agricultural Research (CGIAR) is a global partnership that unites organizations engaged in research for a food-secure future. The CGIAR Research Program on Livestock (Livestock CRP) provides research-based solutions to help smallholder farmers, pastoralists, and agro-pastoralists transition to sustainable, resilient livelihoods and to productive enterprises that will help feed future generations. The CRP aims to increase the productivity and profitability of livestock agri-food systems in sustainable ways, making meat, milk, and eggs more available and affordable across the developing world. There are five core partners charged with co-delivery of the overall CRP mandate: the International Livestock Research Institute (ILRI) with a mandate on livestock; the International Center for Tropical Agriculture (CIAT), which works on feeds and forages; the International Center for Research in the Dry Areas (ICARDA), focusing on small ruminants and dry land systems; the Swedish University of Agricultural Sciences (SLU), with expertise particularly in animal health and genetics; and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), which connects or channels research outcomes into development, innovation, and scaling processes.

The Livestock CRP focuses on meeting the increasing demand for animal-source foods by transforming smallholder and pastoral livestock systems. The goal of the CRP is to create a well-nourished, equitable, and environmentally healthy world through livestock research for development. The CRP recognizes that in order for livestock research for development to enhance the performance of livestock systems, five interacting areas need attention: i) the genetic potential of the livestock, ii) their nutrition, iii) their health, iv) their interaction with the environment, and v) a range of surrounding socio-economic conditions. Based on these five areas, the CRP's objectives have been formulated thus (ILRI 2016³):

1. Ensure that appropriate livestock breeds are readily available, affordable, and widely used by poor women and men livestock keepers.
2. Improve livestock health and health service delivery.
3. Increase livestock nutrition by identifying, testing, and delivering superior feed and forage strategies and options.
4. Reduce the environmental footprint of livestock production across both rapid and fragile growth trajectories, while ensuring that livestock systems in target countries are able to adapt to global environmental changes.
5. Maximize livestock-mediated livelihoods and resilience to risk among smallholder and pastoral producers and their communities, while enhancing availability and access to animal-source food for rural and urban consumers.

The CRP's objectives are being addressed through research on five flagship program (FP) areas, which are: FP1—Livestock Genetics; FP2—Livestock Health; FP3—Livestock Feeds and Forages; FP4—Livestock and the Environment; and FP5—Livestock Livelihoods and Agri-food Systems. With backstopping from ICARDA, GIZ, and other partners, the lead institutions for the FPs are designated as follows:

- FP1: Livestock Genetics—International Livestock Research Institute (ILRI)
- FP2: Livestock Health—Swedish University for Agricultural Sciences (SLU).
- FP3: Livestock Feeds and Forages—International Centre for Tropical Agriculture (CIAT)
- FP4: Livestock and the Environment—ILRI
- FP5: Livestock Livelihoods and Agri-food Systems—ILRI

3. ILRI. 2016. Livestock Agri-Food Systems CGIAR Research Program: Proposal CRP and Flagship Narratives. Nairobi, Kenya: ILRI. Available online at: <https://cgspace.cgiar.org/handle/10947/4398>. Accessed 3 May 2021



OBJECTIVES AND SCOPE OF THE EVALUATION

As the Livestock CRP winds up at the end of this year, 2021, it was deemed necessary to: 1) evaluate the gains from the numerous capacity development activities implemented under the CRP, and 2) use the opportunity to address the comments from previous external evaluations of the CRP as they pertain to capacity-development work. Thus, the evaluation focused on the capacity development activities implemented by the five FPs, and assessed and documented the overall nascent changes that the capacity development (CapDev) programs have influenced, how effective the changes have been, and whether the outcomes are sustainable.

The findings of the evaluation are expected to: 1) contribute to the Livestock CRP's and CGIAR's understanding of capacity development work, 2) identify lessons learned and best practices to inform future programming, 3) make recommendations on how capacity development activities can be carried out in the future, and 4) provide insights relevant to CGIAR management and researchers, donors, and other external partners. Moreover, as recommended in the Livestock CRP Review of 2020 (Uggla 2020⁴), the evaluation sought to provide guidance on CapDev aims, how the CRP will work with other key actors such as national universities and national agricultural research systems (NARS) in achieving these aims, review the CapDev targets, and determine how the CRP will measure progress and align its efforts with national-level needs.

4. Uggla, A. 2020. Review of capacity development activities within the Livestock Health Flagship of the CGIAR Research Program on Livestock. Montpellier, France: CGIAR.



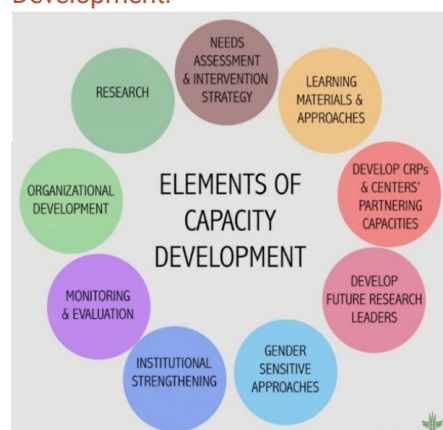
Photo: ILRI/Geoffrey

CGIAR CONCEPTUALIZATION OF CAPACITY DEVELOPMENT

Capacity development is a strategic enabler of impact for the CGIAR as well as its partners. It goes far beyond the transfer of knowledge and skills through training, and cuts across multiple levels, specifically: individual (micro), organizational (meso), and institutional (macro). To support implementation of this broader concept of capacity development in the second phase of CRPs, the CGIAR Capacity Development Community of Practice (CapDev CoP) formulated a Capacity Development Framework (CGIAR 2015⁵) that provides guidance on how the CGIAR and its partners can successfully integrate capacity development for both internal and external clients into the CRPs.

The Framework is underpinned by nine conceptual elements, namely: 1—needs assessments and intervention strategy design; 2—design and delivery of innovative learning materials and approaches; 3—development of partnering capacity; 4—development of future research leadership; 5—application of gender-sensitive approaches to capacity development; 6—institutional strengthening; 7—M&E of capacity development; 8—organizational development; 9—research on capacity development; and 10—development of capacity to innovate (Figure 1).

Figure 1: CGIAR's Conceptualization of Capacity Development.



5. CGIAR. 2015. Capacity Development Framework: Prepared by CGIAR Capacity Development Community of Practice for the second round of CGIAR Research Programs. Montpellier, France: CGIAR. Available online at: <https://bit.ly/3FerdHV>. Accessed on 3 October 2021.

The integrative and multi-faceted nature of capacity development precludes linear prediction of outcomes and appeals to the dual systems and complexity dynamics inherent in complex adaptive systems. Thus, viewed from a complex adaptive systems perspective, capacity can only emerge organically and endogenously (rather than being externally directed) from multiple processes that are complex, evolving, and unpredictable.

This process of change is only partially open to explicit human direction and cannot be predetermined. Specific capacity development outcomes cannot simply be engineered by the delivery of external inputs. Therefore, interventions need to be flexible and able to adapt to future, usually unforeseeable, system behaviour. An evaluation of capacity development investments should therefore focus on processes, interrelationships, emergence, and self-organization (McEvoy 2018⁶).

Globally, the strategic capacity development elements in Figure 1 have been prioritized by the CRP as indicated in Table 1 (ILRI 2016⁷).

Each of the FPs have in turn elaborated their prioritized CapDev actions. For example, FP1—Livestock Genetics has prioritized the following areas: CapDev needs assessment and intervention strategy; learning materials and approaches; development of future research leaders through MSc and PhD fellowships; and institutional strengthening. The priority CapDev areas for the other FPs are indicated in Appendix 1.

Initially, ILRI and partners carried out capacity needs assessments (CNAs) in the five Livestock CRP countries—Ethiopia, Nicaragua, Tanzania, Tunisia, and Uganda (Kang'ethe et al. 2018⁸). The CNAs looked

6. McEvoy, P. 2018. Cooperation, Complexity and Adaptation: Higher Education Capacity Initiatives in International Development Assistance Programs in Sub-Saharan Africa. PhD Thesis, Dublin City University, Ireland.

7. ILRI (International Livestock Research Institute). 2016. Proposal: Livestock agri-food systems CGIAR research program overall and flagship narratives 2017–2022. Nairobi, Kenya: ILRI.

8. Kang'ethe, E., Symekher, L., Lemma, M., Sambati, P., and Dror, I. 2018. Capacity needs assessment of Livestock CRP. Montpellier, France: CGIAR. <https://hdl.handle.net/10568/92426>

at the gap between current and ideal capacities to scale competencies in the CRP through strategic interventions. The capacities were assessed at three levels: systemic, organizational, and individual, and the areas of focus were partnerships, knowledge, implementation, and policy. Based on the country CNAs, the following capacity development areas were recommended: i) develop training methodology capacity; ii) develop partnership management capacity (support to ongoing partnership work); iii) develop capacity of extension workers to overcome barriers to communicating with farmers/pastoralists; iv) develop digital extension solutions to enhance current (low) extension capacities; v) develop and disseminate targeted advocacy messages (linked to the GLAD—Global Livestock Advocacy for Development work); and (vi) provide training on project management

and communication skills targeting implementation-level staff. The CRP then prioritized the following three capacity development areas: i) develop training methodology capacity; ii) develop capacity of extension workers to overcome barriers to communicating with farmers/pastoralists; and iii) develop digital extension solutions to enhance current (low) extension capacities. Four flagship countries of Ethiopia, Tanzania, Uganda, and Vietnam were later prioritized for implementation of the capacity development activities. However, there are other countries like Kenya where a lot of capacity development interventions were implemented, for example under the Accelerated Value Chain Development project. The review used the project lessons from these ‘satellite’ countries to buttress specific stories of change captured in the priority countries.

Table 1: Prioritized CapDev areas for livestock CRP

FP Area	CapDev Element										Total by FP Area
	1	2	3	4	5	6	7	8	9	10	
FP1—Livestock Genetics	X	X		X		X				X	5
FP2—Livestock Health	X	X		X	X			X			5
FP3—Livestock Feeds and Forages	X	X		X		X				X	5
FP4—Livestock and the Environment	X	X	X	X	X	X				X	7
FP5—Livestock Livelihoods and Agri-Food Systems	X	X	X	X	X			X		X	7
Total by CapDev Element	5	5	2	5	3	3	0	2	0	4	

¹ Flagship program

² Capacity development

APPROACH, DESIGN, AND METHODS

This review sought to determine and synthesize project deliveries at the sphere-of-control level and nascent changes registered at the sphere-of-influence level with identified boundary partners. The potential users of the evaluation results are understood to be: a) CGIAR management and researchers, b) donor partners, and c) other external partners. The evaluation process

should foster learning among partners so that they fully appreciate the nature, role, and importance of capacity development. Equally, the results obtained therefrom should inform the design and implementation of subsequent capacity development efforts. The general evaluation approach based on the perceived evaluation objectives is shown in Table 2.

Table 2: A generalized approach to the evaluation

Study Objectives	General Approach to Executing the Objectives
Take stock of the numerous CapDev ¹ activities implemented under the CRP ²	Desk review of Cap Dev program documents and implementation reports
Measure and provide robust empirical evidence on the success and impact of the Livestock CRP CapDev program activities	Review the Livestock CRP CapDev Strategy's vision of success and results framework targets and use this as a basis for assessing the extent to which these were attained. Assess the intended and unintended benefits that arose from implementation of the Livestock CRP CapDev Strategy. Interview with implementing partners.
Assess the changes or outcomes observed as a result of the programs and to what extent these changes or outcomes can be attributed to the programs	Review of program reports and OICRs. Participatory ranking with key stakeholders focusing on the Livestock CRP Cap Dev program outcome results.
Assess mechanisms that delivered the observed changes and the key features of these mechanisms	Review of OICRs and impact reports to link outputs to outcomes while recognizing the multiple, non-linear events, looking at the logical links between interventions and behavioural changes.
Generate knowledge and learning to inform future Livestock CapDev programs	Case studies and Most Significant Change Methods. Lessons learned and best practices are used to inform recommendations for consideration of future capacity development investments.
Address the comments from previous external evaluations of the CRP as they pertain to CapDev work	Review of ILRI responses to comments from previous evaluations and key informant interviews with ILRI Cap Dev personnel to effectively address the outstanding comments from previous external evaluations.

¹Capital development

²CGIAR Research Program

³Outcome-Impact Case Reports

⁴International Livestock Research Institute

Flagship-based mapping was employed in the synthesis of CapDev actions over the four years or so of CRP implementation. A mixed-method approach was adopted to review the results in each of the FPs. Complex adaptive systems perspectives were invoked to probe the sustainability of realized

outcomes and derive lessons for future capacity development programming (Vallejo and When 2016⁹). Case studies and Most Significant Change

9. Vallejo, B. and When, U. 2016. Capacity Development Evaluation: The Challenge of the Results Agenda and Measuring Return on Investment in the Global South. *World Development*, 79:1–13.

techniques were employed, where applicable, to assess the processes of interactions and interrelationships as well as emergent and non-linear effects of the capacity development interventions. The data collection techniques mainly involved online surveys, online one-on-one key informant interviews, and document review. Sustainability of outcomes was judged in terms of the implied social/institutional, economic, and environmental/natural resources dimensions. The evaluation evidence for each of the FPs was systematically aggregated and consolidated across the FPs in order to extract an overriding synthesis of achievements, challenges, and lessons for the Livestock CRP. These overriding performance trends and experiences across the FPs constituted the basis for recommendations to improve the enabling function of CapDev in the next CGIAR strategic dispensation.

The study design was based on the evaluation questions proposed in the ToR:

- Q1. Is the Livestock CRP delivering quality capacity development interventions aligned with its capacity development strategy?
- Q2. How well were CapDev interventions implemented and adapted when needed in the Livestock CRP?
- Q3. How valuable were the results to national partners and/or organizations involved?
- Q4. Are any positive results likely to be sustained? In what circumstances?

These evaluation questions can be likened to the OECD performance evaluation criteria (encompassing relevance, effectiveness, efficiency, impact, and sustainability) defined in Table 3, which will constitute the framework for the current evaluation, as shown in Table 4. To bring out the effectiveness dimension more clearly, an additional evaluation question (Q5) was proposed and agreed upon with the ILRI team, as indicated in Table 4.

Table 3: OECD¹ evaluation framework

Relevance:	The extent to which the stated objectives and program components correctly address the identified problems and real needs of its target groups.
Effectiveness:	<p>What difference the program made in practice, as measured by the extent to which the intended beneficiaries really benefitted from the products or services it made available. In the previous external evaluation of the Livestock CRP², effectiveness was qualified as follows:</p> <ul style="list-style-type: none"> • The extent to which planned outputs and outcomes had been achieved by 2021 – determined through quantitative and qualitative assessments of the CRP's (and FP's³) performance against planned milestones in relation to the level of risk assigned (annually and for the five years under review). • The extent to which achieved outcomes contributed to broader goals and cross-cutting issues (e.g. capacity development) • The extent to which the program's management and governance has supported the CRP's effectiveness • The extent to which the CRP and its Flagship Programs have made progress along their Theories of Change, including an assessment of the quality of those theories of change.
Efficiency:	The extent to which the various activities have transformed the available resources (inputs) into the intended results (outputs) in terms of quantity, quality, and timeliness (value for money).
Impact:	The longer-term positive and negative economic, social, and environmental changes produced by the supported activities, directly or indirectly, intended or unintended, as well as an understanding of the impact pathways.
Sustainability:	The likelihood of continued, long-term benefits from the program interventions after donor funding has been withdrawn.

1. Organisation for Economic Co-operation and Development

2. CGIAR Research Program

3. Flagship program

Table 4: Design matrix for executing the evaluation questions

OECD ¹ Criteria	Evaluation Questions	Method of Data Collection	Sources of Data	Selection of Respondents	Data Analysis and Reporting
Relevance	Q1. Is the Livestock CRP ² delivering quality capacity development interventions aligned with its capacity development strategy?	Document review using a structured framework; Online surveys and key informant interviews, e.g. with FP ³ leads	Livestock CRP documents; Livestock CRP CapDev Strategy; FP implementation reports; Surveys	Consultations with ILRI ⁴ team and strategic partners	Narrative or thematic analysis to establish the degree of coherence with the CapDev Strategy
Efficiency	Q2. How well were Capacity Development interventions implemented and adapted as needed in the Livestock CRP?	Document review using a structured framework; Online surveys and key informant interviews, e.g. with FP leads	Livestock CRP implementation framework; financial reports; FP reports; previous review reports; Surveys	Consultations with ILRI team and strategic partners	Narrative or thematic analysis of secondary data
Effectiveness	Q5. To what extent have the intended Capacity Development outputs and outcomes been achieved by 2021?	Document review using a structured framework; Data extraction matrices	Livestock CRP CapDev implementation framework; FP reports; previous review reports; interviews		Quantitative and qualitative assessments of CRP (and FP) performance against planned milestones
Impact	Q3. How valuable were the results to national partners and/or organizations involved?	Document review using a structured framework; Data extraction matrices; Stakeholder or partner mapping; Semi-structured interviews (online); Focus Group Discussion (via Zoom); Progress reports	Data obtained from interviews; Progress reports; Review reports; Surveys and interviews	Consultations with ILRI team and strategic partners; Random sampling	Narrative or thematic analysis; Gap analysis to find out which stakeholder expectations were unmet; Causal analysis
Sustainability	Q4. Are any positive results likely to be sustained? In what circumstances?	Key informant interviews; Document review	Data obtained from interviews; Review of project reports; Interviews with stakeholders	Consultations with ILRI team and strategic partners; Non-probability sampling (e.g. variation sampling)	Discourse analysis of primary data from interviews; Causal analysis

OECD Criteria	Evaluation Questions	Method of Data Collection	Sources of Data	Selection of Respondents	Data Analysis and Reporting
Questions from previous external evaluations	What are the capacity development aims of the CRP?	Document Review	CGIAR ⁵ Strategy and Results Framework (SRF); Livestock CRP Cap Dev Strategy		Narrative analysis; Gap analysis
	How will CRP management know when this aim has been achieved?	Document review	CRP proposal document; Theory of change documents		Narrative analysis; Gap analysis

1. Organisation for Economic Co-operation and Development
2. CGIAR Research Program
3. Flagship program
4. International Livestock Research Institute
5. Consultative Group on International Agricultural Research

As indicated above, the evaluation employed a mixed methods approach involving qualitative and quantitative data to provide insights into the changes brought about by capacity development interventions in the various Livestock CRP Flagships. Data was collected from available stakeholders including program leaders, other implementing partners, and beneficiaries to determine the changes that had been realized. Specific methods used for data collection included:

- Secondary data collection from Livestock CRP documents, previous external evaluations, review reports, and related literature on Livestock CRP capacity development to answer the evaluation questions and measure changes.
- Key informant interviews (with representatives of the major stakeholders) to collect qualitative information using structured and semi-structured interviews on key evaluation questions (see Appendix 3) to complement quantitative analysis.

- Online semi-structured questionnaire surveys (based on selected evaluation questions, see Appendix 3) targeting implementers and beneficiaries of capacity development interventions by the various Flagships.

Key changes and lessons associated with implementation of capacity development activities in the various FPs were systematically synthesized based on the evaluation questions. Strict data safety protocols were observed in retrieving, processing, and reporting data and information from the respondents. Quantitative data derived from the interview responses were presented in tables and figures. Oral interviews were transcribed and the transcripts coded into NVivo software for qualitative analysis. The themes were selected based on their relevance to the key research questions. Structured summaries were extracted and reinforced, in some cases, by direct quotations from respondents. Systematic investigations using case studies and most-significant-change methodology were also applied to document the intended and non-intended outcomes for some selected interventions.

LIMITATIONS

The review was intended to secure responses to online surveys and key informant interviews from a cross-section of stakeholders including implementing partners, beneficiaries, and donor agencies. In the end, we only managed to interview four Flagship leaders, country coordinators for Ethiopia, Kenya, Tunisia, and Uganda, and two beneficiaries from Tunisia. Thus, the data might seem rather biased towards the implementing partners. Fortunately, the CRP had conducted a number of outcome and impact studies on some of the CapDev interventions that helped provide information related to beneficiary perspectives.

We believe that there are enormous benefits of the CRP CapDev actions to national partners in the over 19 targeted countries. However, this review was primarily virtual and relied mostly on secondary data to elucidate such benefits. Attempts at online interviews with the national partners, at least in the four priority countries, were unfruitful chiefly due to the limited planning timeframe and other logistical hurdles. Ideally, face-to-face interviews with the CapDev beneficiaries in situ would be the best way to directly elucidate the gains; but this was beyond the scope of the review.

To the extent possible, the evaluation intended to adopt a utilization-focused approach that encouraged maximum involvement and participation of potential users of the results. Ultimately, evaluation in itself is a component stage of a fairly cyclic capacity development process (Fig. 1). As such, apart from accountability to development partners, the evaluation process should foster learning among partners so that they fully appreciate the nature, role, and importance of capacity development. The evaluation and synthesis exercise, however, coincided with a very busy season because the CRP and the entire CGIAR had already embarked on preparations for a transition into the next program cycle. As such, the availability of the CRP partners themselves was limited and the logistics for reaching beneficiary partners were equally hampered.

Lastly, the Terms of reference (ToR) also demanded a review of the CapDev targets and determining how the CRP will measure progress and align its efforts with national-level needs. However, the planning and reporting system currently in use by the Livestock CRP, as per CGIAR requirements, does not include information on specific CapDev activities (nor their targets) at the annual planning stage. This made this component of the ToR largely inexecutable.



Photo: ILRI/Joyce Maru

PROGRESS MONITORING AND QUALITY ASSURANCE

The data quality assurance process involved the following: all questionnaires and key informant interviews were jointly reviewed with the CapDev personnel of ILRI, where possible, to ensure consistency and identify potential errors. Data analysis and

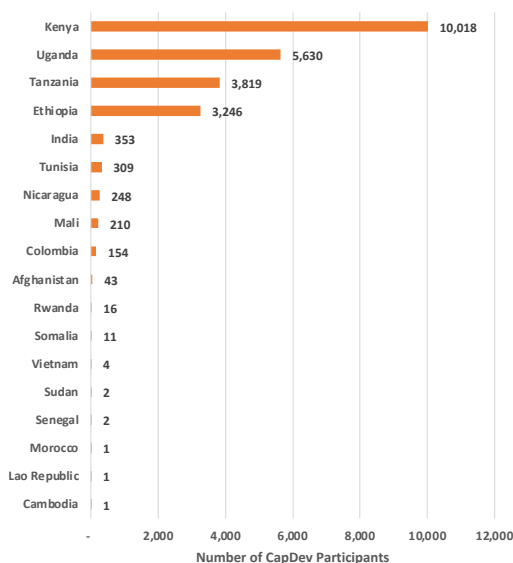
interpretation followed a logical flow and plan: coding, entering, and cleaning; analysing; interpreting and reflecting. Frequent online meetings were held with the concerned ILRI CapDev staff to review progress, address any emerging challenges, and—where necessary—readjust the delivery dates.

SYNTHESIS OF CAPDEV IMPLEMENTATION

Overview

A total of 265,823 individuals (24% women) participated in CapDev activities implemented by the Livestock CRP between 2018 and 2021. The CapDev activities involved formal academic training (Bachelor of Science (BSc), Master of Science (MSc), and Doctor of Philosophy (PhD)), formal one-off training, formal research placement, knowledge exchange and co-creation, and participatory trials and studies. Readership of online journals, attendance of online meetings and workshops, and estimated reach of disseminated study reports accounted for 241,755 of the participants (25% women). Only 24,068 participants were physically drawn from the 19 countries targeted by the CRP. As shown in Figure 2, Kenya registered the highest number of CapDev participants, followed in decreasing order by the Livestock CRP priority countries of Uganda, Tanzania, and Ethiopia (MARLO 2021¹⁰).

