



RESEARCH  
PROGRAM ON  
Livestock

*More meat, milk and eggs by and for the poor*

# CGIAR Research Program on Livestock Agri-Food Systems 2017 Annual Report

## Implementing partners:

- Lead: International Livestock Research Institute (ILRI)
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
- International Centre for Tropical Agriculture (CIAT)
- International Centre for Agricultural Research in the Dry Areas (ICARDA)
- Swedish University for Agricultural Sciences (SLU)

15 July 2018



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 of livestock agri-food systems in sustainable ways, making meat, milk and eggs more available and affordable across the developing world. The Program brings together five core partners: the International Livestock Research Institute (ILRI) with a mandate on livestock; the International Center for Tropical Agriculture (CIAT), which works on forages; the International Center for Research in the Dry Areas (ICARDA), which works on small ruminants and dryland 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 research into development and innovation and scaling processes.


The Program thanks all donors and organizations who globally supported its work through their contributions to the [CGIAR Trust Fund](#)

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*ILRI has offices in East Africa • South Asia • Southeast and East Asia • Southern Africa • West Africa*

## Acronyms

A4NH	CGIAR Research Program on Agriculture for Nutrition and Health
AMR	Antimicrobial resistance
ASF	African Swine fever
AU-IBAR	African Union-InterAfrican Bureau for Animal Resources
BMGF	Bill and Melinda Gates Foundation
CBPP	Contagious bovine pleuropneumonia
CCAFS	CGIAR Research Program on Climate Change and Food Security
CCPP	Contagious caprine pleuropneumonia
CIAT	International Center for Tropical Agriculture
CIRAD	Le Centre de coopération internationale en recherche agronomique pour le développement
CLEANED	Comprehensive Livestock Environmental Assessment for Improved Nutrition, a secured environment and sustainable development along livestock and fish value chains
CRP	CGIAR Research Program
CSIRO	Commonwealth Scientific and Industrial Research Organization
CTTBD	Centre for Ticks and Tick-borne Diseases (Malawi)
DFID	Department of International Development (UK)
ECF	East Coast fever
EIAR	Ethiopian Institute of Agricultural Research
ELISA	Enzyme-linked immunosorbent assay
FAIR	Findable, accessible, interoperable, and reusable
FAO	Food and Agriculture Organization of the United Nations
FP	Flagship project
GALVmed	Global Alliance for Veterinary Medicines
GASL	Global Agenda for Sustainable Livestock
GHG	Greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (Germany)
ICARDA	International Center for Agricultural Research in the Dry Areas
IDO	Intermediate development outcome
IFPRI	International Food Policy Research Institute

ILRI	International Livestock Research Institute
INRAT	Institut National de Recherche Agronomique de Tunisie
ITM	Infection and treatment method
KLIP	Kenya Livestock Insurance Program
LCV	Laboratoire Central Veterinaire (Mali)
LMP	Livestock master plan
MARLO	Managing Agriculture Research for Learning and Outcomes
MEL	Monitoring evaluation and learning
MSP	Multi-stakeholder platform
NIRS	Near-infrared spectroscopy
POWB	Plan of work and budget
PPR	Peste des petits ruminants
RTB	CGIAR Research Program on Roots, Tubers and Bananas
SLO	System level outcome
SLU	Swedish University of Agricultural Sciences
SmaRT	Small Ruminant Meat value chain transformation in Ethiopia
USAID	United States Agency for International Development
UN	United Nations
WEAI	Women Empowerment in Agriculture Index
WELI	Women's Empowerment in Livestock Index
W1/2/3	CGIAR funding windows 1/2/3

# Livestock CRP Annual Report 2017

## 1. Key results

### 1.1 CRP Progress towards intermediate outcomes and SLOs:

The CGIAR Research Program on Livestock Agri-Food Systems (Livestock CRP) was launched in 2017. The Livestock CRP continues a number of the key lines of research initiated under the first phase Livestock & Fish CRP, but with major changes overall in terms of an expanded mandate to strengthen livestock-mediated resilience in livestock-based systems in addition to the original focus on transforming inclusive livestock-based value chains, and with a new flagship dedicated to the environmental issues associated with livestock production. The CRP works to create a well-nourished, equitable and environmentally healthy world through livestock research for development.

The CRP made good progress towards its objectives as evidenced by a steady output of research results across the five flagships. The flagships successfully completed 13 of the 29 milestones set for 2017 with many of the remaining milestones well advanced and close to completion. This completion rate reflects the learning taking place as the CRP adjusts to new emphasis on accountability for milestones under the new phase, and the ever-present tension between setting ambitious targets and under-estimating the many factors that can delay getting a milestone fully completed such as repeated iterations in the publication process. It is providing lessons to improve research planning going forward, further enhancing programmatic focus. During the year, flagship project 1 (FP1) the new Livestock Genetics genomics platforms became operational, the initial results from its genomic and gendered socio-economic characterization of potential poultry systems were produced, and advances in the delivery of improved genetics for dairy cattle and small ruminants were made.

FP2 Livestock Health made significant progress in supporting vaccine development for five priority diseases, tested innovative strategies to improve herd health and for veterinary service delivery in pastoralist systems, and initiated collaboration with the CRP on Agriculture for Nutrition and Health (A4NH) on antimicrobial resistance. The portfolio of improved forage options for stress environments and dual-purpose crops continued to be strengthened by FP3 Feeds and Forages, with increased uptake through commercial distribution, contributing directly to the System level outcome targets (Table A-1). The flagship also further improved decision-support tools to facilitate uptake of appropriate feed technologies more generally. FP4 Livestock and the Environment made further progress in finalizing the development of tools for the assessment of the environmental impacts of livestock and generated data to address the critical knowledge gap on greenhouse gas emissions from livestock in Africa in collaboration with the CRP on Climate Change and Food Security (CCAFS). FP5 Livestock Livelihoods and Agri-Food Systems became a partner in a major new initiative to strengthen livestock data for development and piloted a number of livestock policy and planning innovations across several countries. The CRP continued to support gender mainstreaming across the flagships and established the Women's Empowerment in Livestock Index (WELI) as an important methodological tool. Preliminary results from capacity needs and youth assessments to inform CRP strategies under development have provided initial insights in guiding CRP research. The CRP faced a major challenge in its first year as two of its five flagships were deemed ineligible for window 1 and 2 (W1/2) funding which came with an associated reduction of its management budget. The two flagships in question therefore relied entirely on their portfolio of window 3 (W3)/bilateral funded projects to make progress towards their respective outcomes, recognizing that in most instances these projects were not designed explicitly to achieve the CRP outcomes, though they clearly contribute indirectly.

Moreover, importantly, the W1/2 restrictions meant that the CRP has had to delay implementation of its program in its nine priority countries until 2018. (References in this report to priority countries refer to the nine countries identified in the CRP proposal.) The priority countries are a critical component of the CRP's theory of change as they provide the focus for integrating the various strands of CRP research into livestock development interventions that can take research outputs to scale. This delay, together with the reduction

in W1/2 funding, will require the adjustment of the CRP outcomes and targets. Highlights of key outcomes achieved by the CRP in 2017 are described in the following paragraphs.

#### **Index-based livestock insurance working to protect key assets of Kenyan pastoralists:**

Earlier research by the International Livestock Research Institute (ILRI) created the index-based livestock insurance concept which in Kenya culminated in the Kenya Livestock Insurance Program (KLIP) initiated in 2015 by the government of Kenya. A public-private partnership implemented with technical assistance from ILRI, the program insures pastoralists in the arid and semi-arid lands counties of Kenya against the loss of their livestock, thereby protecting their assets against drought. By 2017, KLIP provided coverage to 34,500 beneficiaries across eight counties. Drought conditions in 2016 and 2017 triggered pay-outs to 33,400 beneficiaries totalling KES710 million (USD7 million). The timeliness of the pay-outs was found critical in allowing insurance holders to cope through better access to forage, water and veterinary services for animals during dry periods, while also contributing to food security and resilience building in their pastoral communities. A tele-survey conducted in two counties revealed that KLIP pay-outs are used for household needs including food, education and debt payment. KLIP plans to expand to all 14 dryland counties in Kenya in 2018. The government of Ethiopia has requested help in designing a similar initiative to KLIP.

#### **Evidence-based investment plan attracts funding for livestock development in Ethiopia:**

Working with the Ethiopia Livestock State Ministry, ILRI researchers undertook an analysis of the national livestock sector as the basis for a five-year investment roadmap, called the Ethiopia livestock master plan (LMP). Using modelling within the framework of the Livestock Sector Investment and Policy Toolkit developed by Le Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) and partners, the team assessed the potential medium-term impact of combined technology and policy interventions. The LMP has informed the government's Growth and Transformation Plan II livestock targets for the years 2015–2020. Launched in 2016, the LMP has since served as the basis for a new World Bank loan of USD170 million, USD75 million in donor-funded projects and USD200 million in private sector investments in the sector of USD445 million. The World Bank project is partly based on technologies tested in CRP livestock. One example is that for small ruminant genetic improvement, a community-based breeding program is identified as strategy of choice. Higher productivity and income levels resulting from the LMP investment interventions are projected to lift out of poverty more than 2.3 million of Ethiopia's 11 million livestock-keeping households.

#### **New businesses emerging in the Ugandan pig value chain**

Through the efforts of the Livestock CRP team in Uganda, business linkages in the pig value chain have expanded the horizons of many entrepreneurs. The program was instrumental in organizing local and national pig multi-stakeholder platforms (MSPs) which through research undertaken into constraints and regular and on-going interactions between value chain actors have enhanced peer learning and strengthened linkages between value chain actors. Several actors have subsequently invested in developing new businesses and integrated research results in the process. Examples include the national pig MSP chairperson, Emma Naluyima, who has vertically integrated her activities in the value chain, moving beyond supply of quality piglets to fattening and value addition in the retail node through quality pork cuts (branded as "ponic pork") and a mobile pork roasting facility serving ready-to-eat pork; Devenish Nutrition Ltd., a private sector company, which used evidence-based research from the program on feeding options to inform its investment in a feed mill and a model farm in Hoima district to supply quality finished pig feed products, catering for different pig growth stages, and through the MSPs identified small-and medium-sized enterprises as franchises; Chris Mulindwa, who established Pig Production and Marketing Ltd (PPML) as a new champion of the smallholder pig value chain and has used materials from the program to train over 1,770 farmers and young people and organized two Pork Expos; Bavubuka Tweekembe Youth group which responded to the opportunity to commercialize sweetpotato silage production and in collaboration with the CRP on Roots, Tubers and Bananas (RTB) and national partners have trained over 2,000 farmers; Breeds, Feeds, and Meats Ltd which tapped into the pig MSPs to develop a partnership with PPML to supply pig artificial insemination using semen from the high-quality boar stud. Particularly encouraging, the MSP concept has been replicated to other localities without help from the program.

### **Bundling public-private products and services taken up to improve pastoralist veterinary care**

One of the main challenges of delivering animal health services in dry regions is the absence of the private sector due to the extensive nature of livestock production, a lack of commercial orientation of livestock keeping and high levels of poverty. An innovative arrangement was piloted in Kenya which leveraged scheduled public sector vaccination campaigns to include additional services offered by Sidai Africa Ltd, a social enterprise. The public sector benefitted from partnering with the private sector because it enabled them to quickly respond to a disease outbreak, which enhanced their credibility among livestock keepers. The county government was able to deliver more vaccines because they no longer had to buy anthelmintic drugs to entice livestock keepers to bring their animals for vaccination and could use the savings to strengthen the vaccine component. The cost of delivering the services by the private sector were greatly reduced because transport, personnel and other facilities were shared. Sales during the campaign helped the Sidai franchise exceed its monthly revenue target by 20%. This bundling program has now become routine in two counties.

## **1.2 Progress by CRP flagships:**

### **FP1 Livestock Genetics**

The Livestock Genetics flagship initiated its proposed agenda with no changes made to its theory of change. Its main objectives are to create opportunities to increase livestock productivity and human livelihoods through the identification and provision of genetically superior livestock working with national policymakers, research, development and private sector partners. The flagship successfully achieved two of the six milestones set for 2017; the remaining four are in progress and have been extended.

Contributing to data for genetic improvement or conservation (outcome 1.1) for the sub-IDO on increased conservation and use of genetic resources, the first 2017 milestone (1.1.1) aimed to characterize livestock production systems from household, environment and animal genotype perspectives. For smallholder systems, information systems using geographic coordinates and environmental parameters to characterize the livestock production systems were developed. The first environmental suitability maps for small ruminants were produced for Ethiopia as well as a [methodology](#) for the same for exotic chicken; both will be finalized in 2018. The methodologies developed are generic, able to be applied globally. The availability of environmental suitability maps for our priority species (dairy cattle, chicken, small ruminant) will help identify and promote the most appropriate existing livestock breeds for systems and value chains (breeds substitution, crossbreeding) and will maximize success in disseminating improved genotypes. For pastoral and semi-pastoral systems, production systems were characterized in the arid and semi-arid areas of [Kenya](#) and the semi-arid [dairy production systems](#) of [Senegal](#), providing baseline information for developing dairy breeding improvement programs suited to these areas. A [publication](#) on the genomic footprints of dryland stress adaptation in Egyptian fat-tail sheep and their divergence from East African and western Asia cohorts has informed the ongoing study on heat tolerance in Sudanese desert sheep. The results will contribute to the output related to identification of signatures of selection at genome level to environmental challenges. In addition, the [identification of \*FecX<sup>Bar</sup>\*, a novel BMP15 mutation](#) responsible for prolificacy and female sterility in Tunisian Barbarine sheep, will be used to design breeding programs for introgression of the mutation into other, non-prolific, populations in Tunisia in 2018. Pigs (Kenya) and chickens (Ethiopia, Tanzania, Nigeria) were sampled for genome sequences; the sampling will extend in 2018 for ruminants in Ethiopia (cattle and sheep) and in Tanzania (cattle). The next steps will be the analysis and making the genome sequence information public, allowing the generation of new genomic screening tools to underpin the design of genetic improvement strategies. A methodological [paper](#) was published for cattle which will facilitate the design of optimal DNA SNPs chips for parentage and admixture proportion analysis. This first milestone will be fully completed in 2018.

The first of the three 2017 milestones contributing to the flagship outcome (1.2) for the implementation of genetic improvement strategies by national partners and the sub-IDOs on closed yield gaps and enhanced genetics, was achieved. This milestone (1.2.1) for analysis of phenotypic recording and genome characterisation data to inform genetic improvement was completed for [chickens](#) (Ethiopia, Tanzania and



Nigeria) and [dairy cattle](#) (Ethiopia and Tanzania). The insights made available by these analyses provide the basis for the identification of the best genotypes in relation to agro-ecologies. The deadline for the achievement of the second milestone (1.2.2) targeting the development of breeding schemes and their piloting has been extended. Breeding schemes for chickens and dairy cattle will be developed in 2018, using outputs from the third milestone (1.2.3) and piloted in 2019. The most advanced program here is the community-based breeding improvement program in sheep and goats led by the International Center for Agricultural Research in the Dry Areas (ICARDA) in partnership with ILRI.

With the success of the pilot community-based breeding programs demonstrated under the previous Livestock & Fish CRP, they are now being extended to new geographic areas in Ethiopia and Tanzania. [Strategies](#) for sustainable dissemination and upscaling developed in 2017, supported by the standardization of technical guidelines, will be tested in 2018 considering opportunities for [strengthening women's participation in breeding cooperatives](#). The third milestone (1.2.3) has been completed for two species, chickens (Nigeria, Tanzania and Ethiopia) and dairy cattle (Ethiopia and Tanzania), with protocols wholly in place for the collection of data for phenotypic and production system characterization to inform genome editing and *ex-situ* conservation. These include [mobile recording systems](#) developed and now in use for dairy cattle. The deadline for the achievement of the milestone has been extended to 2018 to develop similar systems for sheep in partnership with a private partner. The establishment of the genome editing facility is ongoing at ILRI Nairobi, with the development of two [transgenic cells lines](#) in cattle as part of the transgenic cattle project. Pregnancies for the first transgenic trypanotolerant calves are expected in 2018. Two thousand and seventeen saw also the establishment of a poultry research facility at ILRI Addis Ababa, which will be officially opened in the first half of 2018. This facility will house experiments at the poultry health–nutrition–genetics interface to inform recommendations for maximizing genetic gain following distribution of improved genotypes.

A third area of work under the flagship targets the adoption of business models for delivering improved livestock genetics (outcome 1.3; sub-IDO 1.4.2, 1.4.3). The milestone (1.3.1) planned for 2017 sought to identify constraints and opportunities for enabling institutional arrangements. This was partially completed for one species, dairy cattle, with constraints and opportunities identified for [public-private partnerships](#) in Tanzania and Ethiopia and for a [national dairy performance centre](#) in Tanzania. This baseline information will now be applied to developing business models for the dissemination of improved genotypes in crossbred dairy cattle. The deadline for the achievement of this milestone has been extended to 2018 to investigate public-partnerships opportunities and constraints for chicken (Ethiopia, Tanzania, Nigeria) and sheep (Ethiopia).

The flagship also aims to influence policy for animal genetic resources (outcome 1.5; sub-IDO 1.4.4). A final 2017 milestone (1.5.1) was to provide draft policy guidelines as a first step. This was partially achieved through close collaboration with the African Union-InterAfrican Bureau for Animal Resources (AU-IBAR) in drafting a set of 13 policy guidelines (available after AU-IBAR review) on access to and benefit sharing of animal genetic resources. The scope of these policy briefs is broad. It includes a review of the lessons learned from the past genetic improvement programs in Africa, as well as recommendations for strengthening the participation of stakeholders in planning and implementing crossbreeding programs to reduce the loss of indigenous breeding stock and the importance of linking livestock conservation initiatives to sustainable utilization. Once endorsed, these policy guidelines will inform national policies for improvement and conservation of animal genetic resources. The deadline for the achievement of the milestone has been extended to finalize guidelines on institutional arrangements needed for the [certification of breeding rams/bucks in Ethiopia](#).

## **FP2 Livestock Health**

Overall there were no changes in the flagship's theory of change. The flagship set seven milestones in 2017 as progress to achieving the targeted outcomes for 2022. One of the milestones were successfully achieved and the deadlines for the achievement of the remaining six have been extended, in some cases simply to conclude the publication of findings. The first cluster in the flagship evaluates livestock health constraints and aims to have the tools to assess significance of animal diseases and disease risk models and maps in use by 2022 (outcome 2.1). During 2017, an approach for aligning the health modelling to economic analysis in FP5 was defined. The 2017 milestone (2.1.1) for this work was partially completed with the gender-sensitive disease



assessment tool generating outputs for [Ethiopia](#) and [Tanzania](#), moving towards the [harmonization of the tools](#). Data is still being assembled for the risk modelling component, so the deadline for completion has been extended to 2018. Work in Tunisia focused on [ticks](#) and [tick borne diseases](#) and tick occurrence data was extracted from literature and compiled in an [online tick database](#) to guide decision makers, CGIAR and other researchers in targeting interventions to control ticks and tick-borne diseases across the Maghreb region. For peste des petits ruminants (PPR), as a key disease for the flagship of global interest, funding was secured for a new major activity in 2018 which aims to inform international control efforts.

The second cluster developing herd health packages (outcome 2.2) including the use of antimicrobials partially achieved its milestone (2.2.1) to provide a herd health framework and define [package components](#). Work focused mainly in [Ethiopia](#) and [Uganda](#) where training modules for veterinarians and farmers in small ruminant and [pig](#) farming systems were produced and will be rolled out in 2018 in coordination with the ongoing testing of intervention packages to monitor their impact. In Tunisia the importance of toxoplasma was confirmed through its [detection](#) in naturally infected sheep, contributing to commitments from animal and public health side to intensify joint control [efforts](#). Work on antimicrobial resistance was initiated jointly with A4NH, with Livestock CRP focusing on improved farmer practices (outcome 2.3). The 2017 milestone (2.3.1) of developing and convening consultations on a gender and youth-sensitive protocol for assessing the knowledge, attitudes and practices related to antimicrobial use and resistance in livestock among smallholders was largely achieved; the deadline for completion has been extended to 2018 when the protocol will be made publicly available. Demand for such a protocol adaptable to different settings and systems has been expressed by several international research teams including Food and Agriculture Organization of the United Nations (FAO) and many universities.

With respect to having novel livestock vaccines and diagnostics in use (outcome 2.4), the third cluster made progress on its milestone (2.4.2) to achieve proof-of-concept for vaccines against selected diseases, evaluate current vaccines for contagious bovine pleuropneumonia (CBPP) and PPR and develop diagnostics for CBPP and mycoplasma. For East Coast fever (ECF), the testing of different antigen delivery methods to prime anti-sporozoite (antigen p67) and anti-schizont (antigen Tp1) immunity and for identification of novel antigens has continued. Immunological data from the Tp1-Ad/MVA Friesian cattle immunized last year was disappointing in that most animals did not mount a detectable CTL response that killed autologous parasite-infected cells.<sup>1</sup> Hence, finding an appropriate antigen delivery system to prime such responses in cattle remains a high priority. In the case of CBPP, efficacy testing of the Ben-1 live CBPP vaccine was completed, with the results subject to a confidentiality agreement for now. Two candidate live vaccine mutant strains for contagious caprine pleuropneumonia (CCPP) that do not produce hydrogen peroxide were found to be attenuated; but did not protect against challenge (lab book). Whole genome sequence data from the two mutants identified the presence of mutations in several genes which could provide a basis for selecting candidate vaccine antigens. Discussions are underway with a private sector company interested in the commercial production of a novel ELISA diagnostic [test](#) for CBPP. Three 2017 milestones were set to mark progress in improving access to livestock health products and services in priority countries under the fourth cluster (outcome 2.5). The focus is to ensure the outputs from the other clusters in FP2 reach end users in the most cost-effective way. A review of the availability and manufacturing capacity of veterinary vaccines in Mali, Ethiopia, Kenya, Tanzania, Uganda and Vietnam was completed and will be published in 2018 (milestone 2.5.1; extended to 2018). It found adequate capacity for the manufacture of a number of key veterinary vaccines in Ethiopia, Kenya and Mali.

Significant progress has been made with the Laboratoire Central Vétérinaire (LCV) in Mali towards the production of a [thermostable PPR vaccine](#) which will be important for controlling the disease where there is poor infrastructure. The internal quality check of the PPR vaccines being produced at LCV was completed with satisfactory results, preparing the way for an independent quality check and analysis of thermostability profiles of the three vaccines and the extent of sero-conversion achieved in animal experiments. Different gender-sensitive models for the [delivery](#) of ITM were evaluated, finding that there were very few women actors in the ITM value chain, so specific strategies to include women and young people will need to be

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<sup>1</sup> This negative data has not been published but has been documented in our lab books.

developed. The third milestone (2.5.2) for piloting and scaling out specific veterinary services and products was also partially achieved and the deadline has been extended to 2018. Several models for delivery of veterinary products and services in extensive livestock systems were evaluated in the United States Agency for International Development (USAID)-funded development projects in Kenya and Mali. A private-public partnership and mobile veterinary runs were evaluated in Kenya leading to a significant reduction in the cost of delivery of animal health services by the private sector and improved access to quality services by pastoralists, as highlighted in one of the outcome stories. Strengthening private veterinarian capacity was the focus in [Mali](#), complemented by using innovation platforms for better planning and implementation of vaccination campaigns. Baseline and post-vaccination epidemiological surveys indicated a significant improvement in vaccination coverage, but not sufficient to establish the targeted herd immunity. The results are guiding relevant capacity development efforts for value chain actors.

### **FP3 Feeds and Forages**

In 2017, the Feeds and Forages Flagship set 11 milestones contributing to five flagship outcomes and two sub-IDOs (1.3.4, 1.4.2). Nine of the milestones were achieved and two have been extended to 2018. Extensions were related to new variety release procedures, the lack of W1/2 funds and the resulting dependence on bilateral projects that in many cases were not designed to deliver the CRP and flagship objectives directly, although contributing significantly to flagship outcomes. Both milestones were achieved in working towards the use of tools to diagnose feed constraints and prioritize interventions (outcome 3.1). In the first instance, two feed supply and analysis tools were enriched: a [pilot tool](#) for [feed supply-demand estimates](#) in Ethiopia; and a legume database proto-type to support the [LegumeCHOICE tool](#) for livestock producers. Access to the [SoFT tool](#) for the selection of forages was enhanced through IT improvements increasing user numbers to [0.5 million in 2017](#), and the online journal [Tropical Grasslands](#) launched three issues reaching [0.12 million users](#). For the second milestone on NIRS equations, five equations for stationary NIRS were developed ([three](#) for *Urochloa humidicola* and one each for [Tef straw](#) and [Cenchrus purpureus](#)) which will increase breeding efficiency within and beyond the flagship.

For getting forage and rangeland resources developed by the CRP in use (outcome 3.3), of the three promised milestones, two were completed and one extended to 2018. The first milestone identified new *Urochloa* hybrids for future breeding and the scaling of existing hybrids: a) 81 new *Urochloa* interspecific [hybrids](#) were defined, 27 *U. humidicola* hybrids were evaluated for spittlebug resistance and [seed production](#) and 27 *U. humidicola* hybrids were screened for [waterlogging tolerance](#); and b) released *Urochloa* hybrids were further [scaled](#) on approximately 103,000 hectares in 23 countries in 2017. The second milestone on genotyping *Cenchrus purpureus* (syn. Pennisetum purpureum, Napier) was completed: a collection of 105 [Napier grass accessions](#) was genotyped producing approximately 200,000 markers and a diversity analysis was conducted identifying a 'core collection' capturing genetic diversity. [New phenotyping tools](#) were tested for suitability in improving selection and [non-destructive methods](#) for screening forage plants under stress were evaluated. The suitability of genomic selection to enhance breeding efficiency was explored for [Urochloa](#) through a literature review and an expert analysis of the genetic characteristics of their breeding populations. The third milestone on identifying, characterizing or promoting the release of collections of *Cactae*, *Urochloa* and *Megathyrsus* was partially achieved and extended to 2018. The delay resulted from changed release procedures affecting *Urochloa* and dependence on bilateral projects. However, advances were made on molecular and phenotypic characterization (e.g. related to [water use](#), [environmental aspects](#) or [nutritional quality](#)) for the core collection of *Megathyrsus maximus* (137 germplasm accessions; 41 hybrids) contributing to hybrid breeding. A [field day in Jhansi](#) (India) was organized to introduce cactus (*Opuntia ficus indica*) as a multi-purpose plant to farmers. For improved forage and dual-purpose crops (outcome 3.4), the milestone on identifying crop cultivars with potential for genetic enhancement was achieved. New [dual-purpose cultivars](#) were [identified](#) in maize, rice, wheat, cowpea and sorghum, while new forage sorghum and pearl millet cultivars were [tested](#) with commercial and smallholder dairy producers in southern India. All six milestones discussed enhance the delivery of technologies that promote more efficient use of feed resources (sub-IDO 1.3.4). Both milestones

related to improving the utilization of existing and novel feed resources (outcome 3.5) and closing yield gaps (sub-IDO 1.4.2) were achieved. The first milestone on tool development to increase productivity while reducing feed and labour costs in India was achieved by the development of a [ration balancing tool](#) for Odisha state. In addition, the potential for [upgrading cereal straws and stovers](#) as feed using biofuel technology [was identified](#). The second milestone on assessing current commercial and on-farm silage production in India was achieved by exploring [silage as a business option](#) with Dodla Dairy. In addition, [total mixed rations](#) were designed and tested with Indian feed processors and smallholder dairy producers and demonstrated better yields compared to traditional feeding systems.

For the work to increase delivery and uptake of feed and forage resources (outcome 3.8), from the promised three milestones two were achieved and one was extended to 2018. The first milestone on developing knowledge for the design of business models in Kenya, Tunisia and Colombia was completed. We devised a [method for cost-benefit analysis](#) of improved forage technologies in Colombia that enables the financial evaluation of promising forages. A set of public and private sector [actors from Nicaragua were trained](#) on its use. [Cost-benefit analysis](#) for forage technologies (oat and vetch forages) in central Kenya generated evidence that applying these technologies results in positive returns for the farmers. We developed a [methodology for qualitative assessment](#) of adoption factors for new forage technologies in Latin America to better target dissemination strategies. Adoption factors were also identified for [Tanzania using a workshop approach](#). In addition, [four business plans](#) for Tunisian feed block manufacturers were developed. The second milestone on identifying knowledge gaps around promising feed, forage and processing technologies to support new extension approaches in Tunisia and Colombia was partially achieved and extended to 2018 due to a lack of W1/2 funds and limited relevant bilateral project activities. What we achieved was the [identification of knowledge gaps](#) around forage technologies for Colombia that help in developing well-targeted extension approaches. A [policy brief](#) on varietal release protocols for forage seed in Afghanistan and [10 forage factsheets](#) for Eastern Africa were developed and support new extension approaches. The third milestone on the exchange with innovation platforms, roundtables and the private feed sector in Kenya, Tunisia and Colombia was achieved through participation in the [Roundtable for sustainable cattle production](#) in Colombia, establishing private seed sector links, initial [innovation platform meetings](#) in Kenya, and supporting the feed resource [innovation platforms in Tunisia](#). We also mapped the key players within the forage seed marketing system [in Afghanistan](#) and conducted an in-depth forage [value chain analysis in Kenya and Ethiopia](#). Surveys and focus group discussions were conducted to understand [gendered opportunities and constraints](#) in the forage value chains in Afghanistan, to inform future interventions and foster equity in the benefits derived from more effective forage production and marketing systems. These milestones also contribute to the more efficient use of feed resources (sub-IDO 1.3.4).

#### **FP4—Livestock and the Environment**

The objective of the flagship is to enable a range of livestock stakeholders to manage the environmental impacts (good and bad) of livestock production. In 2017, we achieved many of the intended outputs as described in the Plan of work and budget (POWB). We aimed for three milestones; the deadlines for their achievement have been extended to 2018. To promote consideration of environmental concerns in decision making (outcome 4.1), the first milestone (4.1.1) in 2017 for this flagship was to apply the Comprehensive Livestock Environmental Assessment for Improved Nutrition, a Secured Environment and Sustainable Development along Livestock and Fish Value Chains (CLEANED), an environmental impact assessment framework developed under the Livestock & Fish CRP. The CLEANED framework has evolved into two different tools based upon user needs and partner desires. The first, CLEANED-X, is an EXCEL-based [tool](#) used by the International Center for Tropical Agriculture (CIAT). Applications have to date focused mostly on feeds and forages, e.g. a collaborative study with Send-a-Cow in [western Kenya](#) and a forage intensification study in [Nicaragua](#). In addition, efforts on the dissemination of the CLEANED tools and results were undertaken, including the publication of the CLEANED-X model and a joint Kenya Agriculture Livestock Research Organization-Send-a-Cow-CIAT [workshop](#) to discuss the implications of the western Kenya study results for farmers and development partners. The tool is now freely available on [dataverse](#). The second framework is an

[R-based tool](#) that was used in [Burkina Faso](#) to discuss the impacts of alternative livestock development scenarios with a diverse group of stakeholders. To enable key stakeholders to promote environmental management options (outcome 4.3), a second milestone (4.3.1) was to complete the analysis of ruminant greenhouse gas (GHG) emissions factors for livestock systems in three countries. This analysis was completed in Kenya (produced with CCAFS; journal article in press); similar analysis in Tanzania and Vietnam is ongoing. These new factors have been shared with national stakeholders and previous factors produced for manure have already been used in Kenya national reporting.

Our third milestone (4.4.1), a synthesis on policy issues around reducing GHG emissions, is contributing to the outcome on assisting national government agencies to design and implement key policies (4.4). We are summarizing efforts to advise national partners in Kenya, Vietnam and Tanzania on improving targets on reducing GHG emissions from the livestock sector; but this work is still ongoing and evolving so the deadline for completion has been extended to 2018. The 2017 outcome case summarizes the contribution of flagship research to the [roll-out](#) of the Kenya Livestock Insurance Program (KLIP). This outcome was not anticipated in the 2017 POWB, but is nonetheless significant for our policy-related outcome.