Figure 2: Participation in CapDev activities by country.
CapDev—capacity development.



10. Managing Agricultural Research for Learning and Outcomes (MARLO). 2021. Livestock assessment report 2017–202 participants and trainees. Nairobi, Kenya: ILRI.

There were no activities for CapDev reported in either the Annual Report of 2017 or the Managing Agricultural Research for Learning and Outcomes (MARLO) report of 2017. However, in 2018, the Livestock CRP undertook a range of CapDev activities, including development of training materials or tools and facilitation of training events; testing of new extension approaches, including digital extension, information and community technology for agriculture (ICT4Ag – mobile, radio, video, online), mobile apps, and decision support tools; and design and delivery of blended learning experiences.

Moreover, in 2019, the CRP scientists and partners undertook capacity needs assessments (CNAs) and conducted due diligence on solution providers in several countries across multiple livestock value chains. Based on the CNAs, the CRP finalized its Capacity Development Strategy (2019–2021) and implemented a range of initiatives, including facilitating community conversations, developing training modules, and conducting training workshops (both in person and through digital extension channels). Short-term trainings and other activities were also held with stakeholders including farmers, livestock entrepreneurs, extension officers, and policymakers, reaching 13,938 individuals (34% women). About 32 undergraduate and graduate students also received long-term training during the year, including 12 who completed their PhD studies (58% women). With regard to scaling, the CRP piloted a detailed scaling approach, agreeing on clear plans for how it will be implemented over the 2019/2021 period, and an initial scaling workshop was held for the priority country team in Uganda.

The CRP reached a total of 30,930 individuals (33% women) attending various trainings during 2020. Of these, 23,128 people (35% women) were engaged in long-term training, the majority (23,100) through a four-month weekly virtual seminar series on sustainable beef and dairy production in Colombia, and the remainder (one intern and 27 students) in formal education; of these, six women and four men completed PhD's. Participants in short-term training and other events numbered 7,802 (30% women).

Table 5: CapDev implementation by various Flagships

Flagship	2017		2018		2019		2020		Total	%
	Significant	Principal	Significant	Principal	Significant	Principal	Significant	Principal		
FP1	1	0	17	7	12	13	9	7	66	9.40
FP2	5	0	6	10	20	6	24	12	83	11.82
FP3	2	0	50	25	61	19	65	32	254	36.18
FP4	3	0	81	6	71	16	52	17	246	35.04
FP5	0	0	9	11	18	3	8	4	53	7.55
Total	11	0	163	59	182	57	158	72	702	100
%	1.57	0	23.22	8.4	25.93	8.12	22.51	10.26	0	

Key: FP1—Livestock Genetics; FP2—Livestock Health; FP3—Livestock Feeds and Forages; FP4—Livestock and the Environment; FP5—Livestock Livelihoods and Agri-food Systems

CapDev implementation by flagship

Flagship 1: Livestock Genetics

Academic degree training: In 2017, the Livestock Genetics Flagship trained three PhD researchers (one woman) in Ethiopia. In 2018, eight Ethiopian candidates graduated (six MSc's and two PhD's; one woman), while in 2019, three MScs graduated in Ethiopia and three PhD's graduated in Ethiopia, Sudan, and West Africa. In 2020, one PhD student and three MSc students completed their degrees in Ethiopia.

One-off formal training: In 2017, 14 CGIAR staff (one woman) in Ethiopia and Tanzania were trained on reproductive biotechnologies for small ruminants. The training aimed to establish a number of mobile, low-infrastructure laboratories to deliver artificial insemination and other reproductive technologies in support of extending and out-scaling community-based

breeding programs (CBBPs) for goats. The targeted countries were Ethiopia and Tanzania. By 2017, the International Center for Agricultural Research in the Dry Areas (ICARDA) had successfully established goat CBBPs at the Sekota (Amhara), Tanqua Abergele (Tigray), and Woyto-Guji sites in Konso, south Ethiopia. In 2018, 11 participants attended a short-term training on advanced ultrasonography for sheep reproduction in Ethiopia. A number of one-off trainings were implemented in various countries in 2019, with a total of 730 researchers (201 women), farmers, and other stakeholders participating (see Table 6). The types of trainings included CBBP, low-cost artificial insemination in sheep, animal handling and welfare, pig husbandry, and livestock genetics and genomics. The priority countries (Ethiopia, Uganda, and Tanzania) accounted for the largest share of training participants. In Ethiopia, a module on CBBP was integrated into the livestock genetics curriculum of three universities and a tailored MSc-level training on breeding and genetics was introduced in two universities.

Table 6: One-off formal training under the Livestock Genetics Flagship in 2019

Country	Participants, total	Participants, female	Nature of participants	Types of training
Ethiopia	435	95	Mixed participants, researchers	Operationalization of the Certification of Improved Rams and Bucks; CBBP ¹ —breeding data management and analysis; CBBP upscaling.
Tanzania	45	12	Mixed participants	Organization and field implementation of low-cost field solution for sheep artificial insemination; Animal handling and welfare
Uganda	173	71	Farmers, producers	Smallholder pig keepers trained on various aspects of pig husbandry
Nigeria	14	4	Researchers	Livestock genetics and genomics in Nigeria
Senegal	26	5	Researchers	Researchers trained on genomics in preparation for key role in boosting productivity of livestock systems
East Africa	17	9	Researchers	Joint course on hands-on animal genetic and genomic evaluation
Global	20	5	Mixed participants	Training on linear models for the prediction of animal breeding value
Total	730	201 (28%)		

1. Community-based breeding program

In 2020, a number of one-off formal trainings were mounted in various countries, as shown in Table 7. A total of 775 participants (about 29% women) of a varied nature attended (farmers, regulators, researchers, and other value chain actors). Trainings were conducted on pigs, pig breeds, and community-based and synchronized artificial insemination; boar semen collection and semen quality; and cattle artificial insemination. Course materials and guidelines for dairy cattle breeding in East Africa were developed and used for the trainings. Again, the priority countries of Uganda and Vietnam accounted for the bulk of training participants.

Two online trainings of trainers were conducted; one was on certification of improved sires, for 20 researchers and ministry livestock experts, and the other, on ultrasonography in sheep and goats, was held for 23 researchers and ministry livestock experts. A face-to-face training on up-scaling of community-based breeding programs (CBBPs) focusing on collection of baseline data, animal identification, and CBBP start-up, was provided to 40 researchers, project teams, and extension staff of the Ethiopian Ministry of Livestock and Fisheries, from the four Oromia sites in Shashemene, Ethiopia. In Tunisia, 47 participants (19 women) were trained on phenotyping for fasciolosis. The Flagship also developed an e-learning course on 'Essential knowledge for effective improvement and dissemination of genetics in sheep and goats'.

Table 7: One-off formal trainings under the Livestock Genetics Flagship in 2020

Country	Participants, total	Participants, female	Nature of participants	Type of training
Uganda	184	70	Farmer, producer	<ul style="list-style-type: none"> • Smallholder pig keepers training on pig breeds, breeding, and community-based artificial insemination in Uganda • Training of women and men farmers on pig breeds, breeding, and synchronized artificial insemination in Uganda
Vietnam	198	102	Farmer, producer, value chain actor, mixed	<ul style="list-style-type: none"> • Training of village boar keepers and veterinary workers on Ban boar semen collection and semen quality evaluation, in northwest Vietnam • Training of women and men veterinarians on cattle artificial insemination, in northwest Vietnam • Training of women and men smallholder pig keepers on pig artificial insemination, in northwest Vietnam • Training of women and men smallholder pig keepers, other stakeholders, on cattle and pigs breeds, breeding and artificial insemination, in northwest Vietnam
Kenya	42	12	Mixed	Training of trainers (TOT) in community-based breeding program for small ruminants in pastoral communities of Kenya
Ethiopia	191	0	Farmers, administrative staff, experts from Bureau of Agriculture	<ul style="list-style-type: none"> • Animal management and principles of cooperatives • Animal breeding, health, nutrition, and principles of cooperatives
Cameroon	43	11	Researchers	TOT ¹ on technologies for the promotion of local poultry value chain
Tunisia	47	19	Veterinarians, Scientists, Extension agents, Private sector, Academic institutions, PhD Students	National workshop on fasciolosis (phenotyping for fasciolosis in Northern Tunisia). Sensitization on trematode-caused diseases of small ruminants in Sejane district (Bizerte, northern Tunisia) and its economic impact. Participants were trained to develop a reliable diagnostic tool and shown a control strategy to avoid these parasites.

Country	Participants, total	Participants, female	Nature of participants	Type of training
SSA, regional	27	11	Regulators and researchers in livestock genetics	Access and Benefit Sharing (ABS) Workshop, ILRI ² , January 2019, to explore issues related to successful implementation of the ABS elements of the Nagoya Protocol and related national ABS regulation with respect to livestock research.
Virtual	43	0	Researchers and ministry livestock experts	<ul style="list-style-type: none"> TOT on certification of improved sires TOT on ultrasonography in sheep and goats
Total	775	225 (29%)		

1. Training the trainers

2. International Livestock Research Institute

Other types of trainings: A visiting Sudanese scientist, Dr Abdelkareem Abdallah Ahmed Abdallah from the University of Nyala, received a four-month crash course on data analysis in 2017. He then returned to his university to continue with analysis of whole genome sequence data on Sudanese goats and write a paper. A workshop to explore the elements of a theory of change to support ILRI's Mzima Cow project was also conducted in Kenya in 2017. The Mzima Cow project seeks to develop and deploy a trypanosomiasis or sleeping sickness-resistant cow through transgenic means. This was a knowledge exchange activity involving multi-stakeholder exploration of intentions, interests, and power and gender relations around the potential regulatory and uptake challenges of the technology (Canales et al. 2017¹¹).

Flagship 2: Livestock Health

Training tools and extension leaflets developed by the flagship

The Flagship developed an impressive range of training tools (manuals and guides) between 2017 and 2021, some of which were digitized to enable online delivery in the wake of the coronavirus disease—2019 (COVID-19) pandemic:

- Smallholder dairy training manual (East Africa)
- Pig farmer training manual
- Field post-mortem examination training module
- Guide for training of female pastoralists in the Borana Zone, Oromia Region, Ethiopia, on good milk production, handling and processing practices, and prevention of the transmission of milk-borne zoonotic diseases
- Training modules for veterinarians and farmers in small ruminant and pig farming systems

- Knowledge, Attitudes, and Practices tool to understand farmer use of anti-microbials
- Gender-sensitive farmer training approach
- Training guide for community conversation on animal welfare
- A guide to facilitators of community conversation on animal welfare
- A guide for integrating community conversation in extension for gender-responsive animal health management
- Practical guides to herd health management of pigs, dairy cattle, and small ruminants
- Learning modules on coenurosis and anthrax transmission and control
- Peste des petits ruminants (PPR) tool
- Guideline for participatory training on African swine fever control for smallholder pig farmers in Uganda

The Flagship also developed over nine extension leaflets between 2017 and 2019 on anthrax, brucellosis, coenurosis, enzootic abortion, leptospirosis, fasciolosis (liver fluke), heamonchosis, Q fever, and toxoplasma. These are detailed in a CapDev review report compiled by Ugglä (2020¹²) for the Flagship.

Trainings conducted by the flagship

A summary of the trainings conducted by the Flagship in various countries between 2017 and 2021 includes:

- Community conversations on animal herd health in Ethiopia and Mali from 2018.
- Participatory trainings to deliver knowledge on biosecurity to pig farmers in Uganda in 2018.
- Training in medically rational use of antimicrobials in 2019.

11. Canales, C., Manson, N. and Jones, B. 2017. Mzima cow strategy and theory of change—Translating from genetic research in Africa to adoption and social value: The Genetics for Africa—Strategies and Opportunities project workshop report. London, UK: Science Technology and Innovation for Development Ltd.

12. Canales, C., Manson, N. and Jones, B. 2017. Mzima cow strategy and theory of change—Translating from genetic research in Africa to adoption and social value: The Genetics for Africa—Strategies and Opportunities project workshop report. London, UK: Science Technology and Innovation for Development Ltd.

- Training of Ugandan herd health champions at SLU in 2020.
- Hybrid (remote/on-site) training in prudent and medically rational use of antibiotics in 2020.
- Training to improve the knowledge, attitudes, and practices of women regarding hygienic milk production and handling in Ethiopia in 2020.
- Autopsy trainings for veterinarians in Ethiopia.
- Pig herd health trainings for Ugandan veterinarians (one in Uppsala in 2020 and two in Uganda in 2021).
- Three trainings on antimicrobial use in Uganda, 2020–2021.
- A national face-to-face training course on anaemia in small ruminants in Tunisia in 2018 and 2019 attended by 67 participants (32 women).
- Regional trainings on the use of ODK tools to carry out surveys on animal health and animal-related studies in Tunisia in 2018 and 2019, attended by 94 veterinarians and technicians (over 50% women).
- A training course on chronic weight loss in ruminants in Tunisia in 2019, attended by 29 participants (nine women) in 2019.
- A training on trematode infections of small ruminants in Tunisia in 2020, attended by 47 veterinarians (20 women).

Year-by-year details on participation rates in various types of trainings, disaggregated by gender, are given below.

CapDev implementation by type of activity

Academic degree training: In 2017, one Ethiopian MSc and one female Ugandan PhD candidate graduated. One female MSc student in Senegal and one female PhD student in Tunisia graduated in 2018 (Thesis title: Interactions between the parasites *Toxoplasma gondii* and *Haemonchus contortus* and the reproductive function in sheep). Two Masters degrees were completed by two female students in Tunisia in 2019 (one researched an approach to estimating the cost-benefit ratio for treating sheep against gastro-intestinal nematodes, and the other studied sheep infestation by ticks and transmission prevalence of various piroplasmosis). Also in Tunisia, a PhD thesis and a MSc thesis were successfully completed by two female students in 2020, while six other MSc students (one woman) graduated in various other countries in 2020. Thus, a total of 11 MSc and three PhD degrees were completed (by eight women and six men) by the Flagship between 2017 and 2020.

One-off formal training: A total of 1,101 farmers and other value chain actors (21.1% women) attended one-off trainings in 2017, mainly in Ethiopia. The trainings were mounted by ICARDA-SLU-ILRI on the topic of herd health interventions. Ugandan herd health champions

were also trained at the SLU¹³. Other trainings included design of bundled interventions in community-based breeding program (CBBP) sites integrating genetics, reproductive management techniques and control of the main reproductive diseases, and East Coast Fever (ECF) vaccination and disease recognition. In 2018, a total of 2,900 farmers and other value chain actors (about 41% women) attended one-off trainings on: (i) community conversation in Ethiopia as a gender-transformative approach to reduce the risk of zoonoses; (ii) herd health training of small-ruminant farmers in Ethiopia; and (iii) USAID-ITM Project Final Report and farmer-to-farmer (FTF) indicator training in Tanzania. A guide to integrating community conversation in extension for gender-responsive animal health management was elaborated and used in the trainings¹⁴. In 2020, a total of 547 milk vendors in Ethiopia (30% women) were trained to improve their knowledge, attitudes, and practices regarding hygienic milk production and handling in the Borana pastoral area of southern Ethiopia¹⁵, and field researchers in various parts of the globe were trained. Training was also conducted on participatory epidemiology and its toolbox. Hybrid (remote/on-site) training in prudent and medically rational use of antibiotics was also undertaken¹⁶. An integrated training manual on herd health and biosecurity for smallholder pig value chain actors in Uganda was also developed in 2020¹⁷. Using community conversations, training modules for specific animal health issue areas were developed and rolled out, and new modules on antimicrobial use and animal welfare were also developed and tested.

Knowledge exchange: In 2017, farmers and other actors were engaged in focus group discussions on risks in target value chains in Ethiopia (e.g., mastitis in pastoral production systems) and in a national workshop on toxoplasmosis in Central Tunisia (i.e. management constraints in relation to prevalence of infection with *Toxoplasma gondii* in sheep). These knowledge exchange activities were attended by a total of 90 participants (about 66% women) in both countries.

13. Dione, M., Magnusson, U., Jacobson, M. and Lutakome, P. 2020. Strengthening capacity of Ugandan veterinarians: Report from a training for “Pig Herd Health Champions” at Swedish University of Agricultural Sciences, 2-13 March 2020. Montpellier, France: CGIAR. <https://cgspace.cgiar.org/handle/10568/108435>

14. Lemma, M., Mulema, A., Kinati, W., Mekonnen, M. and Wieland, B. 2020. A guide to integrate community conversation in extension for gender responsive animal health management. Nairobi, Kenya: ILRI. <https://hdl.handle.net/10568/110398>

15. Amenu, K., Agga, G.E., Kumbi, A., Shibiri, A., Desta, H., et al. 2020. MILK Symposium review: Community-tailored training to improve the knowledge, attitudes, and practices of women regarding hygienic milk production and handling in Borana pastoral area of southern Ethiopia. *Journal of Dairy Science* 103(11): 9748–9757. <https://hdl.handle.net/10568/109885>

16. Osbjør, K. and Magnusson, U. 2020, 15 December. Pandemic adapted Swedish-Ugandan training on livestock raising with low use of antibiotics. SLU's Global Blog. <http://blogg.slu.se/global-blog/2020/12/>

17. Nsadh, Z. and Michel, D. 2020. Integrated training manual on herd health and biosecurity for smallholder pig value chain actors in Uganda. Nairobi, Kenya: ILRI. <https://cgspace.cgiar.org/handle/10568/110083>

In 2020, 200 mixed participants (50% women) attended monthly webinars on operationalization of the One Health for Humans, Environment, Animals and Livelihoods (HEAL) community of practice. The webinars were jointly facilitated with the ILRI One Health Center for Africa.

Trials and studies: Various studies were conducted in 2017 (mainly in Uganda and Ethiopia) on several topics, namely: (i) determining risk factors for African swine fever; (ii) seroprevalence of *Taenia* spp. cysticercosis in pigs in rural and urban production systems of Uganda; (iii) risk factors, perceptions, and practices associated with *T. solium* cysticercosis and its control in smallholder pig production systems in Uganda; (iv) hygiene practices of pork retail outlets in Kampala District, Uganda; (v) impact assessment of participatory training on biosecurity protocols on the knowledge, attitudes, and practices of smallholder pig farmers in Uganda¹⁸; and (vi) a baseline survey for the Regional Pastoral Livelihoods Resilience Project in Ethiopia. A total of 6,632 farmers and other value chain actors (about 8% women) were involved in these studies in the two priority countries. In 2018, 11 researchers (about 45% women) took part in ECF vaccine development trials in sub-Saharan Africa (SSA). In particular, the studies involved immunogenicity and vaccine trials of p67C in particulate forms, sequence data of p67 specific antibodies, and comparative schizont CTL data from the vaccine trials.

Co-creation events: In 2018, five CGIAR staff members (about 45% women) participated in a training workshop for field researchers on the establishment of robust and feasible production and social indicators (gender, youth, livelihood) to evaluate herd health in the Livestock CRP value chain for dairy, pigs, and small ruminants. In 2019, a mapping workshop was held in Ethiopia which was attended by a total of 60 participants (about 33% women) on two traditional livestock movement corridors identified for inclusion in pilots for models of provision of veterinary services to mobile communities in Ethiopia. In 2020, 65 CGIAR staff and others (about 32% female) participated in task force meetings in the Amhara, Somali, and Oromia regions in Ethiopia and in a training workshop for field researchers. The co-creation events were about public-private partnership models for animal health service delivery and a digital tool to monitor herd-level morbidity, mortality, and productivity in Ethiopian livestock.

CapDev Review: A review of capacity development activities within the Livestock Health Flagship of the CGIAR Research Program on Livestock was also conducted in 2020 to assess the extent to which the CapDev goals were fulfilled and to identify areas

for possible adjustments and improvements, thus contributing to refinement of extension activities (Uggla 2020¹⁹). Targets for the review were extension and training actions linked to small ruminant farmers in Ethiopia and pig farmers in Uganda. The main recommendations from the review include:

- There is a need to develop capacity to diagnose animal diseases, both clinically in the field and confirmatory in laboratories, in most countries involved in the Flagship. Animal health workers often did not display hands-on skills and attitudes during clinical examinations.
- Field diagnostic procedures should be emphasized, while results from properly conducted laboratory diagnostic tests should be interpreted with caution.
- Animal welfare should be included in training and extension activities
- The Flagship should stick more consistently to the principle of 'training the trainers' by primarily directing information and teaching efforts to regional partners and animal health extension workers rather than to farmers.
- A strategic plan should be developed concerning which diseases, syndromes, or other areas require new printed/digital leaflets; the leaflets should be published as a series with a clear purpose and recognizable graphic profile. This would enable implementation partners to have access to a collection of extension leaflets with a logical progression.
- Extension messages from the Livestock CRP Flagships should ideally be delivered in a more integrated package to increase efficiency.
- ICT-enabled tools should be developed, including large-scale production of information and training videos.

Flagship 3: Livestock Feeds and Forages

Academic degree training: In 2017, a total of 29 CGIAR staff and partner researchers (34.5% women) from Colombia and Ethiopia were in various degree programs: nine BSc's (78% female); 14 MSc's; and three PhD's (67% female). In 2018, four CGIAR staff (two women) were in BSc degree programs; six CGIAR staff and researchers in partner countries of Kenya, Ethiopia, and Colombia were in MSc degree programs; and one researcher from Ethiopia was in a PhD program. In 2019, two CGIAR staff (one woman) in Colombia were reportedly undergoing BSc training; three researchers in Ethiopia and Colombia were registered for MSc degree programs; and two researchers were enrolled in PhD degree programs. Basically, it was unclear what the areas of specialization were for the various degree programs. However, some of the areas cited for MSc

19. Uggla, A. 2020. *Review of capacity development activities within the Livestock Health Flagship of the CGIAR Research Program on Livestock*. Montpellier, France: CGIAR.

18. Dione, M.M., Dohoo, I., Ndiwa, N., Poole, J., Ouma, E., et al. 2020. Impact of participatory training of smallholder pig farmers on knowledge, attitudes and practices regarding biosecurity for the control of African swine fever in Uganda. *Transboundary and Emerging Diseases* 67(6): 2482–2493. <https://hdl.handle.net/10568/108309>

and PhD research were: agronomic and nutritional evaluation of forage legumes, management of Fusarium wilt disease, remote sensing for sustainable

livestock production systems, goat and sheep research, and community-based agricultural extension as a participatory organizational learning process in producer organizations (Table 8).

Table 8: Academic trainings under the Feeds and Forages Flagship

Degree Course	Participants, total	Participants, female	Type of participants	Training area (Country)	Research area
2017					
BSc ¹	2	1	CGIAR ² staff	Training in BSc Economics (Colombia)	
MSc ³	1	1	Researcher	MSc student (Ethiopia)	Research on urea-treated straw and urea block supplementation to cross-bred dairy cows
PhD ⁴	4	2	Researchers, CGIAR staff	PhD students (Ethiopia—three; Colombia—one)	Goat research; Research on sheep under Africa Rising (Livestock and Fish CRP); Food-feed crops PhD Thesis: Influence of varietal selection and treatments on the nutritive value of selected pulse crop residue
2018					
BSc	2	2	CGIAR staff		
MSc	6		2 CGIAR staff and 4 researchers	One MSc training in Kenya, one MSc training in Ethiopia, and four MSc's training in Colombia	Agronomic evaluation of forage legumes in Colombia; Contagious innovation management; Management of Fusarium wilt; and case study feed interventions
PhD	1		Researcher	One PhD student in Ethiopia	PhD thesis - Options for improving the yield and nutritive value of maize and grain legume residues for ruminants in East African farming systems
2019					
BSc	2	1	CGIAR staff	Two BSc's training in Colombia	
MSc	3		Researcher	MSc's training in Ethiopia and Colombia	'Remote Sensing for Sustainable Livestock Production Systems in Colombia' including the establishment of a machine-learning classifier for identifying grassland areas; Testing of on-farm grown cultivated forages as a supplement in the diet for fattening sheep –agronomic and forage quality variables of on-farm grown improved forages and responses in weight gain; Community-based agricultural extension as a participatory organizational learning process in producer organizations: lessons from a case study in rural Colombia

Degree Course	Participants, total	Participants, female	Type of participants	Training area (Country)	Research area
PhD	2		Researcher	Two PhD students from unnamed countries producing two journal articles, one each	Peer-reviewed articles on: 1) Root-zone hypoxia reduces growth of the tropical forage grass <i>Urochloa humidicola</i> in high-nutrient but not low-nutrient conditions; 2) Salinity tolerance in chickpea is associated with the ability to 'exclude' Na from leaf mesophyll cells
2020					
BSc	3	3	CGIAR staff	All-female Colombian staff in BSc training	
MSc	7	1	Researchers, CGIAR staff	MSc's training in Ethiopia and Colombia	<p>Titles of the MSc theses:</p> <ul style="list-style-type: none"> • Co-benefits and trade-offs of forage grasses in terms of forage productivity and quality, soil conservation impacts, and crop productivity effects in Wolaita, Ethiopia; • Cost-benefit analysis of nitrogen use efficiency in different forages in Colombia; • Genetic diversity study on Napier grass (<i>Cenchrus purpureus</i>) collections and progenies; • Evaluation of nutritive value and farmer preference of chickpea varieties for food; • Participatory farmer forage validation, performance testing of selected forage varieties, and integration in selected districts of Amhara region, Ethiopia; • Participatory farmer forage validation and integration in Amhara; • Effect of processed sweet lupin grain supplementation on fattening performance of Doyogena sheep.
PhD	1		Researcher	PhD, Ethiopia	Title of PhD thesis: Varietal and environmental variability in food-fodder-feed traits for development of multi-purpose genotypes of barley.

1. Bachelor of Science

2. Consultative Group on International Agricultural Research

3. Master of Science

4. Doctor of Philosophy

Formal one-off trainings: A total of 30,294 participants (34% women) comprised mainly of farmers and researchers were subjected to various one-off trainings in India, Kenya, Nicaragua, Colombia, Tunisia, Ethiopia, Burkina Faso, Rwanda, Lebanon, Haiti, and Western Asia (see Table 9). The training topics included cactus as a multipurpose plant; improved forage technologies; cost-benefit analysis of forages; forage seed production, seed marketing, and forage conservation approaches; entrepreneurship; dairy management; feeds and forages extension approaches; the use of the Gendered Feed Assessment Tool (G-FEAST) and establishment of a FOSS-type stationary Near Infra-Red Spectroscopy (NIRS) facility; sustainable beef and dairy production; participatory evaluation of forage grasses; and sulla feeding in Lebanon. Other topics were business opportunities for cooperatives and young entrepreneurs with regard to the use of mobile

grinders for grinding services, feed pellet production, and use of seed cleaning and treatment units; improving animal feed availability; establishment and management of pastures and forages; online training on the Selection of Forages for the Tropics (SOFT) tool; organizational strengthening of farmer cooperatives; female empowerment, Farmer Business School (FBS); beekeeping, access to credit and subsidies; and information and communication technology (ICT) for agricultural extension.

In addition, the Mind the Gap project conducted several training visits for farmers and a total of 679 participants attended (female participation was approx. 5%): 138 at a farmer field day 'barley/kounouz'; 129 visited a barley NARS research station; 110 came to a farmer business school; 67 attended a 'men's cooperative' and 71 a 'female cooperative'; and 164 attended an all-female empowerment meeting.

Table 9: One-off trainings under the Feeds and Forages Flagship

Country	Participants, total	Participants, female	Nature of participants	Types of training
2017				
India, Kenya, Nicaragua	97	45	Farmer, producer, mixed	One field day organized in Jhansi, India to introduce cactus as a multi-purpose plant had a participation of 69 farmers (50% female); Livestock producers in Central Kenya trained on improved forage technologies; One-week Workshop on Cost-benefit analysis of forages in Nicaragua
2018				
Colombia	20	8	Farmers, producers	Training of trainers: 15 workshops with cattle farmers on forages, and organizational and commercial issues (forage seed production, seed marketing, forage conservation approaches)
Kenya, Tunisia	765	20	Farmers, producers	Entrepreneurial training in Tunisia; Training farmers on feed modules of dairy management for smallholders in Kenya; Training on seed multiplication for seed-producing cooperatives in Tunisia; Several trainings and field days held by the Mind the Gap Project for farmers in Tunisia
Kenya, India	1,736	802	Farmers, producers, researchers	Demo plots and field days with farmers to strengthen feeds and forages extension approaches in East Africa (Kenya); Training of farmers on feeds and forages based on agricultural innovations and the innovation platform concept (Kenya); UK-Ireland-CIAT ¹ student exchange and training for BBSRC ² forages project; intern report on cactus pear as multiple-purpose crop to improve provisioning of ecosystem services in India (one PhD student in India as an intern)

Country	Participants, total	Participants, female	Nature of participants	Types of training
2019				
India, Ethiopia	41	-	Mixed participants	Group training course on cactus pear evaluation and best-agronomic practices in India; Training on production of cultivated forages and diet formulations in Ethiopia
Burkina Faso, Rwanda, Ethiopia	67	-	Researcher	Training on the use of G-FEAST ³ and establishment of a FOSS-type stationary NIRS ⁴ facility in Burkina Faso, Rwanda, and Ethiopia
Tunisia	106	62	Farmers	Three-month training courses on the following topics: i) small ruminants, ii) cattle iii) beekeeping iv) vegetable production
Ethiopia	102	31	Farmers	Capacity strengthening efforts for better technology generation, and promotion and dissemination of food-feed traits of chickpea
	33	7	Government officers and other value chain actors	Strengthening of partnership platform for sheep-fattening
	51	11	Youth sheep farmers and extension agents	Training workshop on feeds, feeding and nutrition for improved sheep-fattening practices and technologies in Ethiopia
	529	207	Youth sheep farmers, model farmers and extension agents	Entrepreneurship skills development training for sheep-fattening youth groups and model farmers
2020				
Colombia, online	23,220	8,036	Mixed participants	Four-month weekly virtual seminar series on Sustainable beef and dairy (Conversatorios sobre Ganadería Sostenible); ICARDA ⁵ e-learning modules - six modules were developed for the ICARDA e-learning platform
Ethiopia	1,789	536	Farmer, producer	Participatory evaluation of forage grasses with farmers in Ethiopia - Brachiaria, Napier, and Desho accessions being evaluated in project sites in Wolaita
Global	14	4	Researcher	Global training on G-FEAST
Lebanon, Tunisia, Haiti, Nicaragua, India and Western Asia	1684	641	Farmer, producer	Field day on sulla feeding in Lebanon; Business opportunities for cooperatives and young entrepreneurs with the use of mobile grinders for grinding services and feed production; Improving animal feed availability in the Nord and Nord-Est departments of Haiti; Training on establishment and management of pastures and forages in Nicaragua; Online training on the SOFT ⁶ tool organized for Indian Grassland and Fodder Institute (IGFRI) and partners (India); Farmer training on cactus pear management in India; Training on cactus pear crop to enhance productivity and increase awareness about cactus cochineal in West Asia; Three one-day trainings of farmers on use of 'short number' to access market price information via mobile phones

Country	Participants, total	Participants, female	Nature of participants	Types of training
2021				
Tunisia	40	12	Farmers and extension agents	Field day on production of feed pellets with imported pelleting machines; Training and coaching of four farmer cooperatives in cooperative management
Total	30,294	10,422		

1. International Center for Tropical Agriculture
2. Biotechnology and Biological Sciences Research Council
3. Gendered Feed Assessment Tool
4. Near infra-red spectroscopy
5. International Center for Agricultural Research in the Dry Areas
6. Selection of Forages for the Tropics
7. Indian Grassland and Fodder Research Institute

Knowledge exchange: In 2017, knowledge exchange activities included a stakeholder workshop on forage seed and a business plan development workshop in Tunisia; and a workshop on gender in the forage value chain in Afghanistan; as well as multi-stakeholder and farmer workshops on forage technologies; roundtable discussions with stakeholders on sustainable cattle production; a technical assistance workshop on dairy and cattle; and a workshop on cattle through Nationally Appropriate Mitigation Action (NAMA) in Colombia. A total of 164 stakeholders (37% women) participated in these knowledge exchange activities. In 2018, about 120,091 farmers and researchers in Ethiopia (only 45 of whom were women) took part in knowledge exchange activities that involved pilot trials with small-scale irrigated forage production in the Amhara Region in addition to integrating the perennial forage Napier grass with Desmodium and Pigeon Pea in cropping systems. Three issues of the Tropical Grasslands (Forrajes Tropicales) journal were also produced and widely accessed online by researchers. About 202 farmers (32% women) participated in a field day and trainings on chickpea technology in Morocco. The capacity of National Agricultural Research and Extension Services

(NARES) actors was also reportedly strengthened for better technology generation, promotion, and dissemination. In 2020, 23 participants took part in the global private forage seed sector hybrid training.

Trials and Studies: A number of participatory trials, studies, and trainings were conducted with a total of 1,393 farmers (25% women) in Afghanistan, Ethiopia, India, Tanzania, and Uganda in 2018 (see Table 10). These included participatory identification of appropriate elite forage accessions (from the Brazilian Agricultural Research Corporation (EMBRAPA) and Africa) targeting different agro-ecologies, farming systems, and niches; small-scale irrigated forage production trials; best agronomic practices for cactus and field day promotion of cactus in India; plant propagation, nursery management, pasture production, and enterprise development training in Afghanistan; and data collection, experimental design, and data analysis in forage trials training in Afghanistan. In Tunisia in 2021, trials on local feed pellet production were carried out by NARES in collaboration with farmers, using imported pellet machines and different locally available materials.

Table 10: Participatory trials and studies under the Feeds and Forages Flagship

Country	Participants, total	Participants, female	Nature of participants	Type of training
Ethiopia, Tanzania, Uganda	269	138	Farmers, producers	Participatory identification of appropriate elite forage accessions (from EMBRAPA ¹ and Africa) targeting different agro-ecologies, farming systems, and niches; Lessons from small-scale irrigated forage production trials: Potential of annual oat-vetch mixtures
India, Afghanistan	306	102	Farmers, producers, researchers	Training of 75 farmers and NARS ² on best agronomic practices for cactus in India; Field day on thornless cactus as an alternate fodder resource for drought-prone areas in India; Field day to promote cactus (<i>Opuntia ficus-indica</i>) as a drought-resilient feed resource in India; Workshop on plant propagation, nursery management, and pasture production and enterprise-development training course in Afghanistan; Data collection, experimental design and data analysis in forage trials training course in Afghanistan

Country	Participants, total	Participants, female	Nature of participants	Type of training
Tunisia	12	4	Farmers, researchers, machine importer	Trial on local production of feed pellets using wheat bran, barley, fava beans, and olive cakes. Laboratory analysis showed 17% protein content and lessons learned from trial were used to train farmers.
Ethiopia	646	56	Farmers	Participatory farmer forage validation, performance testing of selected forage varieties, and integration in selected districts of Amhara, Doyogena, and Bonga regions
	8	3	Farmers	On-farm evaluation of the effect of processed sweet lupin (<i>lupinus angustifolius</i> L.) grain supplementation on weight gain performance of rams
	152	44	Farmers	Chickpea straw in Ethiopian livestock farming systems: Feeding practices and farmers' perception of feeding effects on livestock performance
Total	1393	347		

1. Brazilian Agricultural Research Corporation

2. National Agricultural Research System

Other CapDev activities: In 2018, multiple extension materials were developed for forage training in Central America, Colombia, and Tunisia, including e-learning training modules. New extension approaches were tested and applied (such as sending over 100 technical SMS messages to 560 farmers) in Colombia²⁰ and Tunisia²¹, involving different groups of livestock producers. Different extension materials were developed for Kenya²², Tunisia²³, Colombia²⁴ and Ethiopia^{25,26}. New tools were launched (e.g. G-FAEST), others were maintained and enriched (e.g. SoFT, Legume Choice, and Tropical Grasslands-Forrajes Tropicales (TGFT), a bilingual, peer-reviewed, open-access journal), and others are under construction (e.g. Animal Feed Analysis Web Application (AFAWA)). These tools will help with feed prioritization and capacity development. Successful NIRS training courses, involving staff from ILRI Ethiopia, India, and Burkina Faso, were held in Ethiopia and Burkina Faso. The courses created interest in NIRS utilization for feed quality analysis in Burkina Faso and increased NIRS utilization in Ethiopia.

20. Hering, J. and Rudiger, S. 2018. *Contagious innovation management: Resumen de los talleres del caso estudio en el Departamento del Cauca, Colombia*. Cali, Colombia: International Center for Tropical Agriculture (CIAT). <https://cgspace.cgiar.org/handle/10568/99208>

21. Rudiger, U. *Modules and briefs on the implementation of 4 different extension approaches for livestock producers in Tunisia*. Montpellier, France: CGIAR. <http://repo.mel.cgiar.org/handle/20.500.11766/9379>

22. Ohmstedt, U. 2019. *Hay making factsheet*. Nairobi, Kenya: CIAT. <https://cgspace.cgiar.org/handle/10568/99407>

23. Udo Rudiger. 2018. *Report on performance of feed processing technologies*. Beirut, Lebanon: ICARDA. <http://repo.mel.cgiar.org/handle/20.500.11766/8903>

24. Gutiérrez J. F., Hering, J., Muñoz, J. J., Enciso, K., Bravo, A.M. et al. 2018. *Establecimiento y manejo de pasturas mejoradas - Algunos aspectos clave a considerar*. Cali, Colombia: CIAT. <https://cgspace.cgiar.org/handle/10568/96261>

25. Mulatu, E. and Wamatu, J. 2020. *Entrepreneurship and Business Skills Development Training Manual*. Beirut, Lebanon: ICARDA. <https://hdl.handle.net/20.500.11766/12542>

26. Wamatu, J. and Ephrem, N. 2019. *Sheep fattening communication posters in English Language*. Montpellier, France: CGIAR. <https://hdl.handle.net/20.500.11766/9514>

A number of webinars were held in 2020 on various topics, including an expert webinar on threats and integrated pest management (IPM) of cochineal scale insects on cactus; two international webinars on issues related to cactus pear organized under the umbrella of the FAO-ICARDA cactus network; six e-learning modules developed; and five introduction workshops held (117 participants, incl. 39 women). A total of 155 participants (30% women) took part in these webinars. Seminar series on sustainable livestock (>23,000 visualizations, 18 countries) and an online training on the Tropical Forages Tool (30 scientists in India) were also held in 2020. In Haiti, about 1,292 farmers (912 men/380 women) were trained on forages and another 260 (181 men/79 women) on sustainable livestock. In Nicaragua, 38 farmers and 29 technicians were trained on forages.

Flagship 4: Livestock and Environment

The following training tools were developed or deployed by the Flagship between 2017 and 2021.

- CLEANED (Comprehensive Livestock Environmental Assessment for Improved Nutrition, a Secured Environment and Sustainable Development along Livestock Value Chains) is an ex-ante tool that assesses environmental impacts of livestock systems and value chains. It is available in Excel and R programming language versions, e.g., CLEANED X (Versions 1.0.1, 2.0.1, and 3.0.1) and CLEANED R.
- The Rural Household Multi-Indicator Survey (RHoMIS) tool is a rapid, cheap, digital farm household-level survey and analytical engine for characterizing, targeting, and monitoring agricultural performance. RHoMIS captures information describing farm productivity and practices, nutrition, food security, gender equity, climate, and poverty.
- A mobile phone application (eWeigh App)

- Rangeland management and land-use planning tools
- A COVID-19 module
- G-FEAST tool—The Feed Assessment Tool (FEAST) is a systematic way to assess local feed resource availability and use. It helps in the design of intervention strategies aimed at optimizing feed utilization and animal production. G-FEAST is the gendered version of the tool.
- Training material/manual on how to reduce heat stress in dairy and pig value chains
- The Livestock Management Information System (LMIS)

Academic degree training: In 2017, six researchers (two women) were undergoing MSc studies in Cambodia, Kenya, Laos, Tanzania, and Uganda. Thematic areas for MSc research by the students included: current and likely future heat stress in pigs in Uganda due to climate change; evaluation of the water footprint of livestock; environmental and gender equity impacts of livestock intensification technologies; and nutrient cycling and livestock intensification analysis in Cambodia and Laos. Six PhD candidates (five women and one male) in Tanzania, Tunisia, and Rwanda delivered conference papers, articles, and a thesis on application of the CLEANED tool; quantification of soil- and climate-related impacts; trade-offs of feed and livestock intensification technologies; morphogenetic characterization and evaluation of the pastoral potential of rangelands species; the impact of rangeland management on organic carbon content; and the effects of root confinement on the relative growth of the roots and canopy of *Opuntia ficus-indica*.

In 2018, 12 researchers (eight women) were enrolled in MSc/MA programs in Cambodia, Ethiopia, Kenya, Laos, Tunisia, and Vietnam with research themes contributing to various deliverables of the Flagships, as shown in Table 12. Two PhD researchers (one woman) from Kenya and Senegal were conducting research projects, one on a new approach for improving emission factors for enteric methane emissions of cattle in smallholder systems of Nyando in Western Kenya, and the other on trade-offs in livestock development at the farm level due to varying actor motives.

In 2019, three all-male CGIAR staff in Colombia and Nicaragua were registered for BSc degree courses; six researchers (two women) and CGIAR staff from Kenya, Uganda, Laos, and Tanzania were undertaking MSc studies; and seven female researchers and CGIAR staff from Tanzania, Rwanda, Kenya, and Guatemala were enrolled in PhD studies. The research themes and associated outputs were pertinent to the various Flagships and included, among others: heat stress in dairy and pig value chains in Uganda; greenhouse gas (GHG) emission baseline studies in Kenya; nutrient flows and agro-environmental trade-offs of smallholder livestock intensification options in Laos and Tanzania; microbiome studies in soils and rumen; as well as nutrient cycling and soil fertility associated with climate-smart forages in East Africa.

In 2020, two CGIAR staff (one woman) were reportedly enrolled in BSc programs in Colombia and Nicaragua. It was not clear, however, whether these were additional to the three BSc students reported for the two countries in 2019. Three researchers (one woman) were undertaking MSc studies in Cambodia, Laos, Tunisia, and Vietnam; while ten CGIAR staff and partner researchers (six women) from Ethiopia, Kenya, Rwanda, Tanzania, and Tunisia were in PhD programs. The postgraduate researchers produced various outputs that contributed to the Flagship deliverables, as shown in Table 11.

Table 11: Academic trainings under the Livestock and Environment Flagship

Degree Course	Participants, total	Participants, female	Type of participants	Training area (Country)	Research area and outputs
2017					
MSc ¹	6	2	Researcher and others	MSc studies in Uganda, Kenya, Tanzania, Cambodia, and Laos	MSc studies on: 1) climate change and pigs in Uganda - current heat stress and likely future heat stress; 2) a framework to evaluate the water footprint of livestock; 3) environmental and gender equity impacts of livestock intensification technologies; 4) nutrient cycling and livestock intensification analysis in Cambodia; 5) nutrient cycling and livestock intensification analysis in Laos

Degree Course	Participants, total	Participants, female	Type of participants	Training area (Country)	Research area and outputs
PhD ²	6	5	Three CGIAR ³ staff, two researchers	PhD studies in Tanzania, Rwanda, and Tunisia	Conference paper, articles, and PhD thesis on: 1) application of environmental ex ante assessment tool—CLEANED ⁴ ; 2) quantification of soil- and climate-related impacts and trade-offs of feed and livestock intensification technologies in Rwanda; 3) quantification of soil- and climate-related impacts and trade-offs of feed and livestock intensification technologies in Tanzania; 4) effects of roots confinement on the relative growth of roots and canopy of <i>Opuntia ficus-indica</i> ; 5) morphogenetic characterization and evaluation of the pastoral potential of rangelands species and the impact of rangeland management on organic carbon content
2018					
MSc	12	8	Researcher, university staff, and others	MSc/MA ⁵ studies in Kenya, Vietnam, Cambodia, Laos, Ethiopia, Tunisia, and other countries	Studies on: 1) map modelling degraded Kenyan rangeland soil organic carbon (SOC) status in Kapiti; 2) modelling SOC ⁶ dynamics in Kenya; 3) three studies on analysis of nutrient cycling dynamics across interventions and landscapes in SE Asia; 4) exploratory research on land degradation and soil health; 5) the impact of climate change on forage crops in southeast Asia – the example of Vietnam, Laos, and Cambodia; 6) model-based assessment of grazing impact on SOC stocks and dynamics in Kenya; 7) the segregating mode of biological nitrification inhibition (BNI) potential; 8) the implications of climate-smart agriculture for soil fertility and productivity: the case of the Tula-Jana landscape, SNNPR ⁷ Region Ethiopia; 9) a case study of the silvopastoral system in Jendouba, Tunisia.
PhD	2	1	Researcher and others	PhD studies in Kenya and Senegal	PhD studies on: 1) trade-offs in livestock development at the farm level: different actors with different objectives; 2) a new approach for improving emission factors for enteric methane emissions of cattle in smallholder systems of East Africa—results for Nyando, Western Kenya
2019					
BSc	3	-	CGIAR staff	BSc studies in Colombia and Nicaragua	
MSc	6	2	Two researchers, one CGIAR staff, two others	MSc studies in Kenya, Uganda, Laos, and Tanzania	Various MSc research outputs on: 1) mapping heat stress and identifying the need for adaptation to heat stress in Uganda; 2) a greenhouse gas emissions baseline from water bodies and the effect on livestock in Kenya; 3) heat stress in dairy cattle in Uganda – potential impacts and options for adaptation; 4) a scientific dataset on heat stress in pigs and adaptation options in Uganda; 5) nutrient flows and intensification options for smallholder farmers of the Lao uplands; 6) participatory Approach to Assessing the Climate-Smartness of Agricultural Interventions: The Lushoto Case (Tanzania)

Degree Course	Participants, total	Participants, female	Type of participants	Training area (Country)	Research area and outputs
PhD	7	7	One CGIAR staff, six researchers	PhD studies in Tanzania, Rwanda, Kenya, and Guatemala	Various PhD research outputs on: 1) agro-environmental trade-offs of livestock intensification in smallholder systems in Tanzania; 2) management practices to improve cattle nutrition using Kikuyu grass; 3) quantification of rumen microbes by qPCR; 4) structure and function of the soil microbiome associated with 'climate-smart' tropical forages in East Africa; 5) microbial nitrogen cycling and soil fertility under climate-smart forages in East Africa – PhD research proposal; 6) journal article on experiences and drivers of food insecurity in Guatemala
2020					
BSc	2	1	CGIAR staff	BSc studies in Colombia and Nicaragua	
MSc	3	1	Researcher	MSc studies in Tunisia, Vietnam, Cambodia, and Laos	Thesis and journal articles on: agro-environmental trade-offs in the Greater Mekong Subregion; and the impact of rehabilitation interventions in the silvoagropastoral system in Tunisia
PhD	10	6	One CGIAR and five researchers	PhD studies for Rwanda, Tunisia, Tanzania, Kenya, and Ethiopia	Various PhD outputs on: 1) farming systems approaches to sustainable livestock intensification in Africa; 2) Soil nitrogen cycling in perennial forage crops in Rwanda; 3) characterization of one rangeland's indigenous species in Tunisia; ILRI fellows—Tanzania, Kenya, Ethiopia; 4) water use in global livestock production—opportunities and constraints for increasing water productivity

1. Master of Science
2. Doctor of Philosophy
3. Consultative Group on International Agricultural Research
4. Comprehensive Livestock Environmental Assessment for improved Nutrition, a secured Environment and sustainable Development
5. Master of Arts
6. Soil organic carbon
7. Southern Nations, Nationalities, and People's Region
8. Bachelor of Science
9. International Livestock Research Institute

Formal one-off trainings: As shown in Table 12, the Flagship conducted various trainings in 2017, mainly in Kenya, Rwanda, Tanzania, and Tunisia, targeting farmers, researchers, and policymakers. The total number of participants was 168 and women comprised about 24%. Examples of the training areas include environmental impacts and trade-off modelling; sweet-potato vine silage-making; rangeland governance; monitoring and assessment training in Tunisia; the National Tunisian Pastoral Code; Rangelands Plant Terminology and Basic Plant

Identification; impacts of cash transfers and index insurance; and geospatial suitability and feasibility mapping of selected technological interventions. In 2018, 86 researchers, CGIAR staff, and other participants attended various training sessions conducted in Kenya, Tanzania, and Tunisia on sustainable rangeland management, climate change adaptation through planted forages, water and soil conservation, benefits and plantation of multi-purpose trees, and methods for gauging the environmental impacts of forage intensification options.