Other key outputs from 2017 are an [assessment](#) of the environmental impact of improved forages which is being used in Rwanda and Tanzania by partners to select best-bet forages for adaptation and feeding trials, in which they will be further assessed for acceptance by farmers and impact on livestock productivity, soil health and GHG emissions. In [Vietnam](#), we applied a different type of *ex-ante* impact assessment [tool](#) to look at trade-offs with feed and livestock intensification. In addition, several reports from [Tunisia](#), [Kenya](#) and [Ethiopia](#) summarize successes with rangeland restoration, using combinations of local governance arrangements with simple restoration techniques, such as re-instituting dryland grazing areas, allowing natural re-seeding. These approaches have a lot of potential to go to scale if the enabling policy environment can be assured. In 2018 and 2019, our policy impacts will increasingly focus on improving governance arrangements to improve rangeland management. These approaches also contribute to the promotion of environmental management options. For the outcome to support policies for environmental management, the flagship produced land use plans in [Kenya](#), convened meetings in Tanzania and Kenya on land use planning for rangelands, provided training on land use [governance](#) and produced draft manuals on rangeland mapping and management. A report on the potential to use payments for ecosystem services in [Tunisia](#) was also produced.

### **FP5—Livestock Livelihoods and Agri-Food Systems:**

This flagship was ineligible for W1/2 funding in 2017 and so relied on its portfolio of W3 and bilateral funded activities to make progress towards its targeted outcomes. During 2017, the flagship theory of change was reviewed and adjusted in line with a revised proposal submitted to the System Office, which was approved for W1/2 funding beginning in 2018. The flagship completed one of two milestones set for 2017. The first cluster under the flagship generates evidence to guide priority setting, investment and policy development for the livestock sector (outcome 5.1) and support policy formulation (outcomes 5.2, 5.7). The 2017 milestone (5.1.2) targeted a strategic foresight analysis of animal-source food supply and demand to 2030 and 2050; the analysis is still under review, so the milestone has been extended to 2018. Important strides were made in developing joint approaches to enhancing the quality of data used for global foresight modelling through the new partnership within the Bill and Melinda Gates Foundation (BMGF)-funded [Livestock Data for Decisions](#) consortium strengthening collaboration with modelling teams at the Commonwealth Scientific and Industrial Research Organization (CSIRO), the International Food Policy Research Institute (IFPRI) and the FAO. The policy work has provided an important evidence base for strategic investment in the livestock sector through the development of livestock master plans (LMPs), which are policy documents providing a roadmap for sector-level investment, estimating the projected returns to investment in different livestock subsectors and including livelihood impacts in different production systems. The initial experience in [Ethiopia](#) received an award from the government. The LMPs were developed for [Tanzania](#) and [Rwanda](#) in 2017. The next step is to incorporate a gender component as the analytical tools are upgraded in partnership with CIRAD and the approach is applied to developing an LMP in Bihar (India) in 2018. Mechanisms to influence partners also included a [policy forum](#) organized in Dar es Salaam in April 2017 together with the Agricultural Non-State



Actors Forum to examine inclusive investment opportunities in Tanzania's dairy value chains and ways to exploit evidence accumulated over the past five years under the 'Maziwa Zaida' ('More Milk' in Kiswahili) work started under the Livestock & Fish CRP.

The second cluster promotes the uptake of gender-transformative and youth-supportive approaches by development partners (outcome 5.3). An important tool for achieving this is WELI, which was applied to analysing the relationship between gender, nutrition and food security in [Tanzania](#). The findings show that food security is often within the domain of men and nutritional wellbeing is the responsibility of women; however, without being empowered to deal with food security, ensuring nutritional wellbeing through animal-source food can be a complicated affair for women. WELI now forms part of the Women Empowerment in Agriculture Index (WEAI) work under the Gender Platform.

The third cluster, addressing livestock-mediated nutritional impacts (outcome 5.4) and in partnership with A4NH, described a conceptual approach to integrate food safety and nutrition [assessments](#) into livestock and fish value chains combining knowledge from food sciences, public health, nutrition and economics. New grants were secured to build on research under the Livestock & Fish CRP on the drivers of animal-source food choice in Kenya and to expand nutrition work to Southeast Asia. Bilateral-funded projects allowed good progress towards the uptake of optimal livestock systems (outcome 5.5), focusing in Ethiopia and Pakistan on small ruminants, Nicaragua on cattle as well as Uganda and Vietnam on pig systems. In Ethiopia [intervention plans](#) combining recommended best-bet interventions were designed by seven value chain teams in a [multi-stakeholder workshop](#) in April 2017. The teams selected appropriate interventions for their specific sites from recommended best-bet interventions promoted and presented at the workshop in a series of 28 factsheets covering, for example, [forages](#), [sheep fattening](#), [breeding](#), [disease control](#), [milk processing](#), [meat quality](#) and [gender](#). Implementation of the site intervention plans now relies on development partners providing active support and co-investment in terms of more capital-, or time/capacity-demanding interventions.

In the Agricultural innovation program in Pakistan the piloting of [best-bet innovations](#) was successfully completed at different target sites in Punjab, Sind and Baluchistan provinces which included improved varieties of major forage species, rangeland restoration, the introduction of spineless cactus to increase feed supply, improved small ruminant husbandry practices and improved feeding and disease control strategies. In [Nicaragua](#), in collaboration with key partner Solidaridad Network, good progress was made on sustainable livestock development as part of integrated landscape management in Costa Caribe Sur: a multi-stakeholder platform and seven farmer field schools were established with training provided; and 210 farmers (20% female) implemented silvo-pastoral systems and other improved management practices. An innovative approach to combining participatory methods with system dynamics modelling was employed in the [Nicaragua](#) dairy value chain to understand the potential impacts of alternative interventions.

As a step towards promoting the uptake of innovative institutional arrangements to enhance competitiveness and inclusiveness, an innovative solar powered [milk cooling](#) system was successfully tested in small-scale Tunisian dairy farms through a GIZ-funded public-private partnership. The cooling system had been jointly developed by Phaesus GmbH and the University of Hohenheim and tested in Tunisia in collaboration with ICARDA and the Institut National de Recherche Agronomique de Tunisie. On-farm testing led to an improved design which is now being [marketed](#). A [business plan](#) was developed that showed a clear advantage of the solar powered milk cooling over standard electric systems. However, to make the milk cooling systems attractive to farmers, higher quality of the cooled milk will need to be recognized with a premium price.

The involvement of researchers in development projects like the East Africa dairy development project has allowed the CRP to not only strengthen monitoring, evaluation and learning in these projects, but also resulted in the generation of strong [evidence](#) based on the project monitoring data; although the pathways to influence remain uncertain. The large variation in approach taken by individual W3/bilateral-funded projects contributing to the flagship resulted in the need to agree on a common protocol to be delivered in 2018. In 2017, the work on business models in dairy value chains in East Africa was strengthened through new activity led by [RTI International](#), a relatively new partner with a growing number of joint projects thanks to complementarity of expertise

## 1.3 Cross-cutting dimensions (at CRP level):

### 1.3.1 Gender:

In 2017, the CRP continued to invest in research on various aspects of gender and livestock, as set out in the gender strategy developed for phase 2 of the CRP. Four achievements of Livestock's gender research stand out in 2017: 1) a growing body of work on the specifics of gender dynamics within the technical areas of the flagships; 2) the consolidation of gender specific areas in livestock which are anticipated to lead to gender transformative work; 3) the CRP's ability to open new areas of gender work, such as its relation to nutrition; and 4) continued support to capacity development at individual and institutional levels.

Two thousand and seventeen was a year of growth, but also of challenges, as the gender work is mainly housed within FP5 which was not eligible for W1/W2 funding; the CRP management, however, continued to support cross-cutting dimensions to mainstream gender across rest of the CRP. Research highlights of 2017 were therefore mainly from work across the flagships. Research within FP2 Livestock Health showed gendered decision making on the use of vaccines. [Jumba et al.](#) illustrated that vaccines often had the consequence of increasing productivity for the household which resulted in increased labour for women, but with limited returns for them as their husbands are usually in control of the money resulting from the sale of animals. The consequences were that in some cases women were wary of vaccines. Research under the FP1 Genetics also explored the gendered trait preferences of chickens based on local use.

The growing body of work on gender across the flagships was further supported by the arrival of two post-doctoral fellows funded in part by the System Management Office. Both post-docs are part of the cohort on breeding: one initiated research on the gendered trait preference for small ruminants in the dry zones of Kenya, and the other began looking at trait preferences for men and women on forages in Kenya and Ethiopia. The results are expected to be finalized in 2018. A study in [Afghanistan](#) identified constraints and opportunities for women's involvement in the fodder production systems.

WELI was trialled and an [article](#) on the methodology is in press. WELI will next be implemented in Honduras to understand the variation within different systems. Another [paper](#) highlighted women's perception that livestock is an activity rooted in traditions with little space for more equity, and so it is better to work on gender equity through new activities that are not embedded in gender norms. These results are important in understanding how livestock can be transformative within a gender context.

Two thousand and seventeen also opened up new areas of work on gender and livestock. One such area was on the linkages between gender, livestock and nutrition where research explored the methodological implications of the connection between women's empowerment and household food and nutrition security through qualitative and quantitative approaches. Research was also initiated on gender at landscape level through engagement of the gender team in the development of national livestock master plans. To date they had been gender blind; new versions will guide investment towards women in the livestock sector.

To promote continued capacity development in mainstreaming gender, the gender team was embedded within the different flagships providing individual coaching to specific scientists. This has informed a gender strategy for FP4 Livestock and the Environment now being implemented. It also resulted in a [gender strategy](#) for the African Chicken Genetic Gains project, resulting in a gender expert being based within the program to support project work in Ethiopia, Tanzania and Nigeria. Several training workshops were undertaken on gender and livestock: two in collaboration with the FAO at a [workshop](#) in Colombo for government livestock experts in the region, which was so popular the Sri Lankan government requested a follow-up training for its livestock department. Some 40 staff members from ILRI's Accelerated value chain development project in Kenya were also trained on gender and livestock.

### 1.3.2 Youth:

In line with the current framing in popular discourse of youth as an employment issue, the CRP's focus on young people has been formulated to revolve around "employment, entrepreneurship and capacity development". In 2017, the CRP began developing a strategy for addressing the issue led by a youth specialist as a joint appointment with Royal Tropical Institute (KIT). Primary qualitative data was collected in four CRP priority countries (Tanzania, Uganda, Ethiopia and Nicaragua) and a framework paper drafted to provide a coherent analysis of the emergence of youth on the development agenda, a conceptualization of youth and an analytical framework to guide future work on youth within the Livestock CRP. The key findings highlight the agri-food sector as key for future youth employment scenarios, the limitations of entrepreneurship which in these settings typically occurs out of necessity rather than as a business opportunity, limited opportunities for significant productivity gains, and the view that most of the perceived challenges and opportunities for young people are not new nor do they apply specifically to them. The paper challenges whether young people are inherently different than non-youth, and if not, then a significant increase in research (for development) with a specific youth-lens will be of limited added value. However, a select few challenges and opportunities do merit a more specific youth-lens, including land tenure and migration. The paper proposes three pathways of increasing youth engagement: (i) improved adoption of technologies and management practices through youth-mainstreaming and youth-responsive design; (ii) strategic research to increase knowledge on youth and livestock, especially with respect to land tenure and migration; and (iii) contributing to youth employment, which should be a focus of the Livestock CRP.

### 1.3.3 Other Aspects of Equity / "Leaving No-one Behind"<sup>2</sup>:

N/A

### 1.3.4 Capacity development:

In 2017, in addition to the training figures reported in Table D1, the CRP undertook capacity needs assessments in the CRP priority countries Ethiopia, Nicaragua, Tanzania, Tunisia and Uganda. These looked at the gap between where capacities currently stand and where improvements need to be scaled as competencies at the organizational, community and system levels to deliver expected CRP outputs and achieve outcomes and contribute towards broader development goals. In this case 'capacity' is defined as the capabilities (knowledge, skills, experience, values, motivations, organizational processes and linkages) that determine how well relevant stakeholders utilize resources, opportunities and relationships. The assessments are informing a capacity development strategy for the CRP to be completed in 2018. A [report](#) documents the approach.

### 1.3.5 Open data:

The CRP is making progress towards open-access for all information products, including data. The table below summarizes the current levels of open-access for the different categories of deliverables. Outreach products, reports and other publications have high open-access levels, in many cases due to the use of CGSpace by CRP partners. We continue to make investments to incentivize researchers to publish in open-access journals or pay additional fees for open-access. The lack of open-access for four data products and two training materials are due to either limited exclusivity agreements, intellectual property rights (IPR) or delayed dissemination.

The level of findable, accessible, interoperable and reusable (FAIR) for information products with this quality check is low, partly due to a lack of understanding by researchers of FAIR standards, particularly for interoperability and reusability. Support from the Big Data Platform Module 1 and increasing awareness should help to improve this. The CRP reported 94 journal publications in 2017 of which 62 (66%) were openly published (Table D-1, Indicator #C5). Some of these are associated with 14 open-access datasets, which represent 78% of reported datasets.

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<sup>2</sup> <https://unstats.un.org/sdgs/report/2016/leaving-no-one-behind>



Category	N (deliverables)	Number open- access	% Open- Access	n (scored for FAIR)	%F	%A	%I	%R	Number FAIR	%FAIR
Journal articles*	94	62	66.0							
Data, models, tools, maps	18	14	77.8	7	57.1	71.4	28.6	42.9	1	14.3
Outreach products	29	28	96.6	14	92.9	92.9	50.0	57.1	5	35.7
Reports and other publications	100	85	85.0	100	80.0	85.0	43.0	15.0	11	11.0
Training materials	8	6	75.0	8	62.5	75.0	50.0	25.0	2	25.0
<b>Overall</b>	<b>249</b>	<b>195</b>	<b>78.3</b>	<b>130</b>					<b>19</b>	<b>14.7</b>

\*1 book chapter not included

Specific highlights for websites and online journals associated with the CRP include the open access Selection of Tropical Forages Tool which increased its reach in 2017 with 485,728 total hits (visits) of 485,728 and 310,166 unique page views ([link](#)); and the open access online journal Tropical Grasslands–Forrajes Tropicales with more than 120,000 visits ([link](#)) in 2017.

### 1.3.6 Intellectual assets:

To manage the CRP intellectual assets and ensure alignment with the CGIAR principles on the management of intellectual assets, each CRP implementing partner provides an inventory of their relevant pre-existing assets being leveraged by the CRP and an annual update of any new assets created under the CRP. To date, no new assets have been reported. The lack of System-level guidelines on best practices for identifying and characterizing intellectual assets remains a challenge in harmonizing reporting across partners in terms of the type of assets considered and the level of detail applied, and in ensuring the reporting meets System expectations.

## 2. CRP Effectiveness and efficiency

### 2.1 Variance from Planned Program:

N/A

### 2.2 Use of W1-2 funding:

FP3 Feeds and Forages and FP5 Livestock Livelihoods and Agri-Food Systems were not eligible for W1/2 funds in 2017.

For FP1 Livestock Genetics the largest proportion of W1/2 funds in 2017 was used to generate new data on livestock diversity and systems (outcome 1.1) as the activities here provided important baseline information for the shaping of outcomes 1.2 and 1.3, which largely relied on W3/bilateral funding. W1/2 funds were also used to expand further some important research areas (e.g. development of environmental suitability map), to support pilot and explanatory research (e.g. microbiome analysis of chicken caecum content) and contribute to the establishment of new research platforms for genome editing and poultry research.

The majority of W1/2 in FP2 Livestock Health was dedicated to long-term vaccine and diagnostic work, which also leveraged the largest share of W3/bilateral funding. In descending amounts, W1/2 supported work in the development of improved vaccines and diagnostics against East Coast fever, contagious bovine pleuropneumonia, African swine fever and contagious caprine pleuropneumonia. W1/2 investments were also made for the development and evaluation of herd health packages and protocols for the assessment of antimicrobial use, and the development of tools for assessing socio-economic impact of disease, including livestock distribution and risk maps.