Table 12: One-off trainings under the Livestock and Environment Flagship

Country	Participants, total	Participants, female	Nature of participants	Types of training
2017				
Kenya	42	15	Farmers	Focused farmer training courses for smallholder dairy farmers in Kenya (training materials developed)
Tunisia, others	39	6	Researcher, mixed, policy makers	Two training workshops for multiple stakeholders on environmental impacts and trade-off modelling; educational video on sweet potato vine silage-making; trainings with different target groups on rangeland governance in Tunisia
Tunisia	85	20	Policy makers, universities, development agencies, researchers, and mixed	One training course on monitoring and assessment in Tunisia; two workshops on national Tunisian Pastoral Code; Rangelands Plant Terminology and Basic Plant Identification
Tanzania, Rwanda, Kenya	2	-	Researcher and others	Outputs of research placements: article on impact analysis of cash transfers and index insurance in Kenya and geospatial suitability and feasibility maps for selected technological interventions made accessible (currently and under Global environmental change scenarios) –gender norm included in production of feasibility maps in Tanzania and Rwanda
2018				
Tunisia	47	11	Policymakers, universities, international originations development agencies, universities, researchers, and mixed	Outreach and training materials for sustainable rangeland management – one training course on Rangelands Plant Terminology and Basic Plant Identification and one workshop on national Tunisian Pastoral Code
Tunisia, Tanzania	36	8	CGIAR ¹ staff, mixed participants	Trainings and field days: training course on climate change adaptation through planted forages in Tanzania; outreach and training on water and soil conservation in Tunisia; training on benefits and plantation of multipurpose trees in Tunisia
Kenya, others	3	2	Researchers	Research placements: internship case study quantifying environmental footprint of productivity-enhancing technologies – feeding a productive dairy cow in western Kenya: environmental and socioeconomic impacts; and training in methods (GHGe ² and soil microbe measurements) – environmental impacts of forage intensification options
2019				
Kenya	2,288	-	Mixed participants	Various trainings on IBLI ³ /livestock insurance in Maralal and Samburu counties; trainings on IBLI in Maralal county for (a) local master trainers and (b) policymakers
Tanzania, Rwanda	232	83	Farmers, producers	Training on mobile phone application (eWeigh app) to estimate live weight of dairy cattle; protocol and training on feeding trials in Tanzania and Rwanda

Country	Participants, total	Participants, female	Nature of participants	Types of training
Tunisia	59	11	Policymakers, universities, international organizations, development agencies, universities, researchers, and mixed	One training course on rangeland plant identification and vegetation classification; workshop on rangeland improvement using rest technique; toolbox of sustainable rangelands management in addition to series of on-the-job training events on rangeland assessment and monitoring
Various	1	1	CGIAR staff	Forage selection to improve soil health in the tropics (training on soil analysis methods)
Tanzania, Vietnam, Cambodia, Laos	3	2	Researcher and others	Research placements: Climate change adaptation through planted forages in Southern Highlands, Tanzania; assessing the environmental impacts of smallholder dairy farming systems in Southern Highlands, Tanzania; agricultural intensification pathways and agro-environmental trade-offs in the Greater Mekong
Kenya	30	5	Others	Occidental Insurance Company (OIC) insurance agent training in Kenya
2020				
Vietnam, Tanzania, Uganda, Tunisia, Ethiopia	67	20	Mixed participants	Training of partners on targeting tools; applying CLEANED ⁴ to dairy value chain in Tunisia; CLEANED trainings in Vietnam, Tanzania, Uganda, Ethiopia, and Tunisia
Zambia, others	2	2	Researcher	Case study report of targeting tools application; meta-analysis on multiple benefits of tropical forages in Sub-Saharan Africa
Colombia, online	23	0	Mixed participants	One workshop on indigenous species in addition to series of on-the-job training events on rangeland assessment and monitoring
Tunisia	6	-	Researcher	On-the-job training on rangeland assessment and monitoring conducted in Northern Tunisia

1. Consultative Group on International Agricultural Research

2. Greenhouse gas emission

3. Index-based livestock insurance

4. Comprehensive Livestock Environmental Assessment for improved Nutrition, a secured Environment and sustainable Development

In 2019, about 2,613 participants (about 30% women, excluding the index-based livestock insurance (IBLI) trainings in Kenya) benefitted from various trainings in Kenya, Tanzania, Rwanda, Tanzania, Vietnam, Cambodia, Laos, and Tunisia. The training areas were: IBLI; a mobile phone application (eWeigh App) to estimate live weight of dairy cattle; protocol and training on feeding trials; methods of soil analysis; Occidental Insurance Company (OIC) insurance agent training; and rangeland management. In addition, the following trainings were conducted in 2019: building institutional capacity for policy, programs, and planning systems in Ethiopia, Tanzania, Kenya, and Tunisia.

In 2020, a total of 98 farmers, CGIAR staff, and others (about 22% women) attended various trainings held

in Ethiopia, Tanzania, Tunisia, Uganda, Vietnam, and Zambia. The participants were trained on: Comprehensive Livestock Environmental Assessment for Improved Nutrition, a Secured Environment and Sustainable Development along Livestock and Fish Value Chains (CLEANED R and CLEANED X) tools for livestock and fish value chains; the Rural Household Multi-Indicator Survey (RHoMIS) tool; rangeland management and land use planning tools; a COVID-19 module; the G-FEAST tool; and rangeland assessment and monitoring. Training materials and a manual on how to reduce heat stress in dairy and pig value chains were also developed for extension officers in Uganda.

Knowledge exchange: In 2017, the Flagship held various knowledge exchange engagements in Eastern Africa

(e.g. Kenya and Uganda) and Tunisia on the following issues: heat stress adaptation in Uganda; policy dialogue on land use planning in Kenya; two workshops on the importance, techniques, and practices of sustainable silvopastoral restoration in Tunisia; and an FAO-IPCC Expert Meeting on climate change, land use, and food security. A total of 435 participants (15% women) attended these events. In 2018, 39 CGIAR staff and other participants (33% women) were engaged in knowledge exchange activities in Cambodia and Vietnam. A team from Cambodia executed a training visit to Vietnam to learn the protocols for measuring GHG emissions from soil and other sources with Gasmet Gas Analyzer DX4040. An online dialogue was also conducted on making rangelands more secure. In 2019, the Flagship held at least 10 knowledge exchange events in Tunisia, Tanzania, Saudi Arabia, Turkey, Iraq, Jordan, and Ethiopia, in which 804 CGIAR staff, farmers and other actors (17% women) participated. The events involved packaging sustainable silvopastoral practices

for alleviating land degradation; a regional workshop on IBLI; grassland management characterization; community participation in silvopastoral restoration; silvopastoral systems and climate change mitigation; alley cropping in semi-arid regions; feed interventions for sustainable dairy intensification; and greening dairy value chains. In 2020, 651 farmers and other actors (9% women) took part in participatory rangeland mapping, grassland management prioritization, a Maziwa Zaidi stakeholder workshop on environmental management opportunities, and CLEANED virtual training events held in Ethiopia, Kenya, Somalia, Tanzania, Tunisia, and Uganda.

A summary of the knowledge exchange activities conducted in Tunisia between 2017 and 2020 is shown in Table 13. What was important with these events was the deliberate targeting of youth and students so that they could develop an interest in environmental systems.

Table 13: Knowledge exchange activities in Tunisia

Country	Participants, total	Participants, Female	Nature of participants	Types of training
2017				
Tunisia	67	13	Policymakers, universities, development agencies, researchers, and mixed	Two workshops on sustainable silvopastoral restoration importance, techniques, and practices
2018				
Tunisia	135	62	Graduate students, university students, international originations development agencies, researchers, and mixed	National Tree Festival in Tunisia; two farmer field days; one graduate student field day; one university student field day on agrosilvopastoral systems practices, advantages, and impact on soil and water; and one workshop on raising awareness on the participatory approach
2019				
Tunisia	244	36	Universities, development agencies, researchers, and mixed	One university student field day on agrosilvopastoral systems practices and three workshops on silvopastoral restoration practices to promote ecosystem services
Total	446	111		

Other CapDev activities: A pilot training of value chain actors was held in Kenya in 2017 on a prototype crowdsourcing application for Livestock Management Information System (LMIS)—a digital platform structured around a suite of mobile applications that will support the sustainable and efficient sourcing, verifying, and dissemination of market information and other relevant data for development and resource management of rangelands. A total of 34 value

chain actors (29% women) participated. Farmers in the Southern Highlands of Tanzania were trained on *Brachiaria* grasses as part of forage scaling activities. A total of 316 farmers (32% women) participated. In another scaling activity, 30 participants (50% women) took part in a heat stress policy briefing in Uganda. In 2020, multiple training materials were developed for rangeland assessment and monitoring, including manuals and factsheets. These materials can be used

by different stakeholders in different countries. ICARDA participated in a Tunisian Forestry Week online event (9–14 November 2020, attended by more than 1000 participants) where ICARDA was asked to present the successful agrosilvopastoral approach conducted in Sabihia, Tunisia, and show how it could be extended by the national system to new areas.

Flagship 5: Livestock Livelihoods and Agri-food Systems

Academic degree trainings: The Livestock Livelihoods and Agri-food Systems Flagship had a modicum of academic degree trainings during the four years under review. Only four researchers were trained. A researcher from Tunisia trained at the BSc degree level. Another from the MENA region graduated with an MSc degree. She produced a thesis based on the application of tri-capital framework in resilience assessment of socio-ecological systems in the MENA Region. Another Master student from Morocco completed his studies with a thesis entitled, 'The contribution of pastoral farming in improving the living conditions of rural households in the Tinghir Zone (Morocco)'. The thesis was part of the initiative to adapt RHoMIS to pastoral and agro-pastoral contexts in Morocco. One PhD candidate from Ethiopia graduated; his research work was on 'Preference for market facilities and impact of market sheds on market participation and revenue from small ruminants in Menz-Gishe of Amhara, Ethiopia'.

One-off formal trainings: In 2017, a total of 9,318 researchers, farmers, and other stakeholders (about 9% women) participated in one-off trainings on various themes: gender analysis; enumerator training on social and behavioural communication strategy for dairy consumption in rural areas in Kenya and Tanzania; FFS on production and farm management training in Nicaragua; barriers to uptake of improved dairy technologies in Kenya; Geographic Information System (GIS) training on climate change adaptation for pastoralists in Somalia; and training of enumerators in Rwanda on tools and datasets to assess animal-source food (ASF) consumption with a focus on dairy (Table 16). In Kenya, 20 participants (45% women) attended a training session on a tool for nurturing a network of policy analysts for enhanced agricultural

development and food and nutrition security. In 2019, a total of 14,301 participants (3% women) were engaged in various trainings in Mali, Nigeria, Ethiopia, Kenya, and Uganda. The training themes included entrepreneurship skills development, assessing entry points for complementary CRP activities and opportunities for cooperation with other regional projects, mobile data collection platform and business development plans, integrated livestock, water and land management, and the Women's Empowerment Livestock Index (WELI).

In 2020, Ghana, Kenya, and Rwanda hosted a number of one-off trainings attended by about 1,071 researchers and farmers (29% women), as shown in Table 14. The trainings were on the use of a mobile application to collect nutrition data at the child and caretaker level as well as training community health volunteers and caregivers in nutrition and health in Samburu County, Kenya. Twenty-two Community Health Volunteers and 190 caregivers in Samburu County were trained in nutrition and health, and on the use of the smartphone app that collates nutrition information, including mid-upper arm circumference (MUAC). They recorded and submitted data on health and nutrition over 10 months under the Mbiotisho project (Improving Dietary and Health Data for Decision-making project²⁷). Training was also conducted on the use of the WELI tool for two external partners of the IDRC-funded Livestock Vaccine Innovation Funds (LVIF) project. A team of 28 enumerators in Ghana were trained on utilizing the WELI tool by a consultant expert on the Project-level Women's Empowerment in Agriculture Index (pro-WEAI). Pro-WEAI measures women's empowerment in various types of agricultural development projects. It is made up of 12 indicators that measure three types of agency: intrinsic agency (power within), instrumental agency (power to), and collective agency (power with). The WELI was developed by ILRI based on IFPRI's WEAI. The WELI measures women's empowerment in livestock and crop agriculture and focuses specifically on key areas of livestock production such as animal health, breeding, and feeding, and on use of livestock products such as animal-source-food processing and marketing.

27. International Livestock Research Institute; Food, Agriculture and Natural Resources Policy Analysis Network. 2021. *Improving dietary and health data for decision-making*. Video at <https://www.youtube.com/watch?v=cfbTUIbTRB8>. <https://www.youtube.com/watch?v=cfbTUIbTRB8>

Table 14: One-off trainings under Livestock Livelihoods and Agri-Food Systems

Country	Participants, total	Participants, female	Nature of participants	Types of training
2017				
Asia, Sri Lanka	24	10	Mixed participants	Regional training on gender analysis
Tanzania, Kenya, Somalia	35	24	Researcher	Training of enumerators on social and behavioural communication strategy for dairy consumption in rural areas in Kenya and Tanzania; Geographic Information Systems training on climate change adaptation of pastoralists in Somalia

Country	Participants, total	Participants, female	Nature of participants	Types of training
Kenya, Nicaragua	7,001	28	Farmers	Production and farm management training through Farmers Field Schools in Nicaragua; barrier to uptake of improved dairy technologies in Kenya
Rwanda	15	9	Mixed participants	Training of enumerators: Tool and dataset to assess ASF ¹ consumption in Rwanda, with a focus on dairy
2018				
Kenya, other	20	9	Mixed participants	Nurturing a network of policy analysts for enhanced agricultural development and food and nutrition security in Kenya
2019				
Mali, Nigeria, Ethiopia	1,081	422	VC actors	Training in entrepreneurship skills development: Inception workshop report in the three project countries (Ethiopia, Mali, Nigeria) to assess entry points for complementary CRP ² activities; assessment of opportunities for the Technologies for African Agricultural Transformation project and Livestock CRP scientists to work together
Kenya	32	0	Farmers, producers	Dairy Farmers Assistant training on mobile data collection platform and business development plans in Kenya – adaptation opportunities for smallholder dairy farmers facing resource scarcity: Integrated livestock, water, and land management
Kenya, Uganda	39	0	Researchers	Training on the Women's Empowerment in Livestock Index (WELI) in Kenya and Uganda—WELI tool methodology
2020				
Rwanda, Kenya	812	244	Mixed	Use of a mobile application to collection nutritional data at the child and caretaker level; accelerated Dairy Value Chain project, dairy component, Kenya
Kenya	212	64	Farmers, producers	Improving nutrition and health data to and from remote regions—training community health volunteers and caregivers in Samburu County, Kenya in nutrition and health
Ghana, East Africa	47	6	Researchers	WELI ³ tool available in different languages; baseline data report on using WELI for gender and vaccine Ghana project
TOTAL	9,318	816		

1. Animal-source food

2. CGIAR Research Project

3. Women's Empowerment Livestock Index

Trials and studies: Participatory trials and studies were undertaken by the Flagship in eastern Africa, especially Ethiopia, Tanzania, and Uganda. A total of 1,413 farmers and other actors (33% women) participated in the studies on: assessment of men and women farmers' perception of adopting improved diets for pigs in Uganda; gender-based constraints on and opportunities for women's participation in the small ruminant value chain in Ethiopia; analysis of East Africa Dairy Development (EADD) project performance indicators; and dairy hubs and Women Empowerment in Agriculture in the Southern Highlands of Tanzania.

The gender training was conducted within the Ethiopian Institute of Agricultural Research (EIAR), which subsequently decided to extend the training to staff in their regional centres.

Other CapDev activities: A knowledge exchange workshop on implementation of sustainable livestock platform and research activities in RACCS (Southern Caribbean Autonomous Region) attracted 30 participants (50% women) in Nicaragua. Also in Nicaragua, scaling activities on implementation of sustainable livestock practices through farmer field

schools (FFSs) were undertaken in the RACCS and 440 farmers (25% women) participated. Training was delivered in 11 FFSs. The FFSs were led by a livestock technician, who was supported by five facilitators ('promoters') who also visited individual farmers. The themes included development of a farm plan, dry-season cattle feeding, use of veterinary products, establishment and use of live fences, responsible use of agrochemicals, use of mineral salts as a feed supplement, and use of *Tithonia diversifolia* 'Mexican sunflower' in pastures as part of silvopastoral systems. In Vietnam, 17 CGIAR staff (53% women) took part in a planning meeting for the Vietnam priority country project.

In addition, the Flagship achieved the following CapDev-related milestones:

- Capacity building of decision makers at the national level continued as part of the Livestock Master Plans in Ethiopia, India, and Tanzania.
- In Uganda, the CRP conducted due diligence on six stakeholders applying digital technology solutions to improve smallholder pig farming in Uganda and facilitated needs assessments from the flagships for various capacity development activities.
- The 'eWeigh' mobile application (app), which uses heart girth as a proxy measure to estimate live weight, was tested by Kenyan dairy farmers.
- An improved scaling approach led to high uptake of improved sheep-fattening practices and technologies in Ethiopia.
- A training on participatory system dynamics methods was conducted internally at ILRI in Hanoi and with partners on CRP-mapped bilateral projects in Bihar, Myanmar, and India.
- Two training courses on participatory systems modelling were virtually administered in 2020, one at ILRI and one with Timor Leste partners, and online Padlet papers were developed to support teaching. The Timor training was followed by deployment of methods to conduct stakeholder meetings in the context of Socio-economic and Livelihood Impact Analysis (SELIA).
- Community Health and Environment Officers and Community Health Workers in Rwanda were trained on the Feed the Future Innovation Lab for Livestock Systems nutrition intervention materials.
- Research placement: One Master of Arts student from Sweden, Viktor Johansson, was attached to the Women in Business project in Tanzania and conducted fieldwork on gender norms around women in livestock business.
- A total of 189 Community Environment and Health Officers and Community Health Workers (CHWs) from Ruhango and Nyabihu Districts in Rwanda were trained on the Feed the Future Livestock Systems Innovation Lab (LSIL) nutrition intervention materials for implementation at project control sites in 2020. Community training activities by CHWs at control sites were conducted in keeping with COVID-19 prevention measures, using megaphones and microphones during market days. A PhD student, Naphtal Habiyaemye, was attached to the Rwanda LSIL project. He collected data to assess consumer demand for milk safety attributes using the experimental auctions approach.



Photo: ILRI/Apollo Hablamu

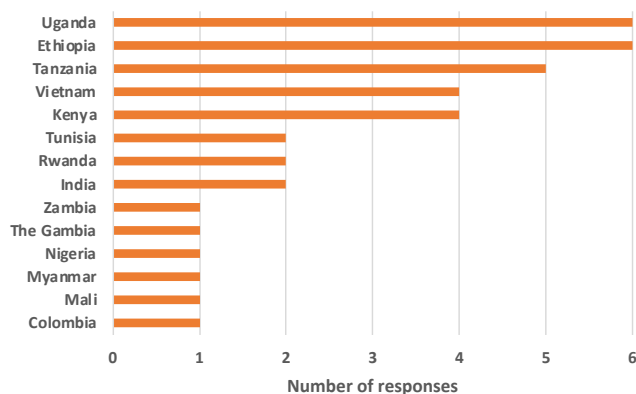
RESULTS OF THE REVIEW OF CAPDEV IMPLEMENTATION BY THE VARIOUS FLAGSHIPS

The material presented in this section was derived from online surveys and one-on-one interviews with key implementers (especially Flagship leaders, country coordinators, and national partners) and beneficiaries.

Is the Livestock CRP delivering quality capacity development interventions aligned with its capacity development strategy?

Approximately 14 countries benefitted from CapDev interventions in the current round of the Livestock CRP. As expected, the highest intensity of CapDev activities by the flagships were targeted at the four CRP priority countries of Ethiopia, Tanzania, Uganda, and Vietnam. As shown in Figure 3, six respondents indicated that they implemented CapDev activities in Ethiopia and Uganda; five in Tanzania; four in Kenya and Vietnam; and two in Tunisia, Rwanda and India; while the rest of the countries were each recipients of CapDev interventions by one flagship.

Figure 3: CapDev implementation in CRP target countries. CapDev—capacity development. CRP—CGIAR Research Project.



The respondents indicated that the main factors that guided the selection of target countries for CapDev implementation were as follows:

1. the country was already a CRP or another ongoing bilateral project priority (e.g., Ethiopia, Tanzania, Uganda, Vietnam, and Kenya)
2. partners working in the countries expressed interest (e.g., Ethiopia, Tanzania, and Tunisia)
3. there was committed leadership and a team in place in the country (e.g., Ethiopia, Uganda, and Vietnam)
4. CapDev was prioritized in the country's livestock master plan (e.g. Kenya, India, and The Gambia)
5. the country invited the CRP partner institutions (e.g., Nigeria, Rwanda, and Zambia)
6. there was a discerned country need (e.g., Tanzania and Uganda)
7. there were strong pre-existing relationships with the NARS (e.g., Tunisia).

The relevance of CapDev activities channelled to the countries by the Flagships can be viewed in terms of the CapDev outlines in the main strategic and programmatic documents of the CRP, namely the CapDev Framework for the second round of the CRP, the Livestock CRP and Flagship Narrative Proposal, and the Livestock CRP CapDev Strategy. The CGIAR CapDev Framework was elaborated in 2015, precisely to help inform CapDev actions in the CRPs, including the Livestock CRP. The Livestock CRP and Flagship Narrative Proposal was developed in 2016 at the inception of the second round of the CRPs and the CapDev activities in the document were largely informed by the outlines in the global CGIAR CapDev Framework and the CRP theory of change.