For FP4 Livestock and the Environment, W1/2 funds were used to develop the innovative frameworks to evaluate the environmental impacts of productivity enhancing technologies (outcome 4.1). It has also supported all of the gender-related work under the flagship as this is considered strategic and currently not supported through bilateral funding. The work on promotion of environmental management options receives considerable bilateral support but W1/2 has been used to fill gaps in staff time and to research strategies to support the empowerment of women and youth (outcome 4.3). W1/2 also supported the flagship management and some targeted policy synthesis and engagement.

### 2.3 Key external partnerships:

The CRP theory of change stresses the importance of involving a wide range of different types of partners to achieve the CRP targets. The list of partnerships in Table G covers this range from upstream to downstream, global to local, public to civil to private sector. A few selected highlights are described here. In the area of upstream discovery research, partnership with the [Roslin Institute](#) of the University of Edinburgh (UK) has evolved from collaborations with individual researchers to a much broader institutional engagement, allowing FP1 Livestock Genetics to leverage its capacity as an advanced research institute in a much more systematic way. Notably, Roslin is one of founding three partners of the [Centre for Tropical Livestock Genetics and Health](#), together with the Scotland's Rural College and ILRI with support from the Bill and Melinda Gates Foundation and DFID. Roslin is providing strategic research support in genetics and bioinformatics across multiple joint activities under the CRP.

Further down the impact pathway, development partners—including private sector become key, [Phaesun GmbH](#), a German solar technology company—played a critical role in designing a technical solution for [cooling milk](#) in rural dairy value chains. The company joined a GIZ-funded public-private partnership and collaborated with researchers from the University of Hohenheim to develop a solar milk cooling kit which was tested with farmers in Tunisia in collaboration with the Tunisian research institute INRAT and the CRP. Importantly, Phaesun is also now providing the means to scale out the technology by marketing it as a commercial [product](#) called the 'BOSS Kit Milky Way'.

The development of livestock master plans for Tanzania and Rwanda was undertaken at the request of and in close collaboration with the relevant government ministries in the two countries, creating the pathway for the

CRP to influence investment at national level. The exercise of developing evidence-based plans for livestock sector development and investment provides an opportunity to demonstrate the value of research and has succeeded in strengthening relationships with the ministries.

Another important impact pathway for the CRP is to link to global multi-stakeholder platforms. To achieve this, the CRP began engaging with the evolving Global Agenda for Sustainable Livestock ([GASL](#)) in 2017 in various ways. GASL is particularly strategic because it provides a forum for strengthening private sector engagement in addition to coordinating with the usual international organizations, research partners and NGOs. The CRP participated in the GASL annual multi-stakeholder partnership meeting in Addis Ababa in May to explore how it might contribute, building on the existing formal membership of the CRP partners CIAT, ILRI and the Swedish University of Agricultural Sciences (SLU). SLU leads the GASL action network on AMR, facilitating a direct link to FP2 work in this area. In addition, the GASL chair was recruited to chair the CRP's Independent Steering Committee, which will strengthen the link. In Colombia, CIAT is a key research partner in the national level Roundtable for Sustainable Cattle Production, providing an example of how the CRP can engage in its priority countries.

#### 2.4 Cross-CGIAR partnerships (other CRPs and platforms):

AMR is increasingly becoming a global concern. The Livestock CRP began to work closely with A4NH to develop a joint agenda as the CGIAR response to this threat. The initial contribution from Livestock CRP in 2017 established protocols for data collection in smallholder livestock systems on antimicrobial use, knowledge and practices to be used jointly by the two CRPs.

Through FP3 Feeds & Forages, the CRP is part of the Excellence in Breeding platform benefitting from the platform on the use of methods and approaches for breeding and pre-breeding and contributing to the platform with crop-specific methods and approaches such as research on apomixis. FP3 Feeds and Forages contributed to the development of the Tropical Forage Germplasm Strategy in consultation with the Genebank Platform. Linked to these efforts, ILRI and CIAT are now jointly managing their forage germplasm collections. Interconnectivity between the updated Tropical Forages Selection tool (SoFT) and platform tools is being explored.

#### 2.5 Monitoring, evaluation, impact assessment and learning (MELIA):

Work to refine the flagship impact pathways was started during the year, with a focus on developing 'product lines' for key expected outputs and elaborating the impact pathways and associated milestones for each of these product lines. This will continue in 2018, as will efforts to ensure that all milestones are specific, measurable, achievable, relevant and timebound (SMART). No CRP led evaluations or impact assessments and no external evaluations were completed in 2017, as reported in Table I. However, FP3 completed some research on cost-benefit analyses, including one cost-benefit analysis presented for forage technologies in central [Kenya](#) and one method prepared for cost-benefit analysis of improved forage technologies in [Colombia](#). The CRP utilized the online Managing Agriculture Research for Learning and Outcomes (MARLO) system for planning in 2017 as well as for reporting. Work started on revising the monitoring, evaluation and learning framework for the CRP to be deployed in its priority countries during 2018.

#### 2.6 Improving efficiency:

ILRI and CIAT, which partner in FP3 Feeds and Forages, have brought together their complimentary capabilities in the ILRI forage genomics and the CIAT forage breeding programs to support each other in areas including plant genotyping and forage breeding/pre-breeding and thereby avoid duplicating investment. Both centres also contributed to the development of the Tropical Forage Germplasm Strategy in consultation with the Genebank Platform. By prioritizing forages likely to be in high demand, the link between germplasm conservation and its use in the Livestock CRP FP3 has been strengthened.

## 3. CRP management

### 3.1 CRP management and governance:

As described in the POWB, the CRP implemented cost-saving measures in its management and governance to address the reduction in 2017 W1/2 funding withheld from the two flagships. These measures included delaying the recruitment of certain CRP management unit positions and a number of activities, and the Independent Steering Committee held a single meeting with a reduced membership. It will add a fifth independent member in 2018 and will review whether a second meeting each year should be re-instituted going forward.

### 3.2 Management of risks to your CRP:

Four principal risks were encountered during 2017. The first two were contextual related to the funding situation. First, uncertainty regarding W1/2 funding and a risk of a shortfall and disruption of research activities were addressed by the CRP reallocating most of its Strategic Investment Fund to cover shortfalls in FP W1/2 funding. Second, the lack of W1/2 funding for two FPs risked compromising the ability of the CRP to deliver on its commitment to cross-cutting themes, especially those related to gender, youth, impact assessment and research prioritization given that these had been envisaged as anchored in research activities in one of the unfunded FPs. In response, the CRP management identified priority work in these areas that could be conducted as strategic CRP-wide activities to support the CRP management and avoid contradicting the intention of the System Council W1/2 funding decision for the two FPs. For example, the CRP undertook youth needs assessments and the development of a youth strategy as planned in the proposal but it did not initiate any research activities as such under the unfunded FP5 which has responsibility for youth-related research.

Continued difficulties in adequate resourcing of the CRP engagement and work in its priority countries was identified as a programmatic risk in failing to demonstrate proof-of-concept of the benefit of such focus and achieving the CRP outcomes. The decision was, therefore, taken to reduce the number of priority countries from nine, as cited in the proposal, to four with the most potential to produce impact so that sufficient W1/2 funding can be allocated to each country to maintain a core set of activities regardless of bilateral funding uncertainty.

Finally, the involvement of external partners in the CRP was challenged by the nature of CGIAR funding arrangements which require significant pre-financing of activities, which may not be possible for external partners. This was considered an institutional risk given the lack of alignment on financial practices between CGIAR and external partners. To address this, the CRP negotiated exceptions to standard CGIAR financial policies given low financial risk associated with the external partners, thereby enabling their continued involvement.

### 3.3 Financial summary:

The CRP quickly expanded its W3/bilateral funded portfolio and as a result realized a total budget of USD58.3 million, 34% higher than anticipated in the CRP proposal budget for 2017. However, the critical W1/2 component of the budget was reduced by over one third following the System Council decision to not provide funds to two flagships and reduce management and support costs accordingly, in addition to the System-wide W1/2 shortfall. The CRP executed 83% of the budget. The low burn rate for W1/2 funding reflects a combination of: (i) a conservative approach taken in response to the funding uncertainty that was not resolved until very late in the year; (ii) a significant number of planned activities in the Genetics flagship that were subsequently funded through W3 instead of W1/2; (iii) Strategic Investment Fund commitments to multi-year activities; and (iv) the inclusion of the USD2.9 million carry-over from Livestock & Fish CRP that was confirmed mid-year and has not been allocated to activities. The lower burn rate for W3/bilateral funding reflects major new W3 projects that were in extended start-up phases. Carry-over of W1/2 funding from the Phase 1 Livestock & Fish is being allocated in 2018–2019 to strengthen the CRP engagement in its priority countries. Note that the minor W1/2 expenditure to FP5 was an accounting misunderstanding that is being corrected in 2018.

## Tables

Table A: Evidence on progress towards SLOs

Table A-1: Evidence on progress towards the SLOs (sphere of interest)

SLO Target (2022)	Brief summary of new evidence of CGIAR contribution to <i>relevant</i> targets for this CRP (with citation)	Expected additional contribution before end of 2022 (if not already fully covered).
<b>1.1.</b> 100 million more farm households have adopted improved varieties, breeds, trees, and/or management practices	CIAT's existing Urochloa hybrids were scaled on approximately 103,000 additional hectares in 23 countries in 2017. The hybrid Mulato II is still significantly increasing in sales, however, the two other, rather new hybrids Cayman (approx. 15,700 ha) and Cobra (approx. 252 ha) are gaining importance in the market as well ( <a href="#">link</a> ). The total area sown with CIAT hybrids is estimated to be 829,000 hectares in 30 countries by 2017.	We expect further adoption on at least 100,000 hectares annually.
<b>1.2.</b> 30 million people, of which 50% are women, assisted to exit poverty	No new evidence in 2017.	
<b>2.2.</b> 30 million more people, of which 50% are women, meeting minimum dietary energy requirements	No new evidence in 2017.	
<b>2.3.</b> 150 million more people, of which 50% are women, without deficiencies in one or more essential micronutrients	No new evidence in 2017.	
<b>3.1.</b> 5% increase in water and nutrient efficiency in agroecosystems	No new evidence in 2017.	
<b>3.2.</b> Reduction in 'agriculturally'-related greenhouse gas emissions by 5%	No new evidence in 2017.	
<b>3.3.</b> 55 M ha degraded land area restored	No new evidence in 2017.	

**Table A-2: List of New Outcome Case Studies from This Reporting Year (Sphere of Influence)**

No.	Title of outcome case study	No. of Sub-IDO	Links to evidence	Space for additional, very brief details, including on cross-cutting issues
1	The Kenya Livestock Insurance Program (KLIP) improved drought mitigation and enhanced food security for over 20,000 pastoralist households in 2017	Increased household capacity to cope with shocks	<a href="https://news.ilri.org/2017/02/21/record-payouts-being-made-by-kenya-government-and-insurers-to-protect-herders-facing-historic-drought/">https://news.ilri.org/2017/02/21/record-payouts-being-made-by-kenya-government-and-insurers-to-protect-herders-facing-historic-drought/</a>  <a href="https://mombasa-2018.climate-risk-transfer.org/documents/23/Executive_Seminar_on_Index-Based_Livestock_Insurance_17_18_April_2018_Day1_2_Kes4vcZFB.pdf">https://mombasa-2018.climate-risk-transfer.org/documents/23/Executive_Seminar_on_Index-Based_Livestock_Insurance_17_18_April_2018_Day1_2_Kes4vcZFB.pdf</a>	KLIP, a government of Kenya funded drought insurance program, paid out KES494 million to 22,000 vulnerable pastoralist households in 2017 alone. These pay-outs ensured that farmers could buy their own food as well as fodder, drugs and water for their livestock during periods of drought. Covering eight counties in Kenya, the program has enabled the beneficiaries to keep their animals alive after the failure of the short and long rains in 2016 and 2017.
2	Creating and supporting opportunities for small- and medium-sized enterprises in the pork value chain in Uganda	Increased livelihood opportunities  Diversified enterprise opportunities	<a href="http://www.devenishnutrition.com/press-releases/59/helping-to-drive-pig-production-in-uganda">http://www.devenishnutrition.com/press-releases/59/helping-to-drive-pig-production-in-uganda</a>  <a href="http://hdl.handle.net/10568/82747">http://hdl.handle.net/10568/82747</a>  <a href="http://www.rtb.cgiar.org/wp-content/uploads/2017/03/Bloch-2.7_Kyalo_V2_Arte.pdf">http://www.rtb.cgiar.org/wp-content/uploads/2017/03/Bloch-2.7_Kyalo_V2_Arte.pdf</a>	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, started under Livestock & Fish, also established multi-stakeholder platforms, providing business and networking opportunities and agribusiness linkages to emerging small- and medium-sized enterprises run by farmers and young entrepreneurs. This capacity development has expanded their horizons and provided business opportunities in training, selling feeds, providing pig artificial insemination services and trading in pork.
3	Bundling of animal health services increases access to quality services to more than 90% of pastoralists	Reduced livestock and fish disease risks associated with intensification and climate change  Conducive agricultural policy environment	<a href="http://www.technoserve.org/files/downloads/case-study_improving-livelihoods-by-saving-animals.pdf">http://www.technoserve.org/files/downloads/case-study_improving-livelihoods-by-saving-animals.pdf</a>  <a href="https://clippings.ilri.org/2017/03/20/ah-delivery/">https://clippings.ilri.org/2017/03/20/ah-delivery/</a>	Access to animal health services is one of the most important factors in improving livestock productivity. We piloted bundling of additional services by public and private sectors during vaccination campaigns. In two counties in Kenya, Garissa and Marsabit, it is now routine for the government to invite private sector actors to provide additional services while the government provides vaccinations. This has saved the government money, increased business opportunities for the private sector, and provided quality services to pastoralists at affordable prices.
4	Livestock master plan guides public and private investments in	Increased livelihood opportunities	<a href="https://clippings.ilri.org/2014/12/03/ethiopia-livestock-master-plan-presents-roadmaps-for-growth-and-transformation/">https://clippings.ilri.org/2014/12/03/ethiopia-livestock-master-plan-presents-roadmaps-for-growth-and-transformation/</a>	Livestock researchers and partners used their modelling expertise to provide a guide for public and private investments in Ethiopia, with the objective of reducing poverty;

	Ethiopia to lift more than two million households out of poverty	Reduced market barriers	<a href="https://clippings.ilri.org/2017/11/23/ilri-recognized-for-contributing-to-ethiopias-livestock-sector-growth/">https://clippings.ilri.org/2017/11/23/ilri-recognized-for-contributing-to-ethiopias-livestock-sector-growth/</a>	achieving food and nutritional security; contributing to economic growth, exports and foreign exchange earnings; and contributing to climate mitigation and adaptation. This roadmap, or master plan, was then used by various actors including the World Bank to shape their investments, which will ultimately impact more than 2.3 million of Ethiopia's 11 million livestock-keeping households. The CGIAR contribution was recognized by an honorary award from the government.
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Table B: Status of planned milestones