In 2017, the Livestock CRP conducted Capacity Needs Assessments (CNAs) in the priority countries of Ethiopia, Nicaragua, Uganda, Tanzania, and Tunisia. The results of the CNAs later informed the design of the Livestock CRP CapDev Strategy, which was finalized in 2019, about three years into the implementation of the second round of the CRPs. As shown in Table 15, elaboration of the Livestock CRP CapDev Strategy was grounded on the first element of the CGIAR CapDev Framework, i.e., the imperative of CNAs to

inform strategy design, thereby ensuring demand-led capacity development interventions. The CNA report recommended ‘development of partnership capacity’, itself an element in the CGIAR CapDev Framework, as a necessary CapDev ingredient to enable the CRP’s theory of change. However, it is instructive to note that eventually, this was not deemed a priority to be implemented by the Flagships. ‘Design and delivery

of innovative learning materials and approaches’ and ‘mainstreaming gender-sensitive approaches to CapDev’ were also embedded in the prioritized CapDev areas in the Strategy. The digital extension aspect in the Strategy also feeds into the innovative and learning materials and approaches element of the CGIAR CapDev Framework. Thus, all prioritized activities in the CapDev Strategy were firmly rooted in the CGIAR’s overarching CapDev Framework.

Table 15: Prioritization of CapDev strategic elements

CGIAR ¹ CapDev ² Framework Elements	Elements in the CapDev Strategy Based on the CNA ³	CapDev Strategy Priorities
1. Capacity needs assessment (CNA) and intervention strategy design	1. Develop training methodology capacity	1. Develop training methodology capacity
2. Design and delivery of innovative learning materials and approaches	2. Develop partnership management capacity (support to the ongoing partnership work)	2. Develop capacity of extension workers to overcome barriers to communicating with farmers or pastoralists
3. Develop CRPs ⁴ and Centres’ partnering capacities	3. Develop capacity of extension workers to overcome barriers to communicating with farmers and pastoralists	3. Develop digital extension solutions to enhance current (low) extension capacities
4. Develop future research leaders through fellowships	4. Develop digital extension solutions to enhance current (low) extension capacities	
5. Gender-sensitive approaches throughout capacity development	5. Develop and disseminate targeted advocacy messages	
6. Institutional strengthening	6. Training on project management and communication skills targeting implementation-level staff	
7. Monitoring and evaluation (M&E) of capacity development		
8. Organizational development		
9. Research on capacity development		
10. Capacity to innovate		

1. Consultative Group on International Agricultural Research

2. Capacity development

3. Capacity needs assessment

4. CGIAR Research Programs

We conducted an online survey targeting the Flagship Leaders to determine the extent to which the implemented CapDev activities in their respective Flagships were informed by the priorities identified in the Livestock CRP CapDev Strategy. As shown in Figure 3, a total of eight responses were received from Flagship and Cluster leaders. The majority (about 63%) indicated that the CapDev activities implemented by their Flagships were either not informed or only slightly informed by the CRP CapDev Strategy. Only two responses indicated that their activities were completely informed by the CapDev Strategy. The CapDev activities implemented by the Animal Health flagship (FP2) was not informed by the CapDev Strategy, while the overall assessments for the rest of the Flagships indicated that the CapDev activities

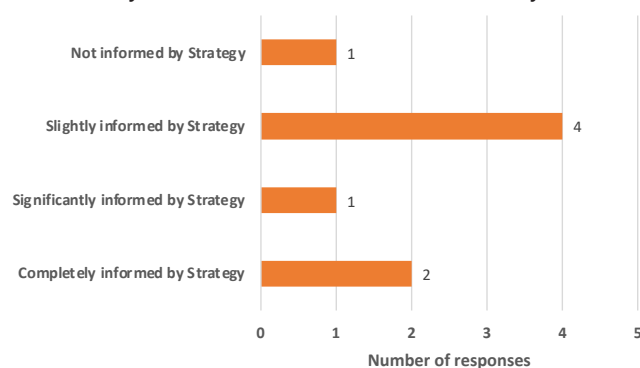
were only slightly informed by the CapDev Strategy. However, for Livestock Genetics (FP1) and Livestock and the Environment (FP4), there are aspects of CapDev that were either significantly or completely informed by the Strategy. Developing the capacity of national partners and actors to implement breeding programs – a CapDev activity implemented by FP1 in Ethiopia, Tanzania, and Uganda—was significantly influenced by the Strategy. Training of national partners on data collection and feedback, also implemented by FP1 in Ethiopia and Tanzania, was completely informed by the Strategy. Scaling assessments of selected interventions, an activity implemented by Livestock Feeds and Forages (FP3), was also gauged to be completely informed by the Strategy.

The extent to which the reported CapDev interventions reverberated with the needs of the national partners varied across the Flagships. For example, in Livestock Genetics, training needs assessments were

independently conducted at the beginning of some of the bilateral projects (e.g., on fish breeding) to identify the training needs and align them with the focus of the project. The Animal Health Flagship also carried out participatory epidemiology and gender analysis, at least in Ethiopia, to identify the priority diseases, their possible causes, and the knowledge, attitude, and practice (KAP) gaps, in order to inform the intervention strategies and associated CapDev actions. In the case of Feeds and Forages Flagship, the interventions were in response to the demand for feed. For example, the FEAST tool was developed over the past 12 years based on the need for a guide to forage selection for farmers, and the heavy use of the tool is evidence of the demand.

Figure 4: How Flagship CapDev actions were informed by the Livestock CRP CapDev Strategy. CapDev—capacity development. CRP—CGIAR Research Project.

Thus, it may seem that the CNAs conducted by the



CapDev Unit of ILRI, apart from the fact that the exercise was rather belated, could have been perceived by some of the Flagships as a superfluous undertaking since they had already conducted their own in-house capacity needs assessments and responded to perceived stakeholder demands with specific tools. However, according to one key informer, the CNAs conducted by the CapDev Unit were meant to identify the 'on-the-go' capacity development support that the Flagships needed while they were implementing their various projects. Perhaps the intention was to reveal the capacity gaps that might not have been captured in the initial in-house needs assessments but became apparent later on during implementation.

At any rate, the CapDev Unit had to lobby the Flagship teams to take on board the prioritized areas in the CapDev Strategy. The lobbying was relatively successful in regard to the activities implemented by the Livestock Health Flagship, as one of the CapDev Unit staff was already interfacing with this Flagship on other fronts. Specifically, the two key areas of CapDev activities implemented by the Health Flagship in Ethiopia—developing training materials and developing approaches in working with local partners i.e., participatory community engagement approaches, techniques, methods—were priorities in the Livestock CRP CapDev Strategy. However, in Tunisia, a non-CRP priority country, implementing partners indicated that

they supported the local CNAs and submitted the results to the CapDev Unit, but that was as far as it went: they never heard anything else and were largely unaware that a strategy had come forth from the CNAs they conducted. Thus, it appears that the CapDev Strategy was meant initially for 'pilot' implementation only in the CRP priority countries.

How well were capacity development interventions implemented and adapted as needed in the Livestock CRP?

At least in the priority countries of the Livestock CRP (i.e., Ethiopia, Tanzania, Uganda, and Vietnam), CapDev activities were implemented as part of an integrated country work plan. For example, when the Country Coordinators did their annual work planning for deliverables, they would ask the CapDev Unit personnel about what CapDev deliverables they required for a particular year in a particular country. If one of those deliverables was, for example, a capacity needs assessment, then it would be incorporated in the annual work plan. As per the CGIAR requirements, the planning and reporting system used by the CRP does not include information on specific CapDev activities at the annual planning stage. As such, it is instructive to note that the country work plans did not have specific targets, at least for gauging the success of CapDev activity implementation. Instead, the extent of integration of CapDev actions into the Flagship programs was scored on the deliverables (i.e., proof of the completion of an activity or set of activities), based on criteria provided in the Guidance on Scoring CGIAR Cross-cutting Markers in the Plan of Work and Budget (POWB) and Annual Report (CGIAR, 2018²⁸). It was known that CapDev activities were planned for if, as indicated above, the Flagship included a specific CapDev deliverable in their annual work plan. The reports were, however, required to indicate if any of the deliverables involved trainees and, if so, to specify the numbers, gender, and types of these trainees. In the MARLO, all reported Flagship activities were scored for the extent to which they had CapDev components, i.e., 0 (not targeted), 1 (significant), or 2 (principal).

Thus, CapDev was something in the mind of the Flagship leaders, but never had any particular delivery targets. The feed assessment tools developed by the Feeds and Forages Flagship (e.g., FEAST) may be used to illustrate how CapDev came into play. The FEAST, and its gendered version G-FEAST, is a participatory tool for helping those who work with farmers (e.g., researchers, extension agents, and NGOs) to design better feed interventions. Conceptually, two elements of capacity

28. CGIAR. 2018. Guidance on scoring CGIAR cross-cutting markers in the Plan of Work and Budget (POWB) and Annual Report. Prepared by the CGIAR Gender Community of Practice. Montpellier, France: CGIAR.

development are wrapped up with the tools. One is the fact that application of the tool itself builds the capacity of local researchers to begin to think a little bit more broadly and systematically about feed interventions and also to think in terms of how the system functions and how feed interventions might fit within that system. The other CapDev aspect is that some training materials were developed to train people in the use of the tool. These training materials were used either for face-to-face or online trainings. But the degree of the Flagship engagement with the CapDev Unit team to specify the CapDev elements associated with the tools was not clear. In this way, CapDev was either expected as an incidental outcome to a main activity or implemented as a spurious sub-activity, depending on the exigencies of the Flagship, with no clear linkages to the CRP CapDev strategic priorities.

The CRP invested W1/2 funding in the four countries to test the hypothesis that integration of research activities across the various Flagships can result in ‘packages’ of technologies that are greater than the sum of their parts. Each Flagship was required to put a portion of its W1/2 of the CGIAR Trust Fund into each country project and an additional amount was supposed to be allocated to each country to cover the management costs. However, in many of the countries, project activities were bilaterally funded, but there were no clear linkages between bilateral projects and country-level intermediate indicators to allow aggregation of results. Program output indicators (e.g. number of CapDev participants) were not clearly linked to bilateral project output indicators, and this probably led to under-reporting on deliverables.

One of the strategies in the global CRP theory of change was to influence policy and investment in the livestock sector with the key short-term or medium-term outcomes of institutionalizing evidence-based decision-making by stakeholders in order to create an enabling business environment. In the case of Tanzania, this intervention was adapted to the policy interventions outlined in the Tanzania Livestock Master Plan (2017/2018–2021/2022²⁹) one of which was ‘prioritizing policies creating a conducive environment

for investment in commercial meat and milk production and processing’. Alignment with the country’s strategic areas was therefore one way of adapting CapDev actions to country context.

To what extent have the planned capacity development outputs and outcomes been achieved by 2021?

As already alluded to above, the planning and reporting system used by the CRP does not include information on specific CapDev activities and their targets at the annual planning stage. Evaluation of implementation effectiveness then becomes a bit hazy. However, we explored this review question by interviewing key informants from various Flagships on their personal perceptions as to the degree to which they had implemented any intended CapDev interventions. The question posed was: ‘To what extent were you able to implement the intended CapDev activities in each of the targeted countries?’.

As shown in Table 16, the extent to which various Flagships completed the intended CapDev activities was different depending on the target country. For Livestock Genetics, CapDev activities were completed (80–100%) in all the priority countries: Ethiopia, Tanzania, Uganda, and Vietnam. The Livestock Health Flagship did not complete all the intended CapDev interventions in any of the three targeted countries of Uganda, Vietnam, or Mali. Feeds and Forages implemented CapDev interventions in nine countries. However, CapDev activities were completed in only four countries: Colombia, Kenya, Tunisia, and Vietnam. Livestock and Environment targeted four countries, but only managed to complete CapDev implementation in two countries: Tanzania and Tunisia. The Livelihoods and Agro-Food Systems Flagship also targeted nine countries for delivery of CapDev interventions, but only three countries (India, Kenya, and The Gambia) registered completion of the activities. The priority countries of Ethiopia, Tanzania, Uganda, and Vietnam all registered activity completion rates of below 49%.

29. Michael, S., Mbwambo, N., Mruttu, H., Dotto, M., Ndomba, C., et al. 2018. Tanzania Livestock Master Plan (2017/2018–2021/2022). Nairobi, Kenya: ILRI.

Table 16: Extent of implementation of CapDev activities by Flagships

Flagship	Country	Duration of Implementation	Extent
Livestock Genetics (FP1)	Ethiopia	2017–2021	80%–100%
	Kenya	2017–2021	50%–79%
	Rwanda	2019–2021	Below 49%
	Tanzania	2017–2021	80%–100%
	Uganda	2017–2021	80%–100%
	Uganda	2020–2021	Below 49%
	Vietnam	2019–2021	80%–100%
	Zambia	2020–2021	Below 49%

Flagship	Country	Duration of Implementation	Extent
Animal health (FP2)	Mali	2018–2021	50%–79%
	Uganda	2017–2021	50%–79%
	Vietnam	2019–2021	50%–79%
Feeds and Forages (FP3)	Colombia	2017–2021	80%–100%
	Ethiopia	2017–2021	50%–79%
	India	2017–2021	50%–79%
	Kenya	2017–2021	80%–100%
	Nigeria	2019–2021	50%–79%
	Tanzania	2017–2021	50%–79%
	Tunisia	2017–2021	80%–100%
	Uganda	2017–2021	50%–79%
	Vietnam	2017–2021	80%–100%
Livestock and Environment (FP4)	Ethiopia	2019–2021	50%–79%
	Kenya	2019–2021	50%–79%
	Tanzania	2017–2021	80%–100%
	Tunisia	2017–2021	80%–100%
Livestock Livelihoods and Agri-Food Systems (FP5)	Ethiopia	2018–2021	Below 49%
	India	2020–2021	80%–100%
	Kenya	2017–2021	80%–100%
	Myanmar	2019–2021	50%–79%
	Rwanda	2018–2021	50%–79%
	Tanzania	2018–2021	Below 49%
	The Gambia	2020–2021	80%–100%
	Uganda	2018–2021	Below 49%
	Vietnam	2020–2021	Below 49%

Disruptions by the COVID-19 pandemic were cited as the main cause for non-completion of planned CapDev activities for the majority of the target countries. Additionally, in Colombia, Ethiopia, and Myanmar, there was civil unrest and political upheaval. Delays in funding and getting ethical approval were additional reasons for non-completion of project activities in Rwanda. In some countries, implementation of some projects started just over a year ago (e.g., Uganda and Zambia for the Livestock Genetics Flagship; and India, The Gambia, and Vietnam for the Livelihoods and Agri-Food Systems Flagship). In Kenya, the reasons for non-completion included new engagements in the country related to the dairy sector, and partner (e.g. private-sector and county government) delays. Lack of implementation capacity was an additional reason for activity delay in The Gambia, as the lead scientist there reportedly left.

Are any positive results likely to be sustained? In what circumstances?

A few illustrative examples of how CapDev was instrumental in the success of some Flagship interventions are given below, along with prospects for sustainability of the interventions beyond the project timelines.

The FEAST tool

The Feed Assessment Tool (FEAST) allows for a systematic assessment of local feed resource options, which helps in the design of intervention strategies to optimize feed utilization and animal production across various landscapes and regions. This tool's main purpose is to identify the constraints and opportunities around feed development in a specific location. Once the constraints and opportunities are identified, it also gives an idea of the potential interventions that can solve those problems. It is meant to be used by research and development workers in all aspects of livestock feeding. The tool gives the top five options that can work in a particular area and this provides an entry point for structured interactive dialogue with development partners and the local people about what must be done, what can be done, and what is most suitable in an area. It generates data summaries which are very suitable for putting into reports, and is pretty standard and easy enough to use.

The general approach to introducing the tool involves an initial training of master trainers. In every project site, the technical people within that project are enlisted for training on the tool, i.e., how to use it to process

data, interpret data, and write reports. The trainees are allowed to go out on their own to conduct the assessments to prove that they can use the tool and come up with reports and recommendations on which interventions to follow up on. For example, the tool can give a recommendation that in a particular area, the best option would be to plant improved forages, or to introduce strategies that will help farmers use crop residues in a better way, or to create a ration formulation based on the local feed resources. Once these options are identified, one goes further to design the interventions and implement them with farmers.

The tool has been used in over 22 countries across Africa, Asia, and Latin America, and promoted independently by a range of civil society, NGOs, government, and private sector organizations in various countries without any support from the CRP partners. Due to its apparent success and widespread use, the results from CapDev interventions from the use of this tool are likely to be sustained in a variety of contexts. There have been suggestions to expand the scope of applicability of FEAST, for example by integrating a soil analysis component to aid in forage production. Further, as evidenced by the MilkIT project implemented in India and Tanzania, the tool may be better disseminated and the results could be better sustained if it were introduced within an integrated agricultural research for development framework like innovation platforms (IPs). The IPs are social spaces where stakeholders with varying incentives ventilate on issues of common concern. The dynamics of IPs could foster systemic and institutional capacity development, as the IPs ensure more inclusive and communicative stakeholder engagements, which is good for scaling up (Duncan et al. 2015³⁰).

RHoMIS tool

By 2018, the Rural Household Multi-Indicator Survey (RHoMIS), a rapid, standardized, cost-effective agricultural performance tracking tool, had been adopted by 13 different research and development organizations (TreeAID, the Global Diversity Foundation, SNV, ICRAF, IFAD, EU-JRC, Bioversity International, FAO, CIAT, IITA, WUR, CSIRO, and the McKnight Foundation) to guide investments and generate information on 24,000 households in 31 countries. The RHoMIS tool allows data from many projects to be pooled, building up a coherent, large dataset that permits cross-site analysis. The RHoMIS framework has been applied to projects in more than 22 countries, with close to 17,000 households being interviewed, and has been financed by donors such as USAID, DFID, and the Bill and Melinda Gates Foundation, among others. In Vietnam, the RHoMIS survey has been used by CIAT in the project Hand and Minds Connected to Boost Eco-Efficiency of Smallholder

Livestock-Crop Farms. RHoMIS was used to collect baseline data for the project, on which consecutive work focusing on soil fertility was based. The success of the RHoMIS tool has relied on multiple trainings with and outreach to research and development organization partners. The RHoMIS innovators provide trainings to partners wishing to use the tool, and support simple analyses to produce results quickly.

Communities of practice on sheep-fattening

ICARDA facilitated collective action of youth groups for market-oriented sheep production in the highland regions of Ethiopia through communities of practice (CoPs). The CoPs have since been replicated in the other highland regions of Ethiopia where ICARDA is active (mainly through peer-to-peer learning) with good results. Prospects for sustainability beyond the CRP timeline abound. More details are given in the case study below.

Community conversations in Ethiopia

Community conversations are knowledge co-creation forums that leverage indigenous (by rural communities) and scientific (by Flagship-implementing partners) knowledge practices. In the Livestock CRP, it was initially employed around herd health management. The conversations have been successfully applied to guide discussions among rural farming communities in Ethiopia focused around livestock health management, gender, and zoonotic disease risks. The facilitated conversations have been shown to have positive effects on knowledge, attitudes, and practices of participating farmers as well as behaviour change and transformation of gender relations at the household and community levels. Due to the apparent success of the approach, the Ethiopian government is keen on mainstreaming its use in the national extension system. More details on this tool are given in the case study below.

Community-based breeding programs in Ethiopia and other African countries

Community-based breeding programs (CBBPs) led by the International Center for Agricultural Research in the Dry Areas (ICARDA) has become the Ethiopian Government's strategy of choice for small ruminant genetic improvement. Implementation of the CBBP is focused on building capacity of partners through short, tailored trainings. ILRI and ICARDA initially trained national partners, who in turn trained other value chain actors. Moreover, a module on CBBP was integrated into the livestock genetics curriculum of three Ethiopian universities and a tailored MSc training on breeding and genetics was introduced in two other universities. The CBBP was incorporated in the country's livestock master plan and received a grant investment of USD 560,000 for its up scaling across the country. The upscale has been implemented by national research and extension staff with technical support from ICARDA.

30. Duncan, A., Teufel, N., Ravichandran, T., Hendrickx, S. and Bal-lantyne, P. 2015. Innovation platforms to improve smallholder dairying at scale: Experiences from the MilkIT project in India and Tanzania. ILRI project report. Nairobi, Kenya: ILRI.

These programs were introduced through training modules and have been very successful due to their participatory model. Key elements of CBBPs include: (i) farmer training to improve selection methods – for example, retaining fast-growing ram lambs for breeding, rather than selling them young; (ii) pooling community flocks to create a large gene pool from which breeding rams can be selected; (iii) farmer-scientist interactions to evaluate different breeding options and thus facilitate informed decisions on flock management; and (iv) setting up a recording system to monitor the performance of individual animals, leading to continuous genetic improvement.

The CBBPs are now owned and promoted by the national systems in Ethiopia, especially in the small ruminant sector. In this sector, the CBBPs are organized into cooperatives, which integrate aspects of capacity development, genetics, nutrition, health, input supply, services, and market access. The way the program is designed from the very beginning is very consultative and it uses local resources of the community groups. No exotic sheep or goat breeds are introduced from external sources; only local breeds are selected and used. The community groups are engaged to identify suitable breed traits or breed characteristics (i.e., good sires, good breeding rams, and he-goats) using indigenous knowledge systems. Thus, the main factor which makes the program successful is the use of locally available breeds. ICARDA's approach to community-based breeding has now been integrated into Ethiopia's national livestock master plan. The program has also been linked to a cloud-based genetic database platform to improve data quality, data collection, and information processing.

Biological and socio-economic performance evaluations of three pilot CBBPs in Ethiopia since their inception in 2010 have shown that:

- Sheep/goat farming, once a side activity for farmers, is now a main business activity and the linchpin of their livelihoods.
- Most participating households in Menz (one of the CBBP sites) graduated from the government-run safety-net program and now use income from sheep sales to buy food.
- 'Best of stock' breeding lambs/kids that were previously sold and slaughtered ('negative selection') are now being kept to improve the breeding stock.
- Increased income from sheep production and increased mutton consumption are directly linked to CBBP production at the Bonga, Horro, and Menz sites.
- Farmers' sheep/goats have shown an improvement in performance, such as lamb growth rate, lambing interval, and reduced mortality. They also tend to attract higher prices in markets compared to sheep/goats from farmers who are not members of breeding groups.

- Most of the established cooperatives have been able to build capital (e.g. the Boka-Shuta cooperative has capital of about USD 100,000).

The genetic gains and socio-economic successes of the CBBP have led to their adoption and implementation by various partners in Uganda, Malawi, Liberia, South Africa, and Burkina Faso.

Adoption of joint village land use planning (JVLUP) by the Government of Tanzania to increase tenure security for livestock keepers.

Capacity development was at the core of the successful adoption of joint village land use planning (JVLUP) to protect shared resources in Tanzania, including grazing lands for local livestock keepers in four clusters of villages covering 175,000 hectares of grazing land. The intervention was funded by IFAD through the Sustainable Rangeland Management (SRM) Project piloted by ILRI, the Government of Tanzania (GoT) and other partners. The GoT has since up-scaled JVLUP with a Global Environment Facility (GEF) grant across 22 villages in five districts, covering almost 13,000 households (69,555 people) over 30,000 hectares. Significant capacity building of partners (NGOs and government) was undertaken with strong influencing and awareness-raising activities that helped to strengthen support for replicating the approach in other areas. These included, among other things, training of staff and partners on conflict management and gender, undertaking of a CSO national dialogue, learning visits to other countries, and hosting from other countries to learn about the JVLUP experiences. All of this helped to build the case for JVLUP and the issuing of group certificates of customary rights of occupancy (CCROs) to livestock keepers. The SRM project has worked very closely with government partners, for example, to provide sub-grants for implementing activities such as trainings and arranging learning visits.