FP	Mapped and contributing to Sub-IDO	2022 CRP outcomes (from proposal)	2017 Milestone	2017 milestones status *	Provide evidence for completed milestones** or explanation for extended or cancelled
F1	Increased conservation and use of genetic resources	F1 Outcome: Outcome 1.1: Data on livestock diversity and systems, including from a gendered lens, used to develop or refine genetic improvement and / or conservation strategies by policymakers, national research and development partners, and the private sector, in five CRP priority countries and other locations.	2017—Milestone 1.1.1 Increased (household survey, productivity and genomics characterization) data availability (published open-access) on livestock diversity and systems, including from a gendered lens.	Extended	A considerable increase of genetic, phenotypic, environmental and production system data have been collected in 2017 with ongoing analysis. However, they have not yet all been made publicly available and therefore achievement of the milestone has been extended to 2018
	Closed yield gaps through improved agronomic and animal husbandry practices Enhanced genetic gain Increased livelihood opportunities Technologies that reduce women’s labour and energy expenditure developed and disseminated Increased conservation and use of genetic resources	F1 Outcome: Outcome 1.2 Genetic improvement strategies for improved livestock genetics implemented by national research and development partners, and the private sector in six CRP priority countries and other locations.	2017—Milestone 1.2.1 Increased understanding through the joint analysis of phenotypic recording and genome characterization data of livestock population performance to provide inputs to the design of genetic improvement strategies.	Complete	<ul style="list-style-type: none"> <li>• <a href="#">Chicken research project report</a> to BMGF</li> <li>• <a href="#">Dairy research project report</a> to BMGF</li> </ul>
			2017—Milestone 1.2.2 Breeding schemes developed and piloted in CRP priority countries.	Extended	Breeding scheme are now developed for <a href="#">small ruminants</a> . In chicken and dairy cattle, it was not possible to be achieved as it required information from milestone 1.2.1 which only became available end of 2017. Achievement of milestone 1.2.2 has therefore been extended to 2018 to finalize the breeding schemes development and to 2019 for their piloting in countries.
			2017—Milestone 1.2.3 Protocols in place for the collection of data for phenotypic and production systems characterisation, for	Extended	<a href="#">Protocols</a> completed for <a href="#">chicken</a> and <a href="#">dairy cattle</a> but remain to be developed for sheep in 2018. Genome editing <a href="#">facility</a> was established at ILRI Nairobi.

			genome editing and ex-situ conservation.		Poultry breeding facility at ILRI Addis built in 2017, to be opened in 2018.
	Technologies that reduce women's labour and energy expenditure developed and disseminated Enhanced genetic gain Increased livelihood opportunities Increased conservation and use of genetic resources	F1 Outcome: Outcome 1.3 Business models for multiplication and delivery of improved livestock genetics, to resource poor women and men livestock keepers, implemented by national research and development partners, and the private sector in five CRP priority countries and other locations.	2017—Milestone 1.3.1 Constraints and opportunities for institutional arrangements identified for CRP countries and focus species (evidenced by project reports).	Complete	Completed for dairy cattle and chicken. <ul style="list-style-type: none"> <li>• <a href="#">Chicken research report</a> to BMGF</li> <li>• <a href="#">Dairy research report</a> to BMGF</li> <li>• <a href="#">Public-private partnerships</a></li> <li>• <a href="#">Dairy performance centre</a>.</li> </ul>
	Closed yield gaps through improved agronomic and animal husbandry practices Increased conservation and use of genetic resources Increased livelihood opportunities Technologies that reduce women's labour and energy expenditure developed and disseminated Enhanced genetic gain	F1 Outcome: Outcome 1.5 Guidelines on policy and institutional arrangements for improvement and conservation of animal genetic resources adopted by policymakers, national research and development partners, and the private sector, in seven priority countries and other locations.	2017—Milestone 1.5.1 Draft guidelines on policy and institutional arrangements available for decision-makers to review, in specific CRP countries (e.g. certification of improved small ruminants in Ethiopia, pig breeding in India).	Extended	A set of 13 policy guidelines (AU-IBAR embargoed, available on request) on access and benefit sharing of animal genetic resources. Progress was also achieved on the development of guidelines on institutional arrangements needed for <a href="#">certification of breeding rams/bucks in Ethiopia</a> . However, in case of pig breeding in India the relevant linked activity (workshop) has now been postponed to 2018, and therefore the milestone is extended.
<b>F2</b>	Reduced livestock and fish disease risks associated with intensification and climate change	F2 Outcome: Outcome 2.1 Assessment tools for significance of animal diseases and risk maps for emergence of animal diseases are used by 100 local and national and 50 international research partners and donors to	2017—2.1.1 a) Gender-sensitive disease assessment tools harmonized across priority CRP countries and b) frameworks to quantify disease impacts and risk models developed.	Extended	The participatory epidemiology and gender assessment tool has been used in new countries, but formal publication of the tool which reflects recent optimisation has been delayed by the review process. Three papers linked to experiences of using the tool are expected for 2018. <a href="#">The tool</a> and evidence

		prioritize research and development interventions to reduce livestock disease risks for livestock keepers.			generated resulted in <a href="#">posters</a> , including <a href="#">one</a> presented at an international conference. The modelling framework to be used for the risk models has been agreed with FP5, and surveillance data from Uganda and Vietnam received. But additional data collection from farms is needed in 2018 in order to finish parametrizing the model.
	Closed yield gaps through improved agronomic and animal husbandry practices	F2 Outcome: Outcome 2.2 Context specific herd health management packages adopted by farmers, extension and animal health workers in priority countries and other locations.	2017—2.2.1 Robust and feasible framework developed to determine appropriate herd health packages, and package components, in priority CRP countries, considering production and social (gender, youth, livelihood) dimensions.	Extended	Initiating an important component of the work was significantly delayed due to the CGIAR financial arrangements which resulted in late disbursement of W1/2 funds to the implementing partner, SLU, which cannot pre-finance its activities. Despite this, progress was made and the milestone will be completed in 2018.
	Reduced biological and chemical hazards in the food system	F2 Outcome: Outcome 2.3 Livestock keepers have necessary knowledge of AMR and antiparasitic resistance to change their practices accordingly, piloted in two priority countries.	2017—2.3.1 Gender and youth sensitive protocols to assess availability and Knowledge-Attitude-Practices (KAP) for antimicrobials and anti-parasitic developed and tested.	Extended	A protocol was established in late 2017 (for antibiotics only) but a manuscript to make it available in the public domain was still in preparation. It will be published in 2018.
	Closed yield gaps through improved agronomic and animal husbandry practices	F2 Outcome: Outcome 2.4 National and international research partners, government agencies and the private sector use 2 novel diagnostic assays and vaccines for control of African swine fever (ASF), CBPP, CCPP, ECF and PPR in at least six priority countries.	2017—2.4.1 Vaccine production (PPR) and release (ECF-ITM) by partners in priority CRP countries (Tanzania, Uganda, Ethiopia and Vietnam).	Extended	During 2017 internal quality checks on different PPR vaccine formulations were completed with satisfactory results. Completing the milestone has been delayed by the requirement for external quality control testing by the Pan-African Vaccine Centre of the African Union, to which the vaccine batches were submitted at the end of 2017.
			2017—2.4.2 a) Proof of concept vaccine development (ECF, CCPP, CBPP, ASF); b) Evaluation of current vaccines (CBPP, PPR); c) Diagnostics	Extended	Each of the three components of the milestone had to be extended for the following reasons: a) ECF vaccine related data on immunogenicity trials with some antigens and on new

			development (CBPP, mycoplasma)		<p>candidate antigens were produced, but this part of the milestone had to be extended to complete publication of the results</p> <p>b) Efficacy testing of the Ben-1 live CBBP vaccine was completed, but results are currently subject to a confidentiality agreement. The PPR vaccine was not ready in time to start animal experiments in 2017. This will now be completed under the new EU-IFAD funded project.</p> <p>c) Contractual discussions with a private sector company that is interested in commercial production of a <a href="#">novel ELISA diagnostic test for CBPP</a> were not finalized as anticipated and have continued into 2018.</p>
	Closed yield gaps through improved agronomic and animal husbandry practices Technologies that reduce women's labour and energy expenditure developed and disseminated	F2 Outcome: Outcome 2.5 Improved access to livestock-related health services and products for female and male livestock keepers in four priority countries	2017—2.5.1 Gendered animal health service and product access current status in CRP priority countries well understood and documented.	Extended	A review of the availability and manufacturing capacity of veterinary vaccines in Mali, Ethiopia, Kenya, Tanzania, Uganda and Vietnam was completed, but is under review for publication, so milestone is extended to 2018.
2017—2.5.2 With partners, pilot-tested and/or scaled-up previously identified services and products.			Extended	Publication of results from activities taking health services to scale in Mali and Kenya was not completed, so is extended to 2018. The activity to scale up ITM in Tanzania was not completed due to project implementation issues and has been extended.	
<b>F3</b>	Closed yield gaps through improved agronomic and animal husbandry practices Technologies that reduce women's labour and energy expenditure	F3 Outcome: Outcome 3.1—Local, national and international research and development partners, the private sector, decision-makers and livestock producers are able to diagnose feed constraints and opportunities and to	2017—Research and development partners, decision makers and input suppliers use at least two tools designed or promoted by the CRP (e.g. LegumeCHOICE) for regional and national feed supply and demand scenarios in two priority countries (Vietnam, Ethiopia).	Complete	Two feed supply and analysis tools were enriched: a) a <a href="#">pilot tool</a> for <a href="#">feed supply-demand estimates</a> in Ethiopia; b) a preliminary legume database to support the <a href="#">LegumeCHOICE tool</a> for livestock producers. The open access Selection of Tropical Forages Tool ( <a href="#">SoFT</a> ) was updated and increased its reach in 2017 with total hits (visits) of 485,728, and 310,166 unique page views

	developed and disseminated	effectively prioritize and target feed and forage interventions, resulting in: a 10% improvement in utilization of feeds and forages, a 20% increase in animal production using improved feed and forage technologies, a 10% accuracy increase for biomass and quality estimation and at least 250,000 annual visitors to global databases, repositories, interactive tools and maps and the Tropical Grasslands—Forrajes Tropicales journal website.	Awareness of research partners increased through promotion of CRP generated knowledge through Tropical Grassland journal.		<a href="#">(link)</a> . The open access online journal Tropical Grasslands-Forrajes Tropicales ( <a href="#">TGFT</a> ) launched three <a href="#">issues</a> .
			2017—Knowledge updating: New equations for stationary and mobile NIRS integrated into platform for Colombia and Ethiopia.	Complete	We developed three new equations for stationary NIRS, each for one forage quality parameter (IVDM, NDF and ADF) specific for the screening of grasses. This helped in studying the quality parameters of 130 germplasm accessions of <i>M. maximus</i> from CIAT's gene bank using NIRS for the first time in history ( <a href="#">link</a> ). Two stationary NIRS equations were developed for <a href="#">Tef straw</a> and <a href="#">Cenchrus purpureus</a> .
	Closed yield gaps through improved agronomic and animal husbandry practices Technologies that reduce women's labour and energy expenditure developed and disseminated	F3 Outcome: Outcome 3.3— National and international research and development partners and the private sector are using CRP developed forage and rangeland resources (with enhanced traits), in 30 countries and reaching producers who plant over 2 million ha, to increase the rate of genetic gain and exploit the genetic diversity of forages and rangeland species to enhance stress-tolerance, biomass productivity and nutritive value.	2017—New cohort of promising <i>Urochloa</i> hybrids defined for later use in breeding activities. New crosses of breeding lines available for further research and already available forage hybrids scaled with private sector partner in at least 15 countries on 100,000 hectares.	Complete	81 new <i>Urochloa</i> interspecific <a href="#">hybrids</a> were defined, 27 <i>U. humidicola</i> hybrids were evaluated for spittlebug resistance and <a href="#">seed production</a> and 27 <i>U. humidicola</i> hybrids were screened for <a href="#">waterlogging tolerance</a> ; b) released <i>Urochloa</i> hybrids were further scaled on approximately 103,000 hectares in 23 countries <a href="#">in 2017</a> .
			2017—Genotyped CRP collections (e.g. <i>P.purpureum</i> ) to identify potential for enhancement and plans for improved phenotyping and genotyping efficiency developed.	Complete	A collection of 105 <a href="#">Napier grass accessions</a> was genotyped producing approximately 200,000 markers and a diversity analysis was conducted capturing genetic diversity. <a href="#">New phenotyping tools</a> were tested for suitability for improving selection and <a href="#">non-destructive methods</a> for screening forage plants under stress were evaluated. The potential of genomic selection was enriched for the <a href="#">Urochloa breeding program</a> .
			2017—Representative collections (3–5 species for diverse	Extended	This milestone was only partially achieved in 2017. The delay resulted from

			agro-ecosystems) of Cactae, Brachiaria and Panicum identified, characterized or promoted for release in North and East Africa and Colombia.		<p>changed release procedures affecting our <i>Urochloa</i> releases and the dependence on bilateral projects due to missing W1/2 funding. However, progress was made on achieving this milestone and we are confident that the milestone will be achieved in 2018.</p> <p>1) Progress made on species characterization: Advances were made on molecular and phenotypic characterization (e.g. related to <a href="#">water use</a>, <a href="#">environmental aspects</a> or <a href="#">nutritional quality</a>) for the core collection of <i>Megathyrus maximus</i> (Panicum) (137 germplasm accessions and 41 hybrids) contributing to hybrid breeding.</p> <p>2) Progress made on species promotion: A <a href="#">field day in Jhansi</a> (India) was organized to introduce cactus (<i>Opuntia ficus indica</i>) as a multi-purpose plant to farmers.</p>
Closed yield gaps through improved agronomic and animal husbandry practices Technologies that reduce women’s labour and energy expenditure developed and disseminated	F3 Outcome: Outcome 3.4—New forage and crop cultivars, superior to local (based on food, feed and fodder traits weighted according to target domains), made available by development partners, government agencies and the private sector and applied by farmers in seven priority counties and other locations.	2017—Milestone 3.4.1 Cultivars with potential for genetic enhancement identified (maize, rice, wheat, cowpea and barley)	Complete	New dual <a href="#">purpose cultivars identified</a> in maize, rice, wheat, cowpea and sorghum, and new forage sorghum and pearl millet cultivars were identified and <a href="#">tested</a> with commercial and smallholder dairy producers in Southern India. Two studies explored food-feed traits in Ethiopian naked-barley landraces and global barley genotypes. Submissions to journals are ongoing.	
Closed yield gaps through improved agronomic and animal husbandry practices	F3 Outcome: Outcome 3.5—Better utilization of existing and novel feed and forage resources through: scalable and gender-responsive processing	2017—Tools developed for increasing productivity while reducing feed and labour costs (India), considering gender-responsiveness and scalability.	Complete	A <a href="#">ration balancing tool</a> for Odisha state was developed. In addition, the potential of <a href="#">upgrading cereal straws and stovers</a> using technology developed for biofuel production for livestock feed was <a href="#">identified</a> .	