Creating and supporting small and medium enterprise (SME) opportunities in the pork value chain in Uganda.

The Livestock CRP generated evidence on gaps and opportunities in the pork value chain through assessments leading to intervention tests, at both farm and market levels. The work also established multi-stakeholder platforms—social spaces for communicative stakeholder interactions providing business and networking opportunities and agribusiness linkages to emerging SMEs run by farmers and young entrepreneurs. This capacity development has expanded their horizons and provided business opportunities in training, selling feeds, providing pig AI services, and trading in pork. Under the Livestock CRP, business linkages in the pig value chain have expanded the horizons of many entrepreneurs. Pig multi-stakeholder platforms (MSPs) have enhanced peer learning and strengthened linkages between value chain actors. Capacity development on specific areas,

largely undertaken by third parties (value chain actors earlier trained by ILRI) have greatly facilitated actor linkages and success of the agribusinesses. More than 1700 value chain actors were trained. The training mainly focused on the following: profitable pig breeds and breeding, pig housing and management, feeds and feeding, closed cycle pig farming, and silage making. Other trainings were on animal health, vaccines, feeds and feeding, food safety, and marketing.

Improved milk-handling practices of pastoralists in Ethiopia

The effect of an intervention designed to improve the hygienic handling and safe consumption of milk on the knowledge, attitudes, and practices (KAP) of women who produce and sell dairy products was tested among the Borana pastoral community in Ethiopia. The intervention consisted of 16 hours of training on good milk production practices and prevention of milk-borne diseases. A total of 120 women were trained and changes in their KAP were assessed. Six months post training, the knowledge score of the participants relative to the baseline value increased by 14.4%, the overall attitude score by 2.6%, and understanding of correct practices by 15.2% (Amenu et al. 2020³¹). In

addition, at pre-training, 30% of participants reported boiling milk before consumption; but this increased to 51% six months after training. For all practices, a statistically significant increase in the percentage of women reporting adoption of the practices was observed. Six months post training, the overall practice score increased from 49.5% at pre-training to 64.7%, a statistically significant change.

Use of the ODK tool in Tunisia

The training helped realize 73,558 responses in 314 surveys related to various aspects of perceptions of ticks and tick-borne diseases by various actors. The popularity of the tool augurs well for sustainability beyond the project timeline.

Indicative gains of CapDev activities under the Livestock Health Flagship

As alluded to above, the Flagship developed a number of training tools that are expected to have been widely used and will continue to be used in different countries. The usage statistics for some of the tools can be proxied by the online download and views data as indicated in Table 17 below. Of the Livestock CRP target countries, the greatest usage statistics for these tools pertain to Ethiopia, Kenya, India, and Senegal.

31. Amenu, K., Agga, G. E., Kumbe, A., Shibiru, A., Desta, H. et al. 2020. MILK symposium review: Community-tailored training to improve the knowledge, attitudes, and practices of women regarding hygienic milk production and handling in Borana pastoral area of southern Ethiopia. *Journal of Dairy Science*. 103: 9748–9757. <https://doi.org/10.3168/jds.2020-18292>

Table 17: Usage statistics of training tools developed by the Livestock Health Flagship

#	CapDev ¹ Tool	Date Uploaded	Usage Statistics by 11 July 2021			
			Downloads	Views	Total	Countries ²
1	A practical guide to herd health management in pigs, dairy cattle, and small ruminants ³²	December 2020	98	85	183	Kenya, India, Ethiopia, Sweden, United Kingdom
2	Guide for training of pastoralists (women) in the Borana Zone, Oromia Region, Ethiopia on good milk production, handling and processing practices, and prevention of the transmission of milk-borne zoonotic diseases ³³	September 2018	721	238	959	Ethiopia, Eritrea, Kenya, USA, Germany
3	Learning module on Anthrax transmission and control ³⁴	December 2018			266	Ethiopia, Kenya, India
4	Field post-mortem examination training module ³⁵	December 2018	2885	88	2973	Ethiopia, India, Kenya
5	Community conversation on animal welfare: a guide to facilitators ³⁶	December 2019	653	214	867	Ethiopia, Kenya, Philippines, Malawi
6	A guide to integrating community conversation in extension for gender-responsive animal health management ³⁷	November 2020			102	Ethiopia, Kenya

32. Båge, R., Jacobson, M., Dione, M., Gertzell, E., Genfors, E., et al. 2020. *A practical guide to herd health management in pigs, dairy and small ruminants*. Nairobi, Kenya: ILRI. <https://hdl.handle.net/10568/110502>

33. Amenu, K., Desta, H., and Alonso, S. 2018. *Guide for training of pastoralists (women) in Borana Zone, Oromia Region, Ethiopia on good milk production, handling and processing practices and prevention of the transmission of milk-borne zoonotic diseases*. Addis Ababa, Ethiopia: Feed the Future Innovation Lab for Livestock Systems. <https://hdl.handle.net/10568/100116>

34. Desta, H., Alemu, B., Wieland, B., and Lemma, M. 2018. *Learning module on Anthrax transmission and control*. Nairobi, Kenya: ILRI. <https://hdl.handle.net/10568/100524>

35. Alemu, B., Ayele, G., Magnusson, U., König, U., Desta, H., et al. 2018. *Field postmortem examination training module*. Nairobi, Kenya: ILRI. <https://hdl.handle.net/10568/100526>

36. Doyle, R., Lemma, M., Mulema, A., Wieland, B. and Mekonnen, M. 2019. *Community conversation on animal welfare: A guide to facilitators*. Nairobi, Kenya: ILRI. <https://hdl.handle.net/10568/106206>

37. Lemma, M., Mulema, A., Kinati, W., Mekonnen, M. and Wieland, B. 2020. *A guide to integrate community conversation in extension for gender responsive animal health management*. Nairobi, Kenya: ILRI. <https://hdl.handle.net/10568/110398>

#	CapDev ¹ Tool	Date Uploaded	Usage Statistics by 11 July 2021			
			Downloads	Views	Total	Countries ²
7	Guideline for participatory training on African swine fever control for smallholder pig farmers in Uganda. ILRI ³ Manual 28.	January 2018			801	Uganda, Czech Republic, Russia

1. Capacity development

2. Countries where most views and downloads have occurred

3. International Livestock Research Institute

Indicative outcomes from use of the tools developed by the Livestock and Environment Flagship

The trainings on CLEANED R and CLEANED X were well received and the tools are being taken up by national partners (e.g., in Kenya and Burkina Faso). The usage

statistics for some of the CapDev tools developed by the Flagship are indicated in Table 18. Of the CRP targeted countries, the CLEANED tools were mainly used in Colombia, Ethiopia, Kenya, and Nicaragua. The other tools on land-use planning and management were initially developed for Ethiopia, but interest in their use has since been registered in Kenya and Eritrea.

Table 18: Use statistics for some tools developed by the Livestock and Environment Flagship

#	Tool	Date Uploaded	Use Statistics as at 12 July 2021			
			Downloads	Views	Total	Countries
1	CLEANED X1, Version 3.0.138	February 2021			75	Colombia, Ethiopia, Kenya, USA, UK
2	CLEANED X, Version 2.0.139	December 2019	325	120	445	Kenya, UK, Nicaragua, Russia
3	CLEANED X—Version 1.0.140	January 2018			277	UK, Tanzania, USA
4	Woreda Participatory Land Use Planning (WPLUP) in pastoral and agro-pastoral areas—Manual	November 2018	1166	568	1734	Ethiopia, Kenya, Eritrea
5	Woreda Participatory Land Use Planning (WPLUP) in pastoral and agro-pastoral areas: Volume II: Toolkit worksheets—Manual	November 2018	397	359	756	Ethiopia, Kenya, Eritrea
6	Protocol for characterizing community-based rangeland management cases—Manual	April 2018			496	Ethiopia, Kenya, UK, Eritrea

1. Comprehensive Livestock Environmental Assessment for improved Nutrition, a secured Environment and sustainable Development, in MS Excel

38. Notenbaert, A., Mukiri, J., Van der Hoek, R., Paul, B., Koge, J. et al. 2021. *CLEANED X—Version 3.0.1*. <https://doi.org/10.7910/DVN/4EB5XT>, Harvard Dataverse, V1. <https://hdl.handle.net/10568/111558>

39. Mukiri, J., Notenbaert, A., van der Hoek, R., and Birnholz, C. 2019. *CLEANED X—Version 2.0.1 Technical Manual and User Guide*. CIAT Publication No. 492. Nairobi, Kenya: CIAT. <https://hdl.handle.net/10568/107238>

40. Notenbaert, A., Birthe, P., Mukiri, J., Birnholz, C., and Koge, J. 2018. *CLEANED X—Version 1.0.1*. doi:10.7910/DVN/QIUJM5, Harvard Dataverse, V1. <https://hdl.handle.net/10568/91205>

How valuable were the results to the national partners and/or organizations involved?

It is instructive to note that the main CapDev actions as prescribed in the Livestock CRP's CapDev Strategy took effect in 2019. Since benefits from CapDev actions usually have a time lag, it may perhaps be too early to speak of results from these interventions, barely two years from inception. However, the CRP implemented a range of CapDev actions outside the priorities speci-

fied in the CapDev Strategy, and some nascent changes from these interventions are already apparent. A list of reported areas of demonstrable success posted by the various Flagships over the last four years is given in Appendix 1.

We illustrate below the valuable results to national partners using two case studies from Ethiopia, namely: community conversations and community of practice groups for sheep-fattening in the Ethiopian highlands.

Case Studies

Case Study 1: Community conversations in Ethiopia

Summary

Perhaps with roots in the political arena, community conversation has found its way into prominence in the livestock sector as an effective tool to promote communicative interactions on various issues of common concern among the community members. The Livestock Health Flagship has leveraged this utility and embraced community conversations to navigate delicate human-livestock issues, initially in Ethiopia. The process has evolved through sequential lesson learning, and a number of modules on various issues (e.g. gender relations, zoonotic diseases, antimicrobial resistance, and feeds and forage formulation) have since been perfected and widely practiced. Demonstrable changes in knowledge, attitudes, and practices at the community level have emanated from conversations on these issues and the scope exists for scaling out of this approach to other developmental aspects being addressed by the Livestock CRP.

Introduction

The International Center for Agricultural Research in the Dry Areas (ICARDA) and the International Livestock Research Institute (ILRI) developed a gender-transformative participatory tool called community conversations to improve the role of women in livestock health management. The tool consists of training modules to guide discussions among rural farming communities focused around livestock health management, gender, and zoonotic disease risks. It is one way of fostering participatory community engagement, which shares the same principles as other participatory community approaches. Community conversations are knowledge co-creation forums that leverage indigenous (of rural communities) and scientific (of Flagship implementing partners) knowledge practices and have been successfully applied in herd health management, gender relations, and feed and forage recommendations to farmers.

Situational analysis (defining the problem)

In 2016 the Livestock Health Flagship conducted participatory epidemiology and gender analysis in Ethiopia. The purpose of this analysis was to identify the situation, i.e. the disease situation, the major disease constraints, and some of the priority interventions against disease. The assessment revealed major knowledge, attitude, and practice gaps of the community members in terms of causes of disease, transmission pathways, and control measures. It also became apparent that the level of gender understanding and gender knowledge at both the community and service-delivery levels was quite weak. Based on these assessment findings, a possible community engagement approach was designed, which became known as community conversations.

Key interventions and steps involved

An initial guide was developed to aid frequent interactive engagement with the team. Later, a facilitation guide on community conversations, gender, and animal health was developed. Using this guide, a number of community conversations were held at different Livestock CRP sites. From these pilot conversations, a reflective and insightful report on the lessons learned was compiled. Furthermore, based on a synthesis of all the lessons from these conversations, guidelines were developed for how to integrate community conversations on animal health in extension approaches. Further experimentation and more experiential learning across different sites enabled the development of further extension guidelines.

Training programs on the approach were also organized for key partners. Internal capacity development of other team members in other projects has continued, i.e. helping them develop their own community conversation materials, demonstrating the community conversations techniques, providing the tools, and helping them to develop their own materials. There has been a continuous synthesis of experiences and refinement of technique as informed by learning from the field. Ultimately, a master training course on the community conversation approach in animal health was developed. Since 2018, three rounds (modules) of community conversations have been tested, on gender roles, zoonotic diseases, and female livestock ownership and decision-making. A fourth round was also organized in 2019 to review and reflect on the process and participants' learning experiences. Scope exists for adding community conversation modules/sessions on new topics, e.g. livestock breeding, rangeland management, animal welfare, and other aspects of livestock husbandry.

Case Study 1: Community conversations in Ethiopia

Outputs/outcomes

Community conversations were piloted in the Livestock Health Flagship, but have since been taken up by the other flagships. The modules were launched in the highland and lowland regions of Ethiopia and 1,600 farmers participated. The effects of these facilitated conversations on the knowledge, attitudes, and practices of participating farmers were evaluated and the results indicate successful behaviour change and transformation of gender relations at household and community levels. The observed behaviour changes include: i) adoption of safety practices when handling sick animals, ii) improved access to farming information for women, iii) more equitable sharing of responsibilities in the homestead, iv) inclusion of women in non-traditional income-generating activities, v) increased awareness of the risks of anti-microbial resistance among community members, and vi) a better understanding of responsible anti-microbial use among local animal health service providers (Mulema et al. 2020⁴¹). Due to the apparent success of the approach, the Ethiopian government is keen on mainstreaming its use in the national extension system.

Setbacks and lessons learnt

According to Lemma et al. (2019⁴²), community conversations alone may not be enough to promote sustainable transformations, e.g. with regard to gender roles and the prevention of zoonotic diseases. Individual relational characteristics influence how effective these conversations can be. Moreover, participants reported challenges in sharing information with household members and with other community members. However, in situations where couples attended the community conversations together, post-event sharing of information and knowledge application became more effective. Certain issues to be addressed in community conversations can be deeply ingrained in the cultural setup of the community. Hence, there is need for patience and well-planned facilitations in trying to navigate such issues through community conversations.

A number of lessons have been adduced around community conversations on gender relations and zoonotic diseases by Lemma et al. (2019⁴⁴). Examples include: i) for good outcomes, there is need for effective facilitation skills, reflective writing skills, and thorough documentation; ii) to bring changes in attitudes and practices, community conversations must be linked to ongoing development interventions that tie people together; iii) people with high social esteem in the community should be brought on board in the conversations to foster the accountability and social pressure needed for reinforcement of the take-home messages; and iv) through social learning, peer influence, and sheer homophily, community conversations are powerful tools that enable communities to take charge of the change they desire for themselves. Indeed, 'a learning environment centred on people's own experiences facilitates (peer) learning and generates understanding through feedback and knowledge supplementation, leading to changes in perspectives and practices.' (Lemma et al. 2019⁴⁴).

Conclusions

The community conversations approach is promising for changing the way extension is performed. In Ethiopia, it is being taken up by new livestock development projects and this creates the opportunity for further scaling out and embedding the approach in the national extension system. Community conversations are an important tool to spur collective actions around key issues affecting the livestock sector and can be scaled out to influence critical livelihood outcomes in other countries.

41. Mulema, A. A., Kinati, W., Lemma, M., Mekonnen, M., Gemedo, B. A., Elias, B., Demeke, F., Desta, H. and Wieland, B. 2020. *Clapping with two Hands: Transforming gender relations and zoonotic disease risks through community conversations in rural Ethiopia*. Human Ecology 48: 651–663. <https://doi.org/10.1007/s10745-020-00184-y>

42. Lemma, M., Kinati, W., Mulema, A., Mekonnen, M., and Wieland, B. 2019. Community conversations: a community-based approach to transform gender relations and reduce zoonotic disease risks. Nairobi, Kenya: ILRI.

Case Study 2: Community of practice groups for sheep-fattening in Ethiopia

Summary

Based on a prior analysis, poor feeding and nutrition was found to be responsible for the underperformance of small ruminant production in the Ethiopian highlands. Sheep-fattening was identified as a potentially important livelihood component for farmers. ICARDA therefore facilitated the formation of youth groups for market-oriented sheep production in this region. The main focus of CapDev was feed formulation and balancing the nutritional composition of locally available feed resources as well as facilitating collective action of youth groups in marketing the fattened flock. There has been an impressive scaling out of the youth groups across three ICARDA focus regions of the Ethiopian highlands. Individual sheep flock ownership within the groups has also grown from an initial 2 to between 16 and 30, while collective marketing of fattened sheep has ensured appreciable price leverage. Some of the youth who had dropped out of school are using their earnings from the sheep-fattening enterprise to go back to school.

Introduction

The small ruminant value chain is a very important source of livelihood for communities living in the Ethiopian highlands. The population density in these areas is very high and sheep farming is the predominant source of livelihood. Engaging the youth in agricultural activities is really core for Ethiopia right now because most of them are, just like everywhere else, migrating from the rural areas into the cities in search of economic opportunities. Facilitating formation of youth groups for market-oriented sheep production in the highland areas of Ethiopia was one of the main capacity development interventions under the Feeds and Forages Flagship. This activity was led by ICARDA as from 2017.

Situational analysis (defining the problem)

ICARDA initially conducted an in-depth analysis of the small ruminant value chain in Ethiopia. A major finding of the analysis was that feeding and nutrition was largely contributing to the underperformance of small ruminant production and productivity in Ethiopia. Sheep-fattening was identified as a very important livelihood component of the farmers in the highland areas due to its agribusiness potential. The traditional sheep-fattening cycle takes 6 months or longer until the farmers are satisfied that the sheep are well fattened. Farmers attribute the long fattening period to lack of adequate and quality feed and to poor management arising from lack of skill and knowledge of improved fattening practices and supplementary feeding methods. Farmers had limited knowledge on feed formulation and would just give feed to the animals without consideration of the nutritional composition in terms of proteins, energy, minerals, and their balance. So, improving the feeding and nutrition aspects of small ruminant value chains became one of the core intervention areas for the Feeds and Forages Flagship in the second round of the Livestock CRP. Specifically, ICARDA initiated sheep-fattening through short-term intensive feeding prior to sale, based on formulations from locally available feed sources.

Another study conducted by ICARDA on the sheep-fattening systems in Ethiopia revealed four main types: commercial, urban and peri-urban, smallholders, and cooperatives. Commercial and cooperative sheep farming are not widely practiced in Ethiopia. Sheep-fattening cooperatives initiated by local governments across the country were barely in existence because of insufficient training and funding opportunities for members and a lack of coordination among government bureaus that resulted in a stifling of the business environment.

Key interventions and steps involved

As of 2014, modification of existing flock-feeding practices to improve fattening performance was facilitated by ICARDA. Feed formulation and balancing the nutritional composition of locally available feed resources were key interventions. Emphasis was placed on the following production principles: identifying existing context-specific feed resources, feed gaps, and production practices using the FEAST tool; accelerated sheep-fattening (i.e., for a shorter as opposed to a long period of time); improved husbandry (such as castration of rams); and clean feeding. With farmers investing so much energy into sheep-fattening, they obviously expected to reap rewards from it. Emphasis was placed on timing and selling off at the right time. Unfortunately, most farmers would take their fattened animals to the market expecting huge returns, only to find dismal price offers. The disillusioned farmers would trek back home with their animals and completely lose interest in the fattening enterprise. The condition of the animals would then start to deteriorate altogether. Realizing that there was an entrepreneurial gap, ICARDA stepped in and recommended timing for the sheep sales as well as selling in groups for better bargaining power. Initially, sheep farmers were elderly folk whose worldview on issues was hard to change; ICARDA decided to focus on the youth, who were more aggressive and willing to learn new ways of doing things. ICARDA came in and trained the groups on entrepreneurial skill development and dynamics of group formation.

Case Study 2: Community of practice groups for sheep-fattening in Ethiopia

Innovative ways in which the youth were engaged included: collective entrepreneurship via formation of sheep-fattening youth groups and cooperatives; incorporation of entrepreneurial skill-development training components into ongoing improved sheep-fattening training programs; and use of coordination committees to improve vertical and lateral engagement. The committees organized as Communities of Practice (CoP) have partnered with ICARDA to help navigate emerging issues and steer the inclusive youth groups towards market-oriented sheep-fattening. Various stakeholders such as researchers from public agricultural centres, government agencies (e.g., Bureau of Livestock, Trade and Enterprise Office, Gender and Youth Office (which fosters gender inclusivity), Cooperative Office), microfinance institutions, and local farmer associations are actively engaged in the CoPs. This has provided the push factor, a favourable environment for enabling market-oriented sheep-fattening. But there was also need of a pull factor, i.e., the existence of a market with incentive prices. The collective sale of sheep by the youth groups has given them stronger negotiating power, and brokers at the marketplace now offer better prices for fattened sheep.

Outputs/outcomes

The sheep-fattening groups are highly motivated and doing well. The membership has grown by over 40% across three of ICARDA's intervention regions. Adoption rates of the commercial sheep-fattening enterprise are higher because of this pull factor of the market. Members emphasize the quality of feed given to their flock. Moreover, they have extended their focus beyond the animals and embraced forage production and sale of feed supplements to enhance their feed base. Most of the youth in the groups are school dropouts, mainly due to high poverty levels in Ethiopia. But, as a result of engaging in this sheep-fattening enterprise, many of them are now going back to school with the proceeds that they are earning. They are able to multiply their animals very quickly. Initially, they would come in with one animal, and ICARDA matched them up with another animal, so that they started out with two. In a span of two years, many of them have multiplied their flocks to between 16 and 30 sheep!

Another outcome is with regard to how the CoP concept around the youth groups has auspiciously evolved into platforms of cooperation among the implementing partners. Initially, the partners never related to each other in any meaningful way, so that there was a silo mode of operation in which the gender team went to the site and did their own work, the livestock team went and did their own work, and the vets went and did their own work. Everybody used to go independently to the farmers; but now, they go together and work together. They say things like, 'I'm going there on gender, can you come with livestock?'. This improved communication has fostered viable community conversations around pertinent issues affecting the group enterprise.

Setbacks and lessons learnt

Government legislation on registration of cooperatives slowed down entry of youth farmers into new markets (licenses are needed for cross-boundary sale of animals; yet licenses are only given to registered cooperatives). Youth groups have had to merge between 20 and 50 persons to enable registration as a cooperative. Moreover, the competence required to manage cooperatives is lacking among the youth, particularly in women-only youth groups, because of their low literacy levels. Continuous upgrading of skills to manage cooperatives is vital.

Conclusions

Collective action of youth in sheep-fattening and consequent strengthening of youth cooperatives has high potential to reduce youth unemployment through collective pursuit of economic opportunities along the sheep-fattening value chain (SFVC). Converging partnerships involving youth cooperatives, local community-based breeding organizations, local governments, research centres, and value chain actors need strengthening for dissemination of innovations that are theme-based and focused on smallholder farmers.

Most significant change

1. In the period in which you have been involved in the capacity development activities, what do you think was the most significant change that occurred as a result of the interventions?

As a project-implementing partner in Ethiopia, I think changes in the partnering and engagement capacity of local research and development partners are the most significant changes. Prior to the interventions, local partners predominantly had a sector-focused orientation, with little intersectoral orientation, collaborative culture, or learning practices. Local stakeholders demonstrated limited capacity for working across sectoral boundaries. The various partner-engagement mechanisms such as planning and review meetings, monitoring and coaching visits, and working together have led to awareness, motivation, and increased engagement capacity of local partners. In addition to technical interventions, functional capacities such as gender integration, integrated intervention approaches, collaborative learning, and action processes have been developed. Local research and development partners working in the small ruminant value chain have been brought together in communities of practice to foster innovation, promote problem solving, and broker collaborative partnerships with other value chain actors.