	Technologies that reduce women's labour and energy expenditure developed and disseminated More efficient use of inputs	technologies, management strategies to conserve and rehabilitate rangelands while producing, preserving and storing feed biomass and diet formulation that increases productivity while reducing overall feed and forage costs and environment impacts, by national and international development partners, government agencies and extension services, the private sector and community-based organizations in three priority countries.	2017—Assessment of current commercial and on-farm silage production (India). This will provide the basis for pilot-testing of on-farm and communal and private sector feed preservation approaches in 2018 with scaling-out in 2019.	Complete	A contract farming option for <a href="#">silage making</a> has been implemented by our partner Dodla Dairy in southern India. In addition, <a href="#">total mixed rations</a> were designed and tested with feed processors and smallholder dairy producers in India leading to superior yields compared to traditional feeding systems.
	More efficient use of inputs Closed yield gaps through improved agronomic and animal husbandry practices Technologies that reduce women's labour and energy expenditure developed and disseminated	F3 Outcome: Outcome 3.8— Increased delivery and uptake of feed and forage resources through proof-of-concept scaling, business model development and value-chain approaches by development partners, the private sector (feed and forage traders, feed processors) and (1 million by 2022) farmers across diverse environments in priority countries and other locations in Latin America, North and East Africa and South and Southeast Asia.	2017—Knowledge required for designing business models (e.g., cost-benefit analyses, business plans, evaluation adoption factors influencing uptake, sector review) developed for three countries (Tunisia, Kenya, Colombia). Business model development will start from 2018.	Complete	We developed a <a href="#">method for cost-benefit analysis</a> of improved forage technologies in Colombia that allows the financial evaluation of promising forages. Since this method serves for application in Latin America, a set of public and private sector <a href="#">actors from Nicaragua were trained</a> on its use. By using a different method for <a href="#">cost-benefit analysis</a> for forage technologies (oat and vetch forages) in central Kenya, we proved that applying these technologies results in positive returns for the farmers. We developed a <a href="#">methodology for qualitative assessment</a> of adoption factors for new forage technologies in Latin America that serves for the development of well-targeted dissemination strategies. Adoption factors were <a href="#">identified for Tanzania</a> using another approach. In addition, <a href="#">four business plans</a>



					for Tunisian feed block manufacturers were developed.
			2017—Identification of knowledge gaps around promising feed, forage and processing technologies in 2 countries (Tunisia, Colombia) that serve as a basis for the development of new extension approaches (in 2018) that enhance technology adoption and scaling.	Extended	This milestone was partially achieved and extended to 2018 due to a lack of W1/2 funds and limited bilateral project activities. The identification of knowledge gaps remains to be done for Tunisia and we are confident that this will be achieved in 2018 as W1/2 funds will now be able to support this activity. What we achieved was the <a href="#">identification of knowledge gaps</a> around forage technologies for Colombia that help in developing well-targeted extension approaches. Through bilateral project activities, a <a href="#">policy brief</a> on varietal release protocols for forage seed in Afghanistan and <a href="#">10 forage factsheets</a> for Eastern Africa were developed and support new extension approaches.
			2017—Exchange with Innovation Platforms, Roundtables and private sector around feed, forage and processing technologies established in at least 3 countries (Tunisia, Kenya, Colombia) as a first step to improve technology uptake	Complete	Achieved through participating in the <a href="#">Roundtable for sustainable cattle production</a> in Colombia, establishing private seed sector links and initial innovation <a href="#">platform meetings</a> in Kenya, and supporting the feed resource <a href="#">innovation platforms in Tunisia</a> . We also mapped the key players within the forage seed marketing system <a href="#">in Afghanistan</a> and conducted an in-depth forage <a href="#">value chain analysis in Kenya and Ethiopia</a> .
<b>F4</b>	More productive and equitable management of natural resources	F4 Outcome: Environmental concerns are considered in decision making across at least 10 priority countries and other locations, by national and international	2017—Framework for assessing environmental footprints of technologies and interventions developed and tested (in Kenya, Tanzania and Vietnam) and results and associated	Extended	The CLEANED framework tools have been tested in Kenya, Burkina Faso and Nicaragua. In Vietnam we applied a different type of ex-ante impact assessment using the FARM DESIGN <a href="#">tool</a> . (data: <a href="https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/LDLJ6D">https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/LDLJ6D</a> ). In

		development partners, government agencies and extension systems, including technology developers seeking to improve cattle, small ruminant and pig production.	assessment tools disseminated.		Tanzania, with CCAFS, we are also assessing trade-offs in 2018. The 2017 applications of the CLEANED <a href="#">framework</a> for assessing environmental footprints of technologies and interventions were focused mostly on feeds and forages, e.g. the collaborative study with Send-a-Cow in western Kenya and the forage intensification study in Nicaragua. In addition, efforts on dissemination of the CLEANED tools and results were undertaken, with e.g. the publishing of the CLEANED-X model and a joint KALRO-Send a Cow-CIAT workshop to discuss the implications of the Western Kenya results for farmers and development partners. In Burkina Faso the framework was used very successfully in a workshop with partners under a bilateral project. <ul style="list-style-type: none"> <li>• <a href="https://github.com/pfeifer/CLEANED-R">https://github.com/pfeifer/CLEANED-R</a></li> <li>• <a href="http://hdl.handle.net/10568/93076">http://hdl.handle.net/10568/93076</a></li> <li>• <a href="http://hdl.handle.net/10568/93069">http://hdl.handle.net/10568/93069</a></li> </ul>
More productive and equitable management of natural resources	F4 Outcome: Government agencies and development partners at local and national levels across at least 10 priority countries and other locations are promoting environmental management options.	2017—GHG emissions from three common livestock production systems using standard technologies assessed in Kenya, Tanzania and Vietnam	Extended	This has been completed for Kenya, however, delays in research mean that in Tanzania data collection is still ongoing with data analysis to be completed in 2018. In the case of Vietnam, we received additional funds allowing for six more months of data collection into 2018 and a more complete analysis. In Kenya GHG emissions are in press for both manure and ruminant emissions (Ndung'u et al in press; Owino et al in press)	
Land, water and forest degradation (Including deforestation) minimized and reversed	F4 Outcome: National government agencies across at least five priority countries design and implement key policies to improve	2017—Synthesis of policy issues on reducing GHG emissions from livestock published	Extended	The work on policy issues for reducing GHG emissions, which is largely undertaken with projects linked to CCAFS, has proven to be more complicated than anticipated. This is due to	

	Increased resilience of agro-ecosystems and communities, especially those including smallholders	the environmental management of livestock systems			the slow pace of development of actual implementation strategies for countries to implement their NDC targets through the livestock sector. Hence although we had a number of discussions on these issues with ministry staff (Livestock and Climate Change Units) in Kenya and Ethiopia, it seemed premature to write a brief in 2017 as these discussions were still ongoing. We are confident in producing a brief in 2018 as we are just starting a new joint activity under CCAFS with funds from the German Government.
<b>F5</b>	Increased access to diverse nutrient-rich foods Conducive agricultural policy environment	F5 Outcome: Outcome 5.1— National and international research partners and policymakers use analyses of livestock-sector dynamics, investment and ex-ante impact assessments to guide priority setting, investment and policy development for the livestock sector in six priority CRP countries	2017—Milestone 5.1.2—Strategic analysis of animal source food supply and demand to 2030 and 2050 conducted, including analysis of the resulting food security implications.	Extended to 2018	The strategic analysis takes the form of scenario analysis to explore targeted livestock investments, assessing the impacts in sub-Saharan Africa and South Asia. It was drafted as a paper and submitted for publication in 2017. The editors of the special Issue in which it will appear requested an additional round of reviews and so final publication has been delayed to 2018.
	Increased household capacity to cope with shocks Increased livelihood opportunities	F5 Outcome: Outcome 5.5— Livestock communities across four priority countries apply tested technologies, management strategies and institutional arrangements that have been developed through system optimization, taking the multiple functions of livestock into account.	2017—Milestone 5.5.1—Generate evidence (publications) on the role of livestock in enhancing resilience capacity and production system competitiveness in dryland and mixed systems (North Africa and Somalia drylands, small ruminant and pig value-chains in Ethiopia and Uganda).	Completed (target countries changed in some cases to better focus on CRP priority countries)	Together, three outputs were produced that cover a range of contrasting examples as to how improved livestock value chain performance can enhance livelihoods and resilience.  Report on technologies to enhance small ruminants value chains performance and address identified constraints in Pakistan <a href="http://hdl.handle.net/20.500.11766/8244">http://hdl.handle.net/20.500.11766/8244</a>  Participatory system dynamics modelling for dairy value chain development in

					<p>Nicaragua  <a href="http://hdl.handle.net/10568/83181">http://hdl.handle.net/10568/83181</a></p> <p>Site intervention plans designed through the Small Ruminant Meat value chain transformation in Ethiopia (SmaRT) project workshop in April 2017  <a href="http://hdl.handle.net/20.500.11766/8245">http://hdl.handle.net/20.500.11766/8245</a></p>
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\* Complete, extended or cancelled

\*\* Provide link to any relevant open accessible document.

**Table C: Cross-cutting aspect of outputs**

Cross-cutting	Number (%) scored 2 (Principal)	Number (%) scored 1 (significant)	Number (%) scored 0	Total overall number of outputs
Gender	2.25%	19.85%	77.90%	267
Youth	0.37%	7.49%	92.13%	
CapDev	3.00%	25.84%	71.16%	

Table D: Common results reporting indicators

Table D-1: Key CRP results from 2017, in numbers

Sphere	Indicators	Data	Comments
Influence	I1/I2*. Projected uptake (women and men) /hectares from current CRP investments (for innovations at user-ready or scaling stage only – see indicator C1)	CIAT’s existing Urochloa hybrids were scaled on approximately 103,000 additional hectares in 23 countries in 2017. The hybrid Mulato II is still significantly increasing in sales, however, the two other, rather new hybrids Cayman (approx. 15,700 ha) and Cobra (approx. 252 ha) are gaining importance in the market as well ( <a href="#">link</a> ). The total area sown with CIAT hybrids is estimated to be 829,000 hectares in 30 countries by 2017. Main countries: Brazil, Mexico. Increasing uptake in East Africa.	We expect further adoption on at least 100,000 hectares annually.
	I3. Number of policies/ investments (etc) modified in 2017, informed by CGIAR research	1 major international policy brief	Policy brief on the role of genetic diversity in adapting African livestock production to climate change
		1 national policy on bundling of animal health services	See Table A-2, OICS No. 3
		2 major investments	See Table A-2, OICS No. 1 and OICS No. 4
	3 curricula	On improving dairy cattle productivity, animal breeding and genetics, and training vaccinators in ITM against ECF	
Control	C1. Number of innovations by phase - new in 2017	5 innovations at proof of concept 1 piloted successfully 5 available for uptake 0 taken up by next users	See Table D-2 for details
	C2. Number of formal partnerships in 2017, by purpose (ongoing + new)	Overall the CRP had 156 active partnerships in 2017, 59 with non-CRP core implementing partners. The key partner organizations (some of which were involved in multiple partnerships with different Flagships and Projects) were as follows. 35 research partnerships: <ul style="list-style-type: none"> <li>▪ 11 developed country universities (in UK, USA, Australia, the Netherlands, Germany, Denmark)</li> <li>▪ 5 developing country universities (in Tanzania, Uganda, Rwanda, Somaliland and Vietnam)</li> <li>▪ 10 National Agricultural Research Institutions (in Ethiopia, Tunisia, Zambia, Ethiopia, India, Uganda and Colombia)</li> <li>▪ 2 international research institutions (CSIRO Australia and JC Craig Venter USA)</li> <li>▪ 3 development organizations (GIZ, GALVmed and RTI International)</li> <li>▪ 1 UN Agency (FAO)</li> <li>▪ 1 government agency (Germany)</li> <li>▪ 2 private sector companies (Phaesun and StratDever)</li> </ul> 4 policy partners:	See Table G for key partnerships per Flagship

	<ul style="list-style-type: none"> <li>▪ 1 CGIAR centre(IFPRI)</li> <li>▪ 3 government agencies (Pakistan, Rwanda and Ethiopia)</li> </ul> <p>5 delivery partners:</p> <ul style="list-style-type: none"> <li>▪ 2 development organizations (Technoserve and Heifer International)</li> <li>▪ 1 social enterprise (Farmer Input Promotion-FIPS Africa)</li> <li>▪ 1 UN Agency (FAO)</li> <li>▪ 1 government agency (Tanzania)</li> </ul>	
<b>C3. Participants in CGIAR activities 2017</b> (new +ongoing)	8,706 'end-users' (at least 8% women) in on-farm trials, farmer field days and similar 1,539 'next users' (at least 40% women) in innovation platforms, policy workshops and similar	Exact number of women was not recorded in all cases
<b>C4. People trained in 2017</b>	Long term: 44 (at least 34% women) Short term: 1,471 (at least 23% women) Academic degree: 19 (53% women)	Exact number of women was not recorded in all cases 3 BSc, 9 MSc and 7 PhD
<b>C5. Number of peer-reviewed publications</b>	94 peer-reviewed journal articles were published in 2017 (66% open access, 90% in ISI journals). Some of these articles are associated with 14 open-access datasets, which represent 78% of reported datasets.	Details of all these peer-reviewed publications are recorded in MARLO
<b>C6. Altmetrics</b>	The 5 highest scoring items in 2017 were: 1) A journal article published in February 2017 in Genome Biology on The Genome Landscape of Indigenous Cattle. 2) A journal article published in December 2017 in the International Journal for Parasitology on Characterization of the <i>Theileria parva</i> sporozoite proteome. 3) A journal article published in May 2017 in Animal on Assessment of lifetime performance of small ruminants under different feeding systems. 4) A journal article published in March 2017 in Livestock Science on Micro-economic analysis of the potential impact of contagious bovine pleuropneumonia and its control by vaccination in Narok district of Kenya. 5) A blog on the CRP Livestock webpage from July 2017 on Biosecurity measures to mitigate African swine fever in Uganda's pig value chains.	The Altmetric Explorer report and the detailed score report in Excel are attached as annexes to this Annual Report

\*Please note: I = Sphere of influence and C = Sphere of control

**Table D-2: List of CRP innovations in 2017 (From indicator #C1 in Table D-1)**

<b>Title of innovation (minimum required for clarity)</b>	<b>Phase of research *</b>	<b>Novel or adaptive research</b>	<b>Contribution of CRP (sole, lead, contributor)</b>	<b>Geographic scope: for innovations in phases AV* or USE* only (one country, region, multi- country, global)</b>
CLEANED tools	AV	Novel	Lead	Multi-country (Kenya, Nicaragua, Tanzania)
Index based livestock insurance	AV	Adaptive	Lead	Ethiopia
New Brachiaria hybrid “Camello”	AV	Adaptive	Sole	Global
Napier grass core population	AV	Adaptive	Lead	Global
The Producers Organisation Sustainability Assessment (POSA)	AV	Novel	Contributor	Multi-country (Kenya, Rwanda, Uganda)
Smallholder dairy training manual	PIL	Adaptive	Lead	Region (Eastern Africa)
Heat stress mapping for pigs	PC	Adaptive	Sole	Uganda
Equations for stationary NIRS for Urochloa humidicola	PC	Novel	Sole	Global
Method for cost-benefit analysis of improved forage technologies	PC	Novel	Lead	Colombia
Innovative solar powered milk cooling system	PC	Novel	Lead	Multi-country (Kenya, Tunisia)
Women Empowerment in Livestock Index (WELI)	PC	Novel	Lead	Tanzania

\* Phases: PC—proof of concept, PIL—successful pilot, AV—available/ready for uptake, USE—uptake by next users.

**Table E: Intellectual assets**

<b>Year reported</b>	<b>Applicant(s) / owner(s) (centre or partner)</b>	<b>Patent or PVP Title</b>	<b>Additional information*</b>	<b>Link or PDF of published application/ registration</b>	<b>Public communication relevant to the application/registration</b>
No new intellectual assets to report in 2017					



Table F: Main Areas of W1/2 Expenditure in 2017

Expenditure area	Estimated % of total W1/2 funding in 2017*	Comments
Planned research: principal or sole funding source	77.2%	
Planned research: Leveraging W3/bilateral funding	1.8%	
Catalysing new research areas	0.0%	
Gender	1.3%	Activities tagged as “principal” only
Youth	0.2%	Youth strategy development (also included under Strategic Investment Fund budget)
Capacity development	1.8%	Activities tagged as “principal” plus capacity development strategy (also included under Strategic Investment Fund budget)
Start-up or maintenance of partnerships	0.0%	
Monitoring, learning and self-evaluation	1.0%	Part of CRP management budget
Evaluation studies and Impact Assessment studies	0.0%	
Emergency/contingency	0.0%	
Flagship management	2.3%	
Strategic Investment Fund	3.7%	
CRP management	13.5%	
<b>TOTAL FUNDING (AMOUNT)</b>	<b>USD11,746,000</b>	

\* (i) some funding may fit more than one category but please try to apportion funding to its principal use (ii) percentages may not add up to 100%

Table G: List of key external partnerships

FP	Stage of research*	Name of partner	Partner type*	Main area of partnership*
FP1 Genetics cluster 1 and 2	Phase 1 and phase 2 piloting2	University of Edinburgh	Academic and research	Bioinformatics, genome association data analysis of cattle, health genetics
FP1 Genetics cluster 1 and 2	Phase 1 and phase 2 piloting2	University of Nottingham	Academic and research	Data analysis by PhD students
FP1 Genetics cluster 2	Phase 1 and phase 2 piloting2	University of New England	Academic and research	Selection of markers and data analysis
FP1 Genetics cluster 2	Phase 1	Wageningen University and Research Centre	Academic and research	Development of analytical tools/models for environmental suitability maps in chicken
FP2 Health cluster 3	Phase 1	University of Washington	Academic and research	Access to novel artificial virus-like particle technology in support of vaccine development studies
FP2 Health cluster 3	Phase 1 research	GALVmed	Development organization	Making improvements to the live ITM vaccine for ECF
FP2 Health cluster 3	Phase 1 research	Federal Ministry of Food and Agriculture (Germany)	Government	Diagnostic and vaccine development
FP2 Health cluster 3	Phase 1 research	University of Copenhagen	Academic and research	Immunology
FP2 Health cluster 3	Phase 1 research	J. Craig Venter Institute	Academic and research	Mycoplasma research and genomics
FP3 Feeds and Forages cluster 2	Phase 1 research	<i>Corporación Colombiana de Investigación Agropecuaria (CORPOICA)</i>	Academic and Research	Evaluation of forage materials
FP3 Feeds and Forages cluster 3	Phase 2 piloting	ACDI-VOCA	Development organization	Providing a link between farmers, the private sector and CGIAR centres
FP5 Livelihoods clusters 1 and 2	Phase 1 research	IFPRI	CGIAR	Joint foresight impact monitoring, gender (WELI, WEAI and associated tools)
FP5 Livelihoods cluster 3	Phase 1 research	Emory University	Academic and research	Nutrition, diets, gender and social behaviour change
FP5 Livelihoods cluster 4	Phase 2 piloting	Ethiopian Institute of Agricultural Research (EIAR), Amhara Region Agricultural Research Institute, Southern Agricultural Research Institute, Oromia Agricultural Research Institute, Tigray Agricultural Research Institute	Academic and research (NARS)	EIAR coordinates sheep and goat research nationally and was responsible for aligning objectives of the IFAD funded SmarT project with the national strategy; the regional centres were responsible for implementation of agreed project activities in the seven value chain sites in Ethiopia and supported the project with staff time and facilities of the designated local research centres.

FP5 Livelihoods cluster 5	Phase 3/4 scaling	Heifer International	Development organization	Dairy value chain, East Africa
FP5 Livelihoods cluster 5	Phase 3/4 scaling	Technoserve	Development organization	Dairy value chain and business models, East Africa

In addition to the formal partnerships above, FP2 also partnered with the Ethiopian Veterinary Association for piloting and with private distributors (Pharmavacs, Dulle vet and Vet Life) for scaling up and scaling out of vaccines.

Table H: Status of Internal (CGIAR) Collaborations among Programs and between the Program and Platforms

Name of CRP or Platform	Brief description of collaboration (give and take among CRPs) and value added	Relevant FP
A4NH	The issue of AMR has been receiving a great deal of attention. The two CRPs have initiated work together to develop a CGIAR agenda to address it. In 2017, the Livestock CRP focused on developing data collection tools to characterize antimicrobial use, knowledge and practices in smallholder livestock systems as its contribution to the joint effort.	A4NH FP5 Improving Human Health LIVESTOCK FP2 Livestock Health
Excellence in Breeding	The link with the Excellence in Breeding platform enhances breeding and pre-breeding efficiency capitalizing on state-of-the-art methodology and approaches while contributing with specific expertise e.g. on apomixis	Excellence in Breeding Livestock FP3 Feeds and Forages
Genebank	Contributing to the development of the Tropical Forage Germplasm Strategy. The update of Tropical Forages Selection tool (SoFT) is linking with Genebank managers and the Global Crop Trust to identify possibilities for interconnectivity between Genebank tools and the selection tool.	Genebank Livestock FP3 Feeds and Forages
PIM Gender platform	The Livestock CRP is an active contributor to the CGIAR Gender Platform with the Livestock CRP gender coordinator as a member of the advisory committee. Two CRP post docs are jointly funded with the Platform through the Systems office.	Livestock FP5 Livelihoods
PIM	Joint development continued of the livestock module of the IMPACT model, hosted by IFPRI, used for global agricultural development scenarios. While improving the livestock module, we are also producing joint publications from the results. In addition, we work closely with the PIM value chain team (their FS3) on joint development of value chain analysis tools. PIM is also funding some specific studies, such as assessment of dairy business hubs, that are closely integrated into Livestock FP5 work.	PIM FP1 and FP3 Livestock FP5 Livelihoods

## Table I: Monitoring, evaluation, impact assessment and learning

Table I-1: Status of evaluations, impact assessments and other learning exercises planned in the 2017 POWB

Studies/learning exercises in 2017 (from POWB)	Status	Comments
No CRP led evaluations or impact assessments completed in 2017		

Table I-2: Update on actions taken in response to relevant evaluations (IEA, CCEEs and others)

Name of the evaluation	Recommendation	Management response – Action Plan	By whom	By when	Status
No external evaluations completed in 2017					

## Table J: CRP financial report

	Planned budget 2017			Actual expenditure 2017*				Difference			
	W1/2	W3/ bilateral	Total	W1/2	W3/ bilateral	Centre own funds	Total	W1/2	W3/ bilateral	Centre own funds	Total
FP1 – Livestock Genetics	4,543	8,541	13,084	2,633	6,066	0	8,698	1,910	2,475	0	4,386
FP2 – Livestock Health**	3,978	5,710	9,688	2,884	3,430	0	6,314	1,094	2,280	0	3,374
FP3 – Livestock Feeds and Forages	0	7,027	7,027	0	3,870	542	4,412	0	3,156	(542)	2,614
FP4 – Livestock and the Environment	3,426	7,663	11,089	2,265	9,895	248	12,407	1,161	(2,231)	(248)	(1,318)
FP5 – Livestock Livelihoods and Agri-Food Systems	0	12,618	12,618	69	12,510	19	12,958	(69)	109	(19)	21
Strategic Investment Fund	2,042	0	2,042	650	0	0	650	1,392	0	0	1,392
CRP management and support	2,660	59	2,719	3,245	2	0	3,247	(585)	57	0	(528)
<b>CRP total</b>	<b>16,649</b>	<b>41,618</b>	<b>58,267</b>	<b>11,746</b>	<b>35,773</b>	<b>809</b>	<b>48,328</b>	<b>4,903</b>	<b>5,845</b>	<b>(809)</b>	<b>9,940</b>

\*Source [Audited lead and participating centre annual financial report]

\*\*In addition to the CRP budget managed within the System, FP2 benefitted from an additional USD40,000 funding for an activity (AgriFose) managed by SLU outside of the System financial accounts. The activity produced a review of animal health delivery in Vietnam that contributed to the FP2 outcome 2.1.

# ANNEX 1: CGIAR Outcome/ Impact Case Studies

## CGIAR outcome/ impact case study #1

### 1. Title

**The Kenya Livestock Insurance Program (KLIP) improved drought mitigation and enhanced food security for over 20,000 pastoralist households in 2017.**

### 2. Short outcome/impact statement

KLIP, a government of Kenya funded drought insurance program, paid out USD494 million to 22,000 vulnerable pastoralist households in 2017 alone. These pay-outs ensured that farmers could buy their own food as well as fodder, drugs and water for their livestock during periods of drought. Covering eight counties in Kenya, the program has enabled the beneficiaries to keep their animals alive after the failure of the short and long rains in 2016 and 2017.

### 3. Link to common results reporting indicator #I3

Policy/investment type: Budget or Investment

Amount: USD4,688,345

Implementing organization type: Government

Stage in process: Stage 2 – Policy/Law etc. enacted

### 4. Maturity of change reported

**Stage 2:** (*sphere of influence*) CGIAR research (and related activities) has contributed to documented policy<sup>3</sup> change and/or a change in practice by end users. This may include changes such as income, nutrient intake etc. in the sphere of influence (e.g. project level). Example of evidence: a study of adoption and effects, commissioned at project level.

### 5. Links to the Strategic Results Framework

5. a) Sub-IDOs - Increased household capacity to cope with shocks

5. b) SRF 2022/2030 targets - # of people, of which 50% are women, assisted to exit poverty

### 6. Geographic scope - Countries

6. a) Kenya

### 7. Key Contributors

Contributing CRPs : Livestock CRP

Contributing Flagships: Livestock and the environment

Contributing external partners:

- *Government:* State Department of Livestock, Ministry of Agriculture, Livestock and Fisheries
- *Insurance companies:* APA Insurance Ltd led consortium (2015 – 2017), Takaful Insurance of Africa (2018)
- *Reinsurance partner:* Swiss Re
- *Technical Assistance partners:* World Bank Group, International Livestock Research Institute, Financial Sector Deepening

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<sup>3</sup> See common reporting indicator #I3 for definitions of what is included under the term 'policy'

## 8. Elaboration of Outcome/Impact Statement

KLIP is an insurance program for pastoralists located in the Arid and Semi-Arid Lands (ASAL) counties of Kenya. Implemented with technical assistance from ILRI, the program limits livestock losses through early compensation allowing pastoralists to protect their assets. Pay-outs are pegged to measurements of forage conditions made via satellite data on vegetation cover to derive an index of seasonal forage availability/scarcity. Once pay-outs are triggered, registered pastoralists in the affected areas are eligible for compensation.

The program began in 2015 in two pilot counties: Wajir and Turkana, each with 2500 beneficiaries. The first insurance contract was signed by the State Department of Livestock (SDL) and a consortium of insurance underwriters (led by APA) at a cost of KES58,393,734. It expanded in 2016 to cover Isiolo, Marsabit, Mandera and Tana River counties. The second KLIP contract was signed in 2016. It covered 14,000 people and was also signed by the APA-led consortium of insurance underwriters. The cost of premiums for this contract was KES164,440,734.

In 2016 KLIP paid a total of KES3.5 million to 275 households in Wajir due to the failure of the long rains in that year. In February 2017, it paid out more than KES214 million to 12,000 households in six counties. Later in August 2017, it made another pay-out worth slightly more than KES319 million to 11,407 beneficiaries across seven counties (1). A third KLIP contract covering eight counties and 18,000 households was signed with Takaful insurance in 2017 for one year. The premiums in this contract are worth KES246 million. Failure of the short rains (October-December 2017) has triggered KES175m worth of insurance claims, to be paid to 9,700 beneficiaries.

The program has improved pastoral drought mitigation through enhanced access to forage, water and veterinary services for animals during dry periods. It has also contributed to food security and resilience building in pastoral communities. A tele-survey conducted in Marsabit and Wajir revealed that KLIP pay-outs are utilized on household needs including food, education and debt payment, averaging about 76%, 44% and 66% respectively. Utilization of KLIP payment on livestock-specific needs averaged at 33%, 33%, 15% and 16% respectively. Overall, there is diverse use of KLIP indemnity pay-outs across all seasons in the two counties. (2)

Currently KLIP is operational in eight counties, with plans underway to reach all 14 ASAL counties of Kenya.

## 9. References cited

1. Kyuma, R. 2018. Progress of Implementation of KLIP (PowerPoint Slides). Retrieved from [https://mombasa-2018.climate-risk-transfer.org/documents/23/Executive\\_Seminar\\_on\\_Index-Based\\_Livestock\\_Insurance\\_17\\_18\\_April\\_2018\\_Day1\\_2\\_K\\_s4vcZFB.pdf](https://mombasa-2018.climate-risk-transfer.org/documents/23/Executive_Seminar_on_Index-Based_Livestock_Insurance_17_18_April_2018_Day1_2_K_s4vcZFB.pdf)
2. Chelanga P, et al. 2018. Pastoralists' access and use of indemnity pay-outs through Kenya Livestock Insurance Program (Unpublished report)

## 10. Quantification

21,975 pastoralists have benefited from pay-outs to date.

## 11. Gender, youth and capacity development

Gender – 0

Youth – 0

CapDev – 0



## 12. Other cross-cutting dimensions

N/A

## 13. Communications materials

- <https://news.ilri.org/2017/02/21/record-payouts-being-made-by-kenya-government-and-insurers-to-protect-herders-facing-historic-drought/>

## 13. Contact person

- Andrew Mude, principal scientist (economist), Livestock CRP, ILRI, [a.mude@cgiar.org](mailto:a.mude@cgiar.org)
- Philemon Chelanga, research analyst, Livestock CRP, ILRI, [p.chelanga@cgiar.org](mailto:p.chelanga@cgiar.org)
- Duncan Khalai, market and capacity development specialist, Livestock CRP, ILRI, [d.khalai@cgiar.org](mailto:d.khalai@cgiar.org)

# CGIAR outcome/ impact case study #2

## 1. Title

**Livestock master plan guides public and private investments in Ethiopia to lift more than 2 million households out of poverty**

## 2. Short outcome/impact statement

LIVESTOCK researchers and partners used their modelling expertise to provide a guide for public and private investments in Ethiopia, with the objective of reducing poverty; achieving food and nutritional security; contributing to economic growth, exports and foreign exchange earnings; and contributing to climate mitigation and adaptation. This roadmap, or master plan, was then used by various actors including the World Bank to shape their investments, which will ultimately impact more than 2.3 million of Ethiopia's 11 million livestock-keeping households.

## 3. Link to common results reporting indicator #I3

Policy/Investment Type: Budget or Investment

Amount: USD150 million

Implementing organization type: Multilateral

Stage in process: Stage 1 – research taken up by next user

## 4. Maturity of change reported

**Stage 2:** (*sphere of influence*) CGIAR research (and related activities) has contributed to documented policy<sup>4</sup> change and/or a change in practice by end users. This may include changes such as income, nutrient intake etc. in the sphere of influence (e.g. project level). Example of evidence: a study of adoption and effects, commissioned at project level.

## 5. Links to the strategic results framework

5. a) Sub-IDOs – increased livelihood opportunities, reduced market barriers

5. b) SRF 2022/2030 targets - # of people, of which 50% are women, assisted to exit poverty

## 6. Geographic scope—countries

6. a) Ethiopia

6. b) A similar process has started in Tanzania, Rwanda and Bihar (India)

## 7. Key contributors

Contributing CRPs: LIVESTOCK

Contributing Flagships: LLAFS

Contributing external partners: Government of Ethiopia

## 8. Elaboration of outcome/impact statement

Using the most recently available data, from 2013, the Ethiopia Livestock State Ministry (LSM) and the International Livestock Research Institute (ILRI) employed the Livestock Sector Investment and Policy Toolkit (LSIPT) to develop herd and sector models and a baseline and foresight assessment of potential livestock development in Ethiopia. The toolkit was initially developed by CIRAD and partners. The models were used to assess the potential 15–20-year impact of combined technology and policy interventions, referred to as the

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<sup>4</sup> See common reporting indicator #I3 for definitions of what is included under the term 'policy'

livestock sector analysis (LSA). The LSA was then used to develop a five-year investment roadmap or livestock master plan (LMP). In turn, the LMP formed the basis for the development of the GoE's Growth and Transformation Plan II (GTP II) livestock targets for the years 2015–2020. The LSA and LMP interventions were tested using the sector model measures of GoE livestock development and policy objectives for the GTP II. The GTP II objectives employed to assess the investment interventions of the Ethiopia LMP were the following:

- Reduce poverty;
- Achieve food and nutritional security;
- Contribute to economic growth (GDP);
- Contribute to exports and foreign exchange earnings; and
- Contribute to climate mitigation and adaptation.

The Ethiopian LMP, supported by LIVESTOCK researchers and launched by the Government of Ethiopia in 2016, has provided the framework for a new loan from the World Bank for a USD 170 million investment to develop the Ethiopian livestock industry. The Ethiopian government is further investing in improving primary production through improved animal genetics and vaccination programs to lower ruminant morbidity and mortality. It is also supporting greater value addition from the livestock sector by setting up four agro-industrial parks. Among the GOE's development partners, BMGF is planning a USD 25 million investment and USAID is planning to invest USD 50 million for implementing the LMP and the EU, the Netherlands and New Zealand are preparing projects to help fund sector investment programs. The plan has also informed private investment of more than USD120 million in value added processing, including a USD 95 million investment by a meat export company, USD 10 million in dairy processing, and about USD 20 million in day-old-chick production for broilers and layers.

The LSA and LMP analysis projects that higher productivity and income levels resulting from the LMP investment interventions would lift out of poverty more than 2.3 million of Ethiopia's 11 million livestock-keeping households.