2. Why do you think this is significant?

Changes in the partnering and engagement capacity of local partners is significant to support implementation and scaling of technical and institutional innovations in the small ruminant value chain sector. Local partners are mandated institutions who own and lead development processes in their localities. Institutional development of partners in terms of new perspectives of working with community groups and diverse stakeholders, facilitating coordination, knowledge generation and sharing, and increasing gender and sectoral outcomes is rewarding for individuals, organizations, and communities. Local service providers are now engaging with communities in a more meaningful way, exploring and learning together with communities, identifying priority issues, and supporting communities in implementing solutions. Communities are now getting better avenues for expressing their views, concerns, and priorities through community engagement processes.

3. How did the CapDev actions contribute to this change?

Capacity development actions are broadly perceived and provided in different contexts and forms. The various consultative processes such as participatory needs assessment and priority-setting engagements, partner planning and review processes, monitoring and coaching visits, implementation engagements with partners, training programs on technical and institutional areas, and development of guidelines, implementation methods, and tools contribute to mindset changes as well as individual and organizational capacities.

4. What are the challenges that you've experienced in implementing the capacity development activities?

The main bottleneck is attitudinal and mindset challenges. Partners are used to conventional working approaches, and they are new to participatory processes and working with and learning from communities. Strengthening capacity for partnership and engagement at the local level takes time and patience. It cannot be expected that more impactful and sustainable changes will happen overnight. Continuous engagement in the form of problem-solving and coaching support, needs-based training, and documentation of changes and lessons requires more time, energy, and funding. For example, local partners in Ethiopia developed action plans for integrating gender in their organizations and programs after they received gender capacity development and coaching support, but they lacked adequate funding to implement their action plans. Similarly, the communities of practice for local partners require continuous support initially to help the groups mature and sustain themselves on their own. This requires more funding for project implementing partners to provide local partners with the necessary coaching and problem-solving support and to document capacity development outcomes and lessons.

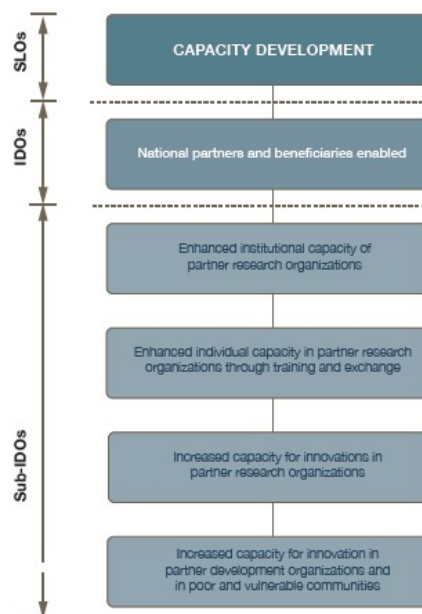
Livestock CRP's and CGIAR's understanding of capacity development work

The 2030 Research and Innovation Strategy (CGIAR System Organization 2021⁴³) situates the CGIAR in

the evolving global context that demands a systems transformation approach for food, land, and water systems. Indeed, this was underscored by the key conclusions from the recently held UN Food Systems Summit 2021. Individuals, organizations, and networks of the CGIAR and partners must therefore have the agility to constantly adapt to new and emerging challenges. Ultimately, this is the desired systems capacity that should endogenously emerge from the capacity development interventions of the Livestock CRP and indeed the other CGIAR CRPs.

43. CGIAR System Organization. 2021. *CGIAR 2030 Research and Innovation Strategy: Transforming food, land, and water systems in a climate crisis*. Montpellier, France: CGIAR System Organization. Available online at: <https://cgspace.cgiar.org/handle/10568/110918>. Accessed on 2 May 2021.

Figure 5: CGIAR's Results Framework for CapDev.
CGIAR—Consultative Group on International Agricultural Research. CapDev—capacity development.



Ultimately, this is the desired systems capacity that should endogenously emerge from the capacity development interventions of the Livestock CRP and indeed the other CGIAR CRPs.

According to the CGIAR Capacity Development Framework and the CGIAR Strategy and Results Framework 2016–2030, capacity development is to be measured in terms of progress towards four sub-IDOs (Intermediate Development Outcomes), as specified in the CGIAR Strategy and Results Framework (Figure 4).

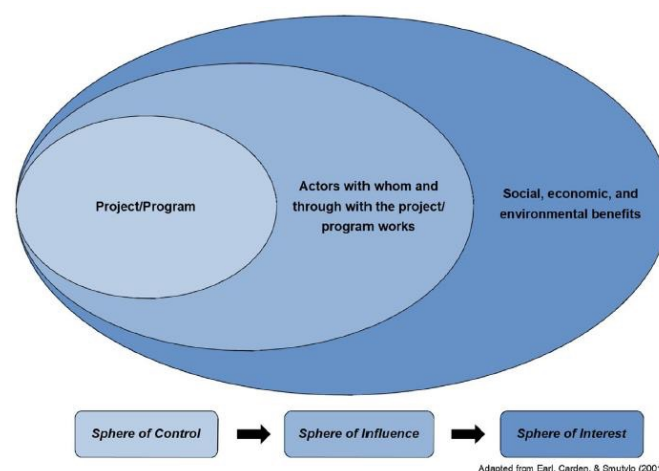
These are:

- Enhanced individual capacity in partner research organizations through training and exchange.
- Enhanced institutional capacity of partner research organizations.
- Increased capacity for innovation in partner research organizations.
- Increased capacity for innovation in partner development organizations and in poor and vulnerable communities.

The results of (or changes engendered by) project interventions can be visualized in terms of three levels of declining relative influence, that is: sphere of control, sphere of influence, and sphere of interest, as depicted in Figure 5 (Belcher et al. 2020). The nature of influence changes as we move away from what projects do (sphere of control) and who they work with and through (sphere of influence), to the improved conditions we hope to see at the macro level (sphere of interest). Outputs are the results realizable within the sphere of control and outcomes pertain to results at the sphere-of-influence level, while impacts relate to

the ultimate results at the sphere-of-interest level. In terms of capacity development interventions, outputs are the knowledge, forums, and processes generated by the project activities; outcomes are the changes in knowledge, attitudes, skills, and relationships that manifest as changes in behaviour (especially of the boundary project partners); and impacts are changes in social, economic, and environmental states resulting from a chain of events to which the project has wholly or partially contributed (Belcher et al. 2020⁴⁴). In Figure 3, the sub-IDOs and IDOs correspond to the sphere-of-influence level, while the system-level outcomes (SLOs) relate to the sphere of interest.

Figure 6: Three spheres of changes engendered by project interventions. Adapted from Earl et al. (2001).



It would be unrealistic to attempt to propose any prescriptive measures on the best way for the CGIAR to do CapDev going forward based on the outcome of this review and synthesis of Livestock CRP CapDev actions over the last four years. However, the following general observations may feed into the general CGIAR thinking on future CapDev actions:

- Co-creation and co-design of technologies, tools, and practices enhances their suitability to the context and priorities of end-users, with important implications for sustainability. This demands some co-creation capacity, at least on the part of the CGIAR.
- Efficiencies of scaling out technologies, tools, and practices hinge on the absorptive and uptake capacities of end users in target countries and the point of entry by the CGIAR as facilitators and intermediaries of local innovations.
- Configuration of national partners for scaling out of impacts should invoke systems thinking, e.g., agricultural innovation systems, and associated CapDev actions should embrace complexity and emergence.

44. Belcher, B., Davel, R. and Claus, R. 2020. A refined method for theory-based evaluation of the societal impacts of research. *MethodsX*, 7: 100788. <https://doi.org/10.1016/j.mex.2020.100788>.



LESSONS LEARNED AND BEST PRACTICES TO INFORM FUTURE PROGRAMMING

Capacity gaps of farmers and other actors on the ground—The extent to which program interventions can be impactful depends on the knowledge levels and adoption capacity of beneficiaries and ultimate users. Generally, the quality of the agricultural labour force crucially determines the extent to which the knowledge domain can be gainfully deployed to improve farm productivity. Formal schooling of agricultural workers and provision of extension and advisory services are expedient policy measures to improve the quality of agricultural human capital for better farm allocative efficiencies and improved productivity. Developing the capacity of ‘next users’ was a deliberate objective in the CRP’s theory of change. Unfortunately, key informants across flagships still felt that lack of capacity of national partners was a drawback to technology uptake and scaling efforts. Thus, developing capacity of national partners to independently execute research and undertake downstream scaling efforts should be prioritized in future CapDev interventions.

Insufficient budgets—Some key informants were of the view that the livestock sector has suffered sustained neglect in terms of funding in many countries compared to other sectors, although the current and potential contribution of the sector to agricultural GDP is significant. The pooled funding projections in the CRP Proposals apparently did not materialize for most of the Flagships, which had to rely on ongoing bilateral agreements to fund activities. Moreover, the CRP Overall and Flagships Narratives Proposal had indicated that a Strategic Investment Fund was set up as an adaptive management instrument to fund special short-term initiatives such as CapDev that complement the cross-cutting agenda within the CRP. This Fund was to derive from an approximately 5% contribution from W1/2 of the CGIAR Trust Fund. However, whether the account became operational and the extent to which it aided CapDev activities by the Flagships was unclear.

Lack of human resources—Some Flagships did not have suitably qualified technical personnel in some focus countries and this was closely tied with the sector’s underfunding.

‘I think there is a lack of capacity in most countries experts because of the long-term underfinancing of the livestock sector. For example, you will probably find 100 experts working on maize in Kenya. However, for forages, you may not have any expert ... I think this is a vicious cycle because people are not trained on forages, and therefore no one takes interest in it. If you do not have forage experts, let’s say, at scientists’ positions in the policy-making institutions, no one will push for funding allocation in these areas.’ Flagship Leader

Lack of trust among stakeholders—for example, aggregators and farmers in the pig value chain in Uganda. The aggregators took advantage of the farmers and reaped most of the benefits at the farmers’ expense. Moreover, the aggregators were unwilling to cooperate with project implementers and intermediaries seeking to find amicable solutions to contentious issues with the farmers. Adoption of innovation platforms as social spaces for facilitated dialogue by stakeholders on key issues would help address the power disparities that were apparent in the Ugandan pig value chain.

Implementation timelines—Flagship programs are currently tied to the CRP cycles. This can be limiting especially for breeding, whether of forages or livestock, which often requires a long-term perspective. In the case of forages, the strategy is to have a continuous pipeline which produces new breeding products every two or three years. In this way, one has a range of products at various stages—some at discovery stage and others ready for scaling. However, to reach the point of pipelines for breeding programs, one needs at least 10 to 15 years (perhaps more for perennial crops), which obviously transcends the normal five-year CRP cycle. For animal breeding, large bilateral funding endowment has enabled the Livestock Genetics Flagship to try something longer-term with more sustainable thinking. Thus, adoption of dual funding approaches – pooled or bilateral – can help overcome the time limitations imposed by the CRP program cycles. The only caveat is that many bilateral projects come with donor preferences and expectations, which may be at variance with the aspirations of the CRP. The

project implementers must weigh the risk of honouring donor requirements at the expense of the CRP goals. This risk can, however, be addressed by aligning the project objectives with the CRP goals at the proposal-development stage.

Enabling environment—An unfavourable political environment limits engagement of private actors, while institutional limitations (e.g., unfavourable regulatory and IPR regimes) discourage development of seed supply systems – in this case, for forages. Particular cases were cited for Ethiopia and India. Strong institutional partners, institutional structures, and the stage of development are also key to programmatic success in target countries. In particular, the stage of development determines where one stands with respect to readiness to take things up (i.e., technology uptake). In terms of scaling up of technologies, this was probably one of the overriding criteria for target country selection in the current CRP cycle.

Covid-19 restrictions on travel and social distancing—This adversely affected CapDev delivery across all the flagships. Face-to-face CapDev engagements were substituted for by online delivery formats at the peak of the pandemic, which included most of 2020. Program meetings were also held effectively online via various platforms. Thus, on a positive note, the pandemic revealed the potential efficiency gains (e.g., from cost and time savings) due to adoption of ICT-based program delivery options.

Scale of land ownership affects technology adoption—Globally, the main adopters of new feeds and forages technologies are medium and smallholder farmers. In Latin America, for example, there are some big farmers but they are not the main clientele for increasing or intensifying the system. The reason is that very big land holders have a lot of land, and therefore are the first to intensify and improve based on improved feeds or improved forage. However, even private sector investors targeting the larger land holders for profit have apparently failed. Large landowners have a feeling of self-sufficiency that makes them relatively resistant to change. On the other hand, the landless also find it

difficult to adopt new technologies because one needs someplace to produce feed. The landless may also be resource-poor, and the option of renting land to invest in feeds and forage production may not be viable. So, medium and smallholder farmers are the main adopters of technologies for feeds and forages. This is an important lesson for targeting future scaling efforts for feeds and forage technologies.

Working with policy-making agencies and policy dialogues to encourage endogenous system changes—This may be practical in some countries like Kenya where open dialogue is encouraged, but could be challenging in jurisdictions like Ethiopia where the political climate stifles freedom of expression. However, the community conversations approach that has registered remarkable successes at the grassroots level in the small ruminant value chains of Ethiopia could serve as a mechanism to instigate bottom-up change management to help navigate enduring system rigidities that undermine innovation.

Cross-flagship learning and knowledge exchange within the CRP—An Integrated Package Tool was developed in Uganda to help farmers optimize productivity. It addresses aspects of health, housing, feeding, food safety, fattening, and more. For example, if one wants to do fattening, the integrated package will give advice on what to do for one's animals to help them gain weight. Although it was just the tool that the community sheep-fattening groups of the Ethiopian highlands needed, they never had an opportunity to use it. Apparently, the capacity to pick up innovations fermented in one flagship and inoculate them elsewhere within the CRP for more effective delivery and outcomes was lacking. Yet, from the outset, the CRP intended to test the hypothesis that integration of research activities across the various flagship areas could result in 'packages' of technologies that are greater than the sum of their parts. In any target country, the 'site integration' concept – facilitated by country coordinators whose roles were supported by an endowment from the CRP Management Fund—provided the platform to test this hypothesis. Unfortunately, in the Integrated Package Tool, the CRP lost a perfect opportunity to test the hypothesis.



HOW CAPACITY DEVELOPMENT ACTIVITIES CAN BE CARRIED OUT IN THE FUTURE

Needs assessments and strategy

The CRP elaborated a theory of change (TOC), which articulates the theoretical grounding of how increases in livestock productivity, underpinned by technological interventions in the various Flagships, lead to System-Level Outcomes. The idea is to develop and deploy research-based solutions that will drive the transition of smallholder producers, value chain actors, consumers, pastoralists, and agro-pastoralists from near subsistence to productive small-scale enterprises and/or resilient livelihoods. Thus, the CRP aims at enabling 'livestock keepers to choose their destination' in the projected structural transformation. This underlines the essence of CapDev: empowerment of beneficiaries to take charge and steer the change that they desire.

'No, I don't think we actually really thought about it that way. I mean, we were really driven by large bilateral projects; flagship funds contributed but to a lesser extent. We had three big bilaterals from the BMGF. It was really what was built into those programs. And okay, they would have aligned in the sense that everything we've been saying about capacity development is integral, but I don't think people developing those programs reflected on either of those [Livestock CRP CapDev] strategies. And to be honest, me as flagship leader, I haven't had to report on those strategies, it's not really at the top of my mind to align what we're doing to that, because I feel that we're doing quite well on capacity development anyway. I think it's always good to have guiding strategies; but one coming in midway, when money is already promised to different things ... and when I took over the Flagship everything was already set in place; I had no leeway, even if I wanted to change anything. All the money was built out of the contract. I didn't have a chance to reallocate. But at the end of the day, particularly for our Flagship, when the bulk of money is coming from bilateral donors who also have their own strategies, and in a way, they of course will overlap because they're all strategy.' Flagship Leader

The spirit of the theory of change (TOC) was integrated by the various Flagships, and CapDev is specified as a cross-cutting enabler. The sort of changes in behaviour and capacity targeted are clearly outlined in the CRP's TOC. Moreover, it is indicated in the CRP Overall and Flagship Narratives Proposal that an analysis was done at the flagship level, based on each Flagship's TOC, to identify the key areas where capacity development was most needed. This analysis informed the strategic CapDev actions and budgets outlined in the CRP Overall and Flagship Narratives Proposal. Thus, we feel that the aims and purposes of CapDev are clearly enunciated in the TOCs of the CRP and Flagships. However, most program leaders interviewed could not relate what they were doing in CapDev to a perceived TOC. Indeed, the CapDev Strategy itself did not specify exactly how the prioritized activities contributed to the CRP or Flagship TOCs. An internal conceptual disconnect thus exists between strategic design and its implementation. For the aspirations of 'site integration', for example, to come to fruition, a shared vision of success by all CRP personnel is imperative. This calls for strengthening ownership of strategy and monitoring, evaluation, and learning (MEL) capacity within the CRP.

Monitoring, cross-learning and evaluation

CapDev actions were not targeted as independent deliverables by the Flagships and the CapDev Strategy did not come with a MEL framework. Considering that there were no specific targets for CapDev actions, the MEL becomes a bit problematic. As the old platitude would have it, albeit harshly: if you do not know where you are going, any road can lead you there. Yet, when setting deterministic targets there is a risk of stifling endogenous emergence of capacity. Currently, CapDev actions are only attached ex post to the main Flagship deliverables and rated based on perception as to whether they were significant or principal. Effects and experiences from the CapDev actions were not formally tracked. This precluded any chance of learning and

any meaningful association of registered changes to CapDev interventions. Therefore, a pragmatic approach to MEL, based on reflection on practical experience in attempting to achieve CapDev goals, is called for (Morgan 2006⁴⁵).

Organizing principles or system concepts

Actor configuration for delivery of development interventions in the agricultural sector has hinged on three organizing principles or system concepts progressively elaborated over the years, namely: the national agricultural research system (NARS), the agricultural knowledge and information system (AKIS), and agricultural innovation systems (AIS) paradigms. The NARS focuses on the generation of knowledge with the public agricultural research agencies as the epicentre, AKIS on the generation and diffusion of knowledge, and AIS on the generation, diffusion, and application of knowledge (Roseboom 2011⁴⁶). The AIS recognizes the role of markets in agricultural knowledge transactions, being cognizant of the fact that all actors, including smallholder farmers, are endowed with knowledge capital. As a construct for CapDev, the AIS postulates that capacity can only emerge as a complex adaptive system rather than being developed or directed in a linear, logical, and deterministic way. In other words, capacity is realized through endogenous processes of self-organisation, adaptation, and emergence.

So, while a deterministic and detailed CapDev strategy would be good for planning, in the end it may be counterproductive in so far as it may not allow the flexibility for explorative learning and redesign. It is good that some of the projects implemented by the CRP (e.g., the MilkIT project in India and Tanzania) have embraced innovation platforms, which is one way of operationalizing the AIS. The CapDev Unit needs to embrace systems thinking in the design of a CapDev 'Guide' that allows for different approaches, reflection, and redesign of CapDev actions. Indeed, the various Flagships demonstrated divergence in their perceived CapDev objectives, and this is all the more reason for a multiplicity of approaches that encourage learning, identification of levers of change, and redirecting of resources and strategies to realize needed capacity.

Scale of focus and subsidiarity

CRP programs are multi-country, and within each country, there are levels of implementation, namely: micro (or grassroots, e.g., farmers), meso (or sub-national, e.g. extension workers and NGOs), and macro (or 'national', e.g. researchers and ministry officials). In the Livestock CRP, these levels are probably referred to as domains of next users. The operations of the CGIAR Centres span countries and it is incontestable that they are well placed to manage multi-country agricultural development interventions. However, noting that countries have their own hierarchical structures for delivery of agricultural research for development, the often-asked question is: to what degree should the CGIAR (and other international development partners) operate at country level? This invokes the elusive challenge of subsidiarity. Ordinarily, subsidiarity refers to devolving decision-making as close as possible to the site of implementation; or, put another way, leaving implementation at any given level to those partners with comparative advantage. In this respect, the micro and—to a large extent – meso levels are clearly the operational domains of national research for development delivery systems.

Uggla (2020⁴⁷), in a review of the CapDev activities in the Livestock Health Flagship, asserted that the 'Flagship should stick more consistently to the principle of "training the trainers" by primarily directing information and teaching efforts to regional partners and the animal health extension workers rather than directly to farmers'. This review sustains this view and reiterates that the role of the CGIAR should be to strengthen the macro-level systemic capacity for effective downstream delivery of development interventions. Efficiencies of going to scale can only be realized if partners at progressively lower levels are empowered to cascade the interventions.

Equity

Some key informants were of the view that the bulk of the CapDev interventions of the Livestock CRP were directed at the Eastern African countries of Ethiopia, Kenya, Tanzania, and Uganda, with the rest of the targeted countries benefitting only marginally. Indeed, the information given in Table 19 on the total participants in the six categories of CapDev actions seems to corroborate this claim. Of the five countries, Vietnam had the lowest share of any CapDev action, as compared to the four Eastern African countries.

45. Morgan, P. 2006. *The concept of capacity*. Maastricht, Netherlands: European Centre for Development Policy Management. <http://ecdpm.org/wp-content/uploads/2006-The-Concept-of-Capacity.pdf>.

46. Roseboom, J. 2011. Supranational collaboration in agricultural research in sub-Saharan Africa. Conference working paper 5. (unpublished report)

47. Uggla, A. 2020. *Review of capacity development activities within the Livestock Health Flagship of the CGIAR Research Program on Livestock*. Montpellier, France: CGIAR.

Table 19: Training participants in Livestock CRP target countries

Type of CapDev ¹		ETH	KE	TZN	UG	VTN
Academic training	MSc	17	12	3	10	1
	PhD	6	7	8	1	0
One-off training		4100	4907	509	371	228
Knowledge Exchange		1273	1153	109	254	1
Co-creation		125	0	0	0	19
Trials and studies		2095	301	807	5957	0
Scaling		0	0	316	30	0

Key: ETH—Ethiopia; KE—Kenya; TZN—Tanzania; UG—Uganda; VTN—Vietnam

Source: MARLO (2021⁴⁸)

1. Capacity development

48. Managing Agricultural Research for Learning and Outcomes (MARLO). 2021. Livestock assessment report 2017–202 participants and trainees. Nairobi, Kenya: ILRI.

Obviously, there were compelling reasons for target country selection, some of which have been discussed above; but, potential for scaling appears to have been the central criterion for a number of the Flagships. In addition, a number of CapDev actions were bilaterally funded and, in that regard, the CRP perhaps had little leeway in the choice of target countries. Nevertheless, where possible, future interventions need to display some degree of equity in the selection of beneficiary countries.

Funding/budgets

The issue with funding is twofold: CRP allocation to CapDev and mode of funding. The Livestock CRP Overall and Flagship Narratives Proposal contains budget lines for CapDev in each of the Flagships, presumably under W1/2 and bilateral funding streams. It appears that the projected W1/2 funding projections never fully materialized in the lifetime of the CRP and the Flagships had to rely on existing bilateral funds to implement CapDev interventions. Some key informants decried the allotment of insufficient funds to CapDev at the program design stage. Others suggested that

the CapDev Unit should have a separate budget line to support the activities they recommend to the Flagships rather than leaving the Flagships to search for funds on their own.