## 9. References cited

Ministry of Agriculture. 2015. Ethiopia livestock master plan: Roadmaps for growth and transformation. Addis Ababa: Ministry of Agriculture and Nairobi, Kenya: ILRI. <http://hdl.handle.net/10568/68037>  
Shapiro, B.I., Gebru, G., Desta, S., Negassa, A., Nigussie, K., Aboset G. and Mechale. H. 2017. [Ethiopia livestock sector analysis](#). ILRI Project Report. Nairobi, Kenya: International Livestock Research Institute (ILRI)

Regarding the World Bank investments:

<http://documents.worldbank.org/curated/en/392591478726570546/pdf/ITM00184-P159382-11-09-2016-1478726567434.pdf>), section 8

Op-ed, The Times newspaper - <https://www.ft.com/content/796e4fe4-6554-11e7-9a66-93fb352ba1fe>  
(reference to 4 agro-industry parks to attract private sector investment in agro-processing, to help speed up the transformation of the livestock sector.)

Additional newspaper articles about investment in livestock but without mentioning LMP

1. USD75 million investment by a subsidiary of Allana Group – Frigorifico Boran Foods Plc, commissioned in 2017 in Adami Tulu, 163kms from the Ethiopia capital, Addis Abeba. <http://www.africanews.com/2017/03/26/ethiopias-75m-abattoir-set-to-be-operational-next-month>. There are also \$20 million invested by Allana to buy an offal processing plant near Modjo, around 2015 or 2016.
2. EthioChicken, established in 2010, has already produced and sold 13 million chicks in Ethiopia. The company currently employs directly more than 700 people, of whom 40 percent are women. In

addition, the company cooperates with approximately 1800 agents employing thousands of people. When the number of households buying the chickens are added to this, it can be estimated that the company positively affected up to 1.6 million households, or more than 6 million Ethiopians, in 2016.

3. Finnfund has granted Agflow Poultry, owner of EthioChicken, a loan of USD 10 million. The aim is to support the development and expansion of the company's operations in Ethiopia.

[https://www.finnfund.fi/ajankohtaista/uutiset17/en\\_GB/ethiochicken/](https://www.finnfund.fi/ajankohtaista/uutiset17/en_GB/ethiochicken/)

## 10. Quantification

For now, quantification is limited to projections of potential impact should the LMP be fully funded and executed based on the Livestock Sector Analysis, which predicts that more than 2.3 million of Ethiopia's 11 million livestock-keeping households would benefit from higher productivity and income to lift them out of poverty. At an average five members per household, this represents 11.5 million people.

## 11. Gender, youth, and capacity development

Gender = 0

Youth = 0

Capacity Development = 1

In the process of developing the LMP in Ethiopia, and at the request of the Government, the ILRI team has been building national capacity for fact-based, realistic financial planning in livestock ministries through training and technical support to 6 ministry staff. Using the Livestock Sector Investment and Policy Toolkit (LSIPT) and related tools developed under the auspices of AU-IBAR jointly with the World Bank, CIRAD and FAO, ILRI built dynamic herd and economic sector models, made projections to set targets and conducted foresight scenario analyses to create 15-year livestock sector strategies, which were used to develop the 5-year LMP.

## 12. Other cross-cutting dimensions

N/A

## 13. Communications materials

<https://clippings.ilri.org/2014/12/03/ethiopia-livestock-master-plan-presents-roadmaps-for-growth-and-transformation>

## 13. Contact person

Barry Shapiro, senior livestock development advisor, CRP Livestock, ILRI, Email: [b.shapiro@cgiar.org](mailto:b.shapiro@cgiar.org)

# CGIAR outcome/ impact case study #3

## 1. Title

**Creating and supporting SME opportunities in the pork value chain in Uganda**

## 2. Short outcome/impact statement

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, started under Livestock & Fish, also established multi-stakeholder platforms, 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.

## 3. Link to common results reporting indicator #i3

N/A

## 4. Maturity of change reported

**Stage 2:** (*sphere of influence*) CGIAR research (and related activities) has contributed to documented policy<sup>5</sup> change and/or a change in practice by end users. This may include changes such as income, nutrient intake etc. in the sphere of influence (e.g. project level). Example of evidence: a study of adoption and effects, commissioned at project level.

## 5. Links to the strategic results framework

- 5. a) Sub-IDOs – (i) Diversified enterprise opportunities and (ii) Increased livelihood opportunities
- 5. b) SRF 2022/2030 targets - # of people, of which 50% are women, assisted to exit poverty

## 6. Geographic scope—Countries

- 6. a) The outcome/impact case occurred in Uganda
- 6. b) Comment box: Trainings through our SMEs have expanded to Kenya, Nigeria, Tanzania

## 7. Key contributors

Contributing CRPs: Livestock, A4NH, RTB

Contributing Flagships: Animal Health, Feeds and Forages, Livestock Livelihoods and Agri food systems (LLAFS)

Contributing external partners: Local and National Governments, NGOs (ISU, VEDCO, SNV), Research (Makerere University and NALIRRI)

## 8. Elaboration of outcome/impact statement

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(1). The chairperson of the national pig MSP, Emma Naluyima, has become vertically integrated in the value chain, moving beyond supply of quality piglets to fattening and value addition in the retail node through quality pork cuts (branded as “ponic pork”). He has, in addition opened a mobile pork roasting facility serving ready-to-eat pork. Devenish Nutrition Ltd., a private sector company, has tapped into the pork demand opportunities and constraints identified through evidence-based research and has set

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<sup>5</sup> See common reporting indicator #I3 for definitions of what is included under the term ‘policy’

up a feed mill and a model farm in Hoima district to supply quality finished pig feed products, catering for different pig growth stages (2). Through linkages with the pig MSPs it has identified other SMEs such as Pig Production and Marketing Ltd (PPML), a key champion of the smallholder pig value chain, to stock and sell feed products through a franchising arrangement. The Livestock CRP provided mentorship to PPML including advice on animal health, vaccines, feeds and feeding, food safety and marketing. Chris Mulindwa, the company Managing Director, was awarded a young leadership entrepreneurial training through ILRI to enhance his skills. So far, PPML has engaged in training farmers, marketing of pigs and pig products (3). They have adopted pig farmers training manuals (4) developed by the Livestock CRP and have expanded their farmer training activities beyond Uganda. More than 770 pig farmers and 1000 youth have been trained since 2014. In 2015 PPML organized a farm clinic with the Daily Monitor Seeds of Gold Programme with more than 700 participants(5) and the first ever Pork-Expo in Africa in 2017 with 5,000 participants. A second edition this year attracted 15,000 participants(6). Other private sector players such as Breeds, Feeds, and Meats Ltd (BFML) have also tapped into the networks created through the pig MSPs to develop a partnership with PPML to supply pig artificial insemination (AI) using semen from the high-quality boar stud. Finally, youth such as Bavubuka Tweekembe Youth group have identified a business opportunity around commercial sweetpotato silage production (7) to address a gap identified from VC assessments. They are increasing demand for sweetpotato silage interventions under the RTB Endure project. The youth group is mentored by NaLIRRI and has trained more than 2000 farmers on silage making and utilisation.

## 9. References cited

1. Emily Ouma, Michel Dione, Brian Kawuma, Robinah Nyapendi and Mary Jo Kakinda. Enhancing the Uganda pig value chain through capacity building and multi-stakeholder platforms. ILRI Research Brief 75. March. 2017
2. Helping to drive pig production in Uganda. <http://www.devenishnutrition.com/press-releases/59/helping-to-drive-pig-production-in-uganda>
3. Online Pig training announcement by SMES in Uganda: <https://agriprofocus.com/post/579e38dba93f252756f8c5fd>
4. Silage manual for training farmers: <https://cgspace.cgiar.org/bitstream/handle/10568/82747/RTB-Endure-Sweetpotato-silage-Manual-for-Smallholders-Farmers.pdf?sequence=1&isAllowed=y>
5. A farm clinic with the Daily Monitor Seeds of Gold Programme: [https://web.facebook.com/pigfarmers?\\_rdc=1&\\_rdr](https://web.facebook.com/pigfarmers?_rdc=1&_rdr)
6. Pork Expo 2017 and 2018: <https://web.facebook.com/search/top/?q=Pork-Expo%20in%20Africa%20in%202017%20>
7. Examples of silage business centers established in Kamuli and Mukono districts in Uganda: [http://www.rtb.cgiar.org/wp-content/uploads/2017/03/Block-2.7\\_Kyalo\\_V2\\_Arte.pdf](http://www.rtb.cgiar.org/wp-content/uploads/2017/03/Block-2.7_Kyalo_V2_Arte.pdf)

## 10. Quantification (where data is available)

N/A

## 11. Gender, youth, and capacity development

Gender – 0

Youth – 1

Chris Mulindwa, a young pig producer with an entrepreneurial spirit, was recruited to assist with ILRI farmer trainings. He later set up his own company to offer pig production trainings to farmers. With the help of ILRI, he adopted some contents and developed a pig farmers training module that he started marketing. ILRI staff volunteered as lecturers during the first two rounds of training. The training is still running, but it is only one arm of the business; now pig farmers come from across East Africa and discuss hydroponic fodder, vaccines and marketing.

CapDev – 1

More than 1,700 people in total have received training.

## 12. Other cross-cutting dimensions

N/A

## 13. Communications materials

1. The two articles below, by ILRI and CIP, mention Christopher Mulindwa or his Pig Production and Marketing (PPM Uganda) Ltd company: <https://news.ilri.org/2017/03/21/uganda-research-for-development-work-is-helping-to-transform-the-countrys-growing-smallholder-pig-sector/>
2. Sweetpotato for Happy healthy Pigs: <https://spark.adobe.com/page/6jdHY/>
3. A slide presentation by Chris on his partnership with ILRI, 14 Mar 2017. PPM's involvement in capacity development of pig value chain actors and scaling out of interventions: [https://cgspace.cgiar.org/bitstream/handle/10568/81320/uganda\\_lscm\\_christopher\\_mar2017.pdf](https://cgspace.cgiar.org/bitstream/handle/10568/81320/uganda_lscm_christopher_mar2017.pdf)
4. Uganda: Why pig breeds matter in the market, The Monitor, 8 Jan 2017, by Christopher Mulindwa: <http://allafrica.com/stories/201701090858.html>
5. Uganda: Knowing How to Rear Pigs to Get the Best Results, The Monitor, 7 Nov 2016: <http://allafrica.com/stories/201611080147.html>
6. PPM's pig farmer training: <http://pigproductionandmarketing.blogspot.co.ke/2014/10/normal-0-false-false-false-en-us-x-none.html>
7. Pig association assists farmers to double pork prices, Farm Biz Africa, 12 Feb 2015: [http://farmbizafrika.com/index.php?option=com\\_content&view=article&id=1263:farmer-group-turns-sunflower-into-a-sh800million-yearly-earning&catid=27&Itemid=144](http://farmbizafrika.com/index.php?option=com_content&view=article&id=1263:farmer-group-turns-sunflower-into-a-sh800million-yearly-earning&catid=27&Itemid=144)
8. Top TV interview on pig farming with PPM Productions manager Christopher Mulindwa (Luganda), Top Television in Uganda, 6 Mar 2014: <https://www.youtube.com/watch?v=EsR8fMGP3w8>
9. Livestock as income generation for African youth, YPARD, 7 Apr 2014: <https://ypard.net/fr/2014-april-7/livestock-income-generation-african-youth>
10. Pork Expo Africa 2018: <https://soundcloud.com/christopher-mulindwa>

## 13. Contact person

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# CGIAR outcome/ impact case study #4

## 1. Title

**Bundling of animal health services increases access to quality services to more than 90% of pastoralists**

## 2. Short outcome/impact statement

Access to animal health services is one of the most important factors in improving livestock productivity. We piloted bundling of additional services by public and private sectors during vaccination campaigns. In two counties in Kenya, Garissa and Marsabit, it's now routine for the government to invite private sector actors to provide additional services while the government provides vaccinations. This has saved the government money, increased business opportunities for the private sector, and provided quality services to pastoralists at affordable prices.

## 3. Link to common results reporting indicator #i3

Policy/Investment Type: Policy or Strategy

Implementing organization type: Government

Stage in process: Stage 2 – Policy/Law etc. enacted

## 4. Maturity of change reported

**Stage 2:** (*sphere of influence*) CGIAR research (and related activities) has contributed to documented policy change and/or a change in practice by end users. This may include changes such as income, nutrient intake etc. in the sphere of influence (e.g. project level). Example of evidence: a study of adoption and effects, commissioned at project level.

## 5. Links to the strategic results framework

- 5. a) Sub-IDOs – Reduced livestock and fish disease risks; conducive agricultural policy environment
- 5. b) SRF 2022/2030 targets - # of people, of which 50% are women, assisted to exit poverty

## 6. Geographic scope—Countries

- 6. a) Kenya

## 7. Key contributors

Contributing CRPs : Livestock

Contributing Flagships: Livestock Health, Livestock and the Environment

Contributing external partners: USAID, Technoserve, Sidai Africa, FACTS Ltd

## 8. Elaboration of outcome/impact statement

One of the main challenges of delivering animal health services in the ASALs is the near-complete absence of the private sector due to the extensive nature of livestock production, lack of commercial orientation of livestock keeping and high poverty levels. We addressed these problems by leveraging scheduled public sector vaccination campaigns to include additional services by the private sector. The project brought together the county veterinary department and Sidai Africa Limited, a social enterprise, to assess if it would be feasible to provide a single bundle of products and services that is more attractive to the consumer.

Roles: The county government provided vaccination teams and transport and promoted the upcoming campaign on local radio stations; Sidai provided technical staff and brought along a variety of drugs and

vaccines to sell to the herders; ILRI—with additional support from the AVCD project and Technoserve—provided the vaccine; and REGAL-IR, a USAID-funded project, provided fuel.

Several challenges had to be overcome. Initially pastoralists were not willing to buy the additional inputs such as anthelmintics because they had previously been provided for free by the government. The veterinary department staff were hesitant to try this new approach because they felt that the private sector was encroaching into their territory.

Contrary to popular opinion that pastoralists are unlikely to invest in animal health, almost 90% of those who brought animals for vaccination bought an additional product. Sidai ended up selling products for treating trypanosomiasis, worms, tick infestation and various bacterial infections, including pneumonia. Overall, sales during the campaign helped the Sidai franchise exceed its monthly revenue target by 20%.

The pilot proved very successful. The public sector saw the benefit of partnering with the private sector because it enabled them to quickly respond to a disease outbreak, which enhanced their credibility among livestock keepers. The county government could deliver more vaccines because they no longer had to buy anthelmintic drugs to entice livestock keepers to bring their animals for vaccination and could use the savings to buy more vaccines or keep vaccinators longer in the field. Livestock keepers were happy to have additional services at their doorstep and to get advice from the service providers. The cost of delivering the services by the private sector were greatly reduced because transport, personnel and other facilities were shared. This bundling program has now become routine in Garissa and Marsabit counties but it needs to be anchored in law.

## 9. References cited

None

## 10. Quantification

200,000 livestock units (cattle, sheep and goats).

The government vaccinates about 100,000 animals twice a year. We assume 50% of these benefit from additional services (deworming, tick control, other vaccines, trypanocides) in the two counties.

## 11. Gender, youth, and capacity development

Gender – 0

Youth – 1

The project worked with the three private companies (a third company Medina joined after they saw the significant increase in revenue from the PPP model) to recruit local newly graduated animal health technicians to support them in the delivery of services during vaccination campaigns. The objective was to expose young graduates to business opportunities in animal health delivery in the ASALs and for them to gain practical experience. On average each company was recruiting an additional three technicians for each campaign. The young graduates were involved in deworming, tick control, treating clinical cases and vaccination.

CapDev - 0

## 12. Other cross-cutting dimensions

N/A

## 13. Communications materials

[http://www.technoserve.org/files/downloads/case-study\\_improving-livelihoods-by-saving-animals.pdf](http://www.technoserve.org/files/downloads/case-study_improving-livelihoods-by-saving-animals.pdf)

<https://clippings.ilri.org/2017/03/20/ah-delivery/>

## 13. Contact person

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## ANNEX 2: Altmetrics report and scores



Altmetric Explorer  
Report.pdf



2017 Altmetric  
attention score report