'At the design level of the programs, enough resources should be allocated to CapDev instead of relying on modicum amounts because often people forget that CapDev takes money. A small amount of funds may be allocated at the beginning and, in the middle, the reality strikes that you don't have funds to access anything. So that is also somewhere we need to improve a bit'.

It may be imagined that pooled or core funding like W1 allows for flexibility in allotment to activity implementation. Bilateral funding, on the other hand, may be locked to specific aspects of interventions depending on the agreement with the donor. This may compromise the global strategic goals of the Flagship. However, some Flagship leaders indicated that it is through bilateral funding streams that they have been able to sustain research beyond the CRP cycles.



Photo: 1

OVERALL CONCLUSIONS AND RECOMMENDATIONS

Highlands, Son La province.

Synthesis of CapDev actions

- A total of 265,823 individuals (24% women) participated in CapDev activities implemented by the Livestock CRP between 2018 and 2021. Kenya registered the highest number of CapDev participants followed, in decreasing order, by the Livestock CRP priority countries of Uganda, Tanzania, and Ethiopia.
- All outputs from the Livestock CRP annual reporting cycle were scored for the extent to which they contributed to CapDev, i.e., not targeted (0), significant (1), or principal (2). Between 2017 and 2020, about 73% of the total outputs with embedded CapDev deliverables were deemed to have made a significant contribution, while 27% made a principal contribution. Overall, FP3 and FP4 jointly accounted for 71% of the total CapDev deliverables over the four years. The least CapDev implementation was recorded in FP5, followed by FP1.
- The CapDev interventions were comprised of long-term academic training at BSc, Master, and PhD levels, short-term trainings like one-off workshops and training visits, and other engagements that were deemed to be of CapDev import like knowledge exchange (i.e., focus group discussions, roundtable discussions, policy dialogues), trials and studies (i.e. participatory trials and studies), and co-creation events (i.e. taskforce meetings). The trainees included CGIAR and national partner researchers, policy makers and regulators, extension agents, farmers, and other value chain actors.
- For national partners, it is uncertain as to whether there were clear guiding criteria or bases upon which the academic trainings were decided on in terms of area of study (or technical discipline), level of study (BSc, MSc, or PhD), target country, or even partner organizations within the target countries from which the beneficiaries were selected. In a similar vein, McHugh and Bennet (2020⁴⁹) observed in their report on CGIAR Research Program 2020 Reviews:

Livestock, that 'for postgraduate researchers, we find the general approach to developing skills ad hoc and project driven. Each student's experience is different and highly dependent on their host organization or personal background. We conclude that more could be done to create a collegiate postgraduate learning experience in CGIAR and in CRPs with a set of learning activities that are more closely aligned with national postgraduate programs and aims'. A more systematic and targeted channelling of academic trainings to the national partners would ensure relevance, create clear exit strategies, impart efficiencies in the scaling up of technologies and tools, and ensure sustainability of impacts from CRP interventions.

- The one-off trainings were on technologies, methods, and practices of relevance to the objectives of the Flagships. Most of them concerned the deployment and scaling up of various decision-support and extension tools (including manuals and guides). The usage statistics for some of the tools can be proxied by the online downloads and views data. However, for better tracking of their use, the CGSpace online repositories for the tools could be configured to document additional user statistics. For example, those viewing or downloading the tools can be requested to provide information such as their vocation (e.g., researcher, student, or private sector) and purpose for download.

Key points from CapDev review

Alignment of interventions with CapDev strategy

- All prioritized activities in the CRP CapDev Strategy were firmly rooted in the CGIAR's overarching CapDev Framework. However, the CapDev activities implemented by a majority of the Flagships were either not informed or only slightly informed by the priorities of the CapDev Strategy. A few activities in some flagships, though, were reportedly completely informed by the CapDev Strategy. Given the disparity

49. CAS Secretariat (CGIAR Advisory Services Shared Secretariat). 2020. CGIAR Research Program 2020 Reviews: Livestock. Rome, Italy: CAS Secretariat Evaluation Function.

between strategy and practice, it may seem that the CNAs conducted by the CapDev Unit and the ensuing CapDev Strategy, apart from the fact that they were rather belated, could have been perceived by the Flagships as superfluous and non-compelling. Indeed, one Flagship had reportedly conducted its own in-house capacity needs assessments and responded to perceived stakeholder demands with specific tools.

Implementation and adaptation of CapDev interventions

- At least in the priority countries of the Livestock CRP (i.e., Ethiopia, Tanzania, Uganda, and Vietnam), CapDev activities were implemented as part of an integrated country work plan. As per the CGIAR requirements, the planning and reporting system used by the CRP does not include information on specific CapDev activities at the annual planning stage. Instead, it was based on deliverables, that is, proof of the completion of an activity or set of activities. The reports were, however, required to indicate if any of the deliverables involved trainees and, if so, to specify the number, gender, and type of these trainees. In the MARLO, all reported Flagship activities were scored for the extent to which they had CapDev components.
- CapDev was something in the mind of the Flagship leaders, but never had any particular delivery targets. The degree of the Flagship's engagement with the CapDev Unit team to specify the CapDev elements for implementation was, in most cases, unclear. Thus, CapDev was either expected as an incidental outcome to a main activity or implemented as a spurious sub-activity, depending on the exigencies, with no clear linkages to the CRP CapDev strategic priorities.
- In many of the countries, project activities were bilaterally funded; but there were no clear linkages between bilateral projects and country-level intermediate indicators to allow aggregation of results. Program output indicators (e.g., number of CapDev participants) were not clearly linked to bilateral project output indicators, and this probably led to under-reporting on deliverables. However, in some cases, alignment with the country's strategic areas was one way of adapting CapDev actions to country context.

Achievement of CapDev outputs and outcomes

- The planning and reporting system used by the CRP does not include information on specific CapDev activities and targets at the annual planning stage, which may pose a challenge for evaluation of implementation effectiveness. However, based on perceptions by Flagship implementing teams, the extent to which various Flagships implemented the

CapDev activities was different depending on the target country.

- For Livestock Genetics, CapDev activities were completed (80–100%) in all the priority countries. The Livestock Health Flagship did not complete all the intended CapDev interventions in any of the three targeted countries of Uganda, Vietnam, or Mali. Feeds and Forages completed CapDev implementation in only four out of nine targeted countries: Colombia, Kenya, Tunisia, and Vietnam. Livestock and Environment targeted four countries, but only managed to complete CapDev implementation in two countries: Tanzania and Tunisia. The Livelihoods and Agro-Food Systems Flagship also targeted nine countries for delivery of CapDev interventions, but only three countries (India, Kenya, and The Gambia) registered completion of the activities. In addition, the priority countries of Ethiopia, Tanzania, Uganda, and Vietnam all registered activity completion rates of below 49%.
- Disruptions by the COVID-19 pandemic, delays in funding and in getting ethical approvals, late onset of implementation of some projects, engagements with new partners, and lack of implementation capacity (e.g., the lead scientist in The Gambia had left) were some of the reasons cited for non-completion of CapDev activities.

Gains to CapDev and sustainability of results

- Training on the use of the FEAST has led to its adoption in over 22 countries in Africa, Asia, and Latin America, where the tool has been promoted independently by a range of civil society, NGO, government, and private sector organizations. Sustainability is likely in various contexts and this could be aided by integrating additional components (e.g. soil analysis) and introducing it within an innovation platform set-up.
- CoPs for sheep-fattening—Initially introduced by ICARDA, this market-oriented collective action driven by the youth has been replicated in other neighbouring regions of the Ethiopian highlands through peer-to-peer learning. Moreover, the youth groups have since extended their focus beyond the animals and embraced forage production and sale of feed supplements to enhance their feed base. Most of the youth in the groups were school dropouts, mainly due to high poverty levels in Ethiopia. But as a result of engaging in this sheep-fattening enterprise, many of them are now going back to school with the proceeds that they are earning. They are able to multiply their animals very quickly. In a span of two years, many of them have multiplied their sheep flocks to between 16 and 30 sheep! The self-propagating CoP concept around the sheep-fattening youth groups has auspiciously evolved into platforms of cooperation among the implementing partners, a kind of 'reverse capacity

development'. Initially, the partners did not relate to each other in any meaningful way; but now, they go together and work together with the farmers.

- Community conversations—these are knowledge co-creation forums that leverage indigenous and scientific knowledge domains to midwife solutions to community challenges. They are used to guide discussions among rural farming communities on issues affecting local livestock farming. The facilitated conversations have been shown to have positive effects on KAPs of participating farmers as well as behaviour change and gender relations at household and community levels. The observed behaviour changes include: i) adoption of safety practices when handling sick animals, ii) improved access to farming information for women, iii) more equitable sharing of responsibilities in the homestead, iv) inclusion of women in non-traditional income-generating activities, v) and increased awareness of the risks of anti-microbial resistance among community members. The Ethiopian government has mainstreamed the conversations into the national extension system.

Improved milk-handling practices

- Training on good milk production practices and prevention of milk-borne diseases for women of the Borana pastoralist community in Ethiopia has resulted in improved KAPs and a statistically significant increase in the age of women adopting the improved practices. Six months post training, the overall practice score increased from 49.5% at pre-training to 64.7%, a statistically significant change.

Benefits of results to national partners

- Community breeding programs, introduced by ICARDA through training modules, owe their success to their participatory model. The CBBPs are now owned and promoted by the national system in Ethiopia. The program is very consultative and uses local breeds selected from the herds of the community groups. The approach to community-based breeding has now been integrated into Ethiopia's national livestock master plan. The program has also been linked to a cloud-based genetic database platform to improve data quality, data collection, and information.

Lessons and best practices

- Key informants across flagships still felt that lack of capacity of national partners was a drawback to technology uptake and scaling efforts. Thus, developing capacity of national partners to independently execute research and undertake downstream scaling efforts should be prioritized in future CapDev interventions.

- The pooled funding projections in the CRP Proposals apparently did not materialize for most of the Flagships, which had to rely on ongoing bilateral agreements to fund activities. Some Flagships did not have suitably qualified technical personnel in some focus countries, and this was closely tied with sector under-funding.
- Lack of trust and exploitative power relations were apparent among some stakeholders (e.g., in the pig value chain in Uganda). Adoption of innovation platforms as social spaces for facilitated dialogue by stakeholders on key issues would help address power disparities such as were apparent in the Ugandan pig value chain.
- Strong institutional partners, institutional structures, and the stage of development are key to programmatic success in target countries. In particular, the stage of development determines where one stands with respect to readiness to take things up (i.e., technology uptake) and hence impact at scale.
- Medium and smallholder farmers are the main adopters of technologies for feeds and forages. This is an important lesson for targeting future scaling efforts of feeds and forage technologies.
- Community conversations that have registered remarkable successes at the grassroots level in the small ruminant value chains could serve as a mechanism to instigate bottom-up change management to help in navigating enduring system rigidities that undermine innovation in some countries like Ethiopia.
- Tools developed by one flagship could easily have been deployed in another for greater efficiency. An example is the Integrated Package Tool developed by Livestock Health Flagship, which had components that could have been employed in the youth sheep-fattening enterprise in Ethiopia. However, the capacity to pick up innovations fermented in one flagship and inoculate them elsewhere within the CRP was lacking. The concept of site integration need not be only for co-delivery; it should really be about co-learning.

Suggestions for Future CapDev

Approach to CapDev

- Currently, the CRP equates CapDev largely with training, save for a few participatory approaches like community conversations. A few key informants talked about learning-by-doing as a means to strengthening partner capacity without any clear details as to how this approach was implemented in practice nor how the results thereof were tracked. Inherent in these approaches is the notion that capacity development is a linear and predictable

change process that can be directed by the implementation of some external inputs to a system. However, contemporary development practice of CapDev affirms that this is not true.

- Additionally, achieving impact at scale entails not only, for example, knowledge of a technology or how to use a decision support tool developed by the CRP; it is more to do with the embeddedness of the technology or tool in the system. That some farmers were averse to the use of semen from cross-bred animals is an issue of institutional embeddedness of the semen technology. Although the farmers were knowledgeable about the crossbreed semen technology, the Livestock Genetics Flagship needed to employ non-tangible aspects of capacity (i.e. use of a digital feedback system to directly appraise farmers on the evidence for breeding gains) to be able to navigate their resistance.
- There is need for a paradigm shift in the way the CRP, and indeed the CGIAR, views capacity development. By invoking systems thinking, which posits that capacity is an emergent system attribute, CapDev should be increasingly viewed as a complex adaptive process to be approached as a process of experimentation and learning rather than the implementation of predetermined activities.

Theory of change and CapDev

- The aims and purposes of CapDev are clearly enunciated in the TOCs of the CRP and Flagships. However, most program leaders interviewed could not relate what they were doing in CapDev to a perceived TOC. Indeed, the CapDev Strategy itself

did not specify exactly how the prioritized activities contributed to the CRP or Flagship TOCs. An internal conceptual disconnect thus exists between strategic design and its implementation. For the aspirations of 'site integration', for example, to come to fruition, a shared vision of success by all CRP personnel is imperative. This calls for strengthening ownership of strategy and MEL capacity within the CRP.

Monitoring and cross-learning

- Currently, CapDev actions are only attached ex post to the main Flagship activities and rated as to whether they were significant or principal based on perception. Effects and experiences from the CapDev actions were not formally tracked. Therefore, a pragmatic approach to MEL, based on reflection on practical experience in attempting to achieve CapDev goals, is called for.

Scale of focus and subsidiarity

- Ugglä (2020⁵⁰), in a review of the CapDev activities in the Livestock Health Flagship, asserted that the 'flagship should stick more consistently to the principle of "training the trainers" by primarily directing information and teaching efforts to regional partners and the animal health extension workers rather than directly to farmers'. This review sustains this view and reiterates that – based on subsidiarity—the role of the CGIAR should be to strengthen the macro-level systemic capacity for effective downstream delivery of development interventions. Efficiencies of going to scale can only be realized if partners at progressively lower levels are empowered to cascade the interventions.

50. Ugglä, A. 2020. *Review of capacity development activities within the Livestock Health Flagship of the CGIAR Research Program on Livestock*. Montpellier, France: CGIAR.

APPENDICES

Appendix 1: Demonstrable successes, supportive factors, and least achievements

Areas of demonstrable success	
FP1	<ul style="list-style-type: none"> Community-based breeding programs are being handed over to national systems. African dairy genetic schemes—national artificial insemination centres which never used to accept semen from crossbred cattle, insisting only on semen from purely exotic cattle, are now doing that, because we had the evidence to show them that it was an appropriate way forward.
FP2	<ul style="list-style-type: none"> Visible outputs are being produced by training activities on animal health and breeding programs, especially community-based breeding programs and associated capacity development interventions. Ugandan champions trained at the SLU¹, Sweden, are motivated and organizing trainings on their own in the pig value chain. AI service provider companies, initially trained by the Flagship, are now driving AI²-related farmer trainings for their own benefit because the more AI people do the inseminations, the more semen the company sells, and the money goes directly to them. In the Nyanza Region of Kenya, there are quite a few farmers who have started keeping improved dairy animals largely due to the efforts of the Flagship. In addition, there are many farmers now using artificial insemination. Viable PPPs (public-private partnerships) have formed on animal health in Tanzania (the ECF³ vaccine). In terms of research, many papers have been produced—more than 100 papers in collaboration with national researchers. Innovation platforms created in Mali to build capacity of value chain actors have been replicated in other areas.
FP3	<ul style="list-style-type: none"> Researchers are thinking more systematically with the application of the FEAST⁴ tool. Young farmers are happy with their fattened livestock and are more aggressive in their market approach. Some are going back to school; they are also multiplying their sheep very quickly. Farmers appreciated SMS messages sent to them by the national extension services in Tunisia. A seed-machine seller had sold over 52 machines in a period of two years in Tunisia. The ICARDA⁵ website shows that 200 people have participated in online training on different topics (cactus production, irrigation, bee-keeping, and cattle-raising).
FP4	<ul style="list-style-type: none"> MSc⁶ graduates trained by the Flagship are applying acquired knowledge in different locations. CLEANED-X⁷ and CLEANED-R tools are being used in various locations around the world.
Supporting factors for demonstrated success	
FP1	<ul style="list-style-type: none"> Participatory activities which included farmers and national research organizations Social capital gains from previous interactions or engagements

FP2	<ul style="list-style-type: none"> • Programs designed in consultative manner using local resources of community groups • Counties' own efforts—counties taking the initiative in some areas, putting substantial money into the efforts • Local authorities trying to mobilize their own funds for supporting CapDev⁸ activities, even during the pandemic • Bringing in cooperatives, trade offices, and enterprise offices in the context of the community-of-practice groups • Market support; market orientation of sheep-fattening by community youth groups as a pull factor • Willingness to cooperate on the part of stakeholders • Strong commitment of CRP⁹ personnel, reflecting long periods on the ground and an ability to interact with local governments
-----	--

Supporting factors for demonstrated success

FP3	<ul style="list-style-type: none"> • Good private-sector angle to CapDev in the pig-smart ecosystem of private sector producers in Uganda • Training and certification of small-scale farmers, leading to government recognition rather than condemnation for spoiling the market • Ensuring all stakeholders are informed through annual stakeholder workshops to update them, listen to their feedback (comments and suggestions), and share plans for the coming year • Group email to the stakeholders affording communication • Leveraging the government extension services • Setting up village-based agents who are conducting TOT • Forage machine impacts seen immediately, especially for farmers in Tunisia. Simple and easy-to-use machines leading to farmers noticing clean seeds and better production directly linked to the machines • Farmers with prior education in dairy farming (in Kenya)
-----	---

Areas of least achievement

FP2	<ul style="list-style-type: none"> • Negative power dynamics in Uganda's pig value chain—pig aggregators not seeing value in linking up with farmers and negotiating deals • Neglect of higher- (policy-level) and middle-level (input supplier) engagement – interventions focused on the field level, i.e. farmers, a hindrance in herd health initiatives
FP3	<ul style="list-style-type: none"> • Insufficient policy for institutional structures and legal procedures • Unsustainability of innovation platform and development of E-learning modules • Private initiatives not being included

Key: FP1—Livestock Genetics Flagship; FP2—Livestock Health Flagship; FP3—Feeds and Forages Flagship; FP4—Livestock and Environment Flagship.

1. Swedish University of Agricultural Sciences
2. Artificial insemination
3. East Coast Fever
4. Feed Assessment Tool
5. International Center for Agricultural Research in the Dry Areas
6. Master of Science
7. Comprehensive Livestock Environmental Assessment for Improved Nutrition, a Secured Environment and Sustainable Development
8. Capacity development
9. CGIAR (Consultative Group on International Agricultural Research) Research Program

Appendix 2: One-on-one interviewees

<p>FP1: Livestock Genetics</p> <ul style="list-style-type: none"> • Karen Marshall 	<p>FP2: Livestock Health</p> <ul style="list-style-type: none"> • Henry Kiara • Mamusha • Michel Dione • Vish Nene • Ben Lukuyu • Prof. Ulf
<p>FP3: Livestock Feeds and Forages</p> <ul style="list-style-type: none"> • Ben Lukuyu • Udo Rudiger • Jane Wamatu • Michael Peters • Amos Omore • Uwe Ohmstedt • Alan Duncan • Sondo and Hajer • Mamusha 	<p>FP4: Livestock and Livelihoods</p> <ul style="list-style-type: none"> • An Notenbeart

Appendix 3: Interview questionnaire

Livestock CRP CapDev evaluation and synthesis: One-on-one interviews with FP implementers

Respondent particulars:

Name:	Flagship:	Responsibility:
Permission to Record: <input type="checkbox"/> Yes <input type="checkbox"/> No	Date:	

Key:

- CapDev—Capacity Development
- CRP—CGIAR Research Program
- P—Flagship Program

Interview questions

These questions are intended to probe the strategic relevance, programmatic design, implementation effectiveness and efficiency, and nascent changes accruing from CapDev interventions by the various Livestock CRP FPs. The estimated time to complete the interview is about 45 minutes.

- Did you have any specific objectives that you set out ab initio to achieve in your CapDev interventions at FP level?
- If so, how did this relate with the FP or CRP theory of change?
- What were the main CapDev interventions by the FP?
- How were the main CapDev interventions by the FP aligned with the national CapDev targets and strategies of the priority countries?
- How were the implementing, national, and beneficiary partners organized at country level for effective delivery of CapDev actions?
- Does the project governance structure facilitate good results and efficient delivery?
 - Yes ☐
 - No ☐
 - If no, please state the reasons:
- Please rate the adequacy of FP management or implementation capacities at country level based on the following aspects (Use a scale of 1–5 to score, where 5—very adequate; 1—not adequate at all):
 - Staffing numbers: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
 - Technical competency: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
 - Financing: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
 - Operational: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
- Is there a clear understanding of the roles and responsibilities by all parties involved in CapDev implementation?
 - Yes ☐
 - No ☐
 - If no, please state the reasons:
- To what extent did the FP CapDev interventions prioritize strengthening the capacity of national actors to independently undertake research? Use a scale of 1–5 to score, where 5—well prioritized; 1—not prioritized at all)
 - 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

10. Does the FP CapDev action receive adequate political, technical and administrative support from its national partners?
 - Yes ☐
 - No ☐
 - If no, please state the reasons:
11. Have the quantity and quality of the CapDev outputs produced so far been satisfactory?
 - Yes ☐
 - No ☐
 - If no, please state the reasons:
12. Do the CapDev benefits accrue equally to men and women?
 - Yes ☐
 - No ☐
 - If no, please state the reasons:
13. Are the CapDev project partners benefiting from the outputs?
 - Yes ☐
 - No ☐
 - If no, please state the reasons:
14. How have stakeholders been involved in the implementation of CapDev interventions? Use a scale of 1–5 to score, where 5—very involved; 1—not involved at all.
 - National partners: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
 - Beneficiaries: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
 - Other development partners: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
15. How effective has the FP been in establishing national ownership of CapDev actions? Use a scale of 1–5 to score, where 5—very effective; 1—not effective at all:
 - 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
16. Is the management and implementation of CapDev interventions participatory?
 - Yes ☐
 - No ☐
 - If no, please state the reasons:
17. Is this participation contributing towards achievement of the CapDev intervention objectives?
 - Yes ☐
 - No ☐
 - If no, please state the reasons:
18. Have the CapDev interventions been appropriately responsive to the needs of the national constituents?
 - Yes ☐
 - No ☐
 - If no, please state the reasons:
19. How efficiently was the dedicated CapDev budget utilized? Use a scale of 1–5 to score, where 5—very efficient; 1—not efficient at all:
 - 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

20. Have the CapDev approaches employed by the FP produced demonstrable successes?
 - Yes
 - No
 - If no, please state the reasons:
21. In which areas (geographic, sectoral, issue) do the CapDev interventions have the greatest achievements?
22. Why is this so and what have been the supporting factors?
23. How can the FP build on or expand these achievements?
24. In which areas do the CapDev interventions have the least achievements?
25. What have been the constraining factors and why?
26. How can these constraints be overcome?
27. What, if any, alternative strategies would have been more helpful in ensuring greatest achievement of CapDev interventions?
28. Would you kindly list the key areas of change that you envisaged would occur from implementation of FP project activities during the second round of the CRP?
29. Please state the extent to which you personally perceive that CapDev interventions would have helped facilitate the envisaged changes (use a scale of 1–5 to score, where 5–very effective; 1–not effective at all).
30. Please suggest the nature of CapDev activities that would best facilitate the identified change pathways.



RESEARCH
PROGRAM ON
Livestock