Evaluation of the CGIAR Research Program on Livestock and Fish

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Table of Contents

Tables

Figures

Boxes

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Acronyms

A4NH	CRP on Agriculture for Nutrition and Health
AAS	CRP on Aquatic Agricultural Systems
ASF	African swine fever
AU-IBAR	African Union's Interafrican Bureau for Animal Resources
BecA	Biosciences eastern and central Africa
BMGF	Bill & Melinda Gates Foundation
BNI	biological nitrification inhibition
BoT	Board of Trustees
CCAFS	CRP on Climate Change, Agriculture and Food Security
CCEE	CRP-Commissioned Independent External Evaluation
CIAT	Centro Internacional de Agricultura Tropical / International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
CIRAD	French Agricultural Research Center for International Development
CO	Consortium Office (CGIAR)
CRP	CGIAR Research Program
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DDF	Dairy Development Forum (Tanzania)
DG	Director General
EC	European Commission
ECF	East Coast Fever
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
FC	Fund Council (CGIAR)
FEAST	Feed Assessment Tool
FP	Flagship Project (CGIAR)
FTE	full time equivalent
GHG	greenhouse gas
GIS	geographical information system
HQ	headquarters
ICARDA	International Center for Research in the Dry Areas
ICLARM	International Center for Living Aquatic Resources Management
ICRAF	World Agroforestry Center, known as the International Center for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDO	Intermediate Development Outcome
IEA	Independent Evaluation Arrangement (Rome)
IF	impact factor
IFAD	International Fund for Agricultural Development

ILRI	International Livestock Research Institute
IPG	international public good
IRS	internationally recruited staff
ISPC	Independent Science and Partnership Council (CGIAR)
KIT	Royal Tropical Institute (Netherlands)
L&F	CGIAR Research Program on Livestock and Fish
M&E	monitoring and evaluation
MLE	monitoring, learning and evaluation
NARS	national agricultural research system
NGO	non-governmental organization
NRM	natural resource management
NRS	nationally recruited staff
OCS	One Corporate System (of reporting and financial management) (CGIAR)
PIM	CRP on Policies Institutions and Markets
PNAS	Proceedings of the National Academy of Sciences of the United States of America
PPA	Project Partnership Agreement (CGIAR)
PPMC	Program Planning and Management Committee (L&F)
POWB	Program of Work and Budget (CGIAR)
SASI	FP on Systems Analysis for Sustainable Innovation (L&F)
SEI	Stockholm Environment Institute
SPAC	Science and Partnership Advisory Committee (L&F)
SPIA	Standing Panel on Impact Assessment (CGIAR)
SRF	Strategy and Results Framework (CGIAR)
TOC	Theory of Change
USA	United States of America
USD	US Dollar
VC	value chain
VCC	Value chain coordinator
VCTS	FP on Value Chain Transformation and Scaling (L&F)
W1	Window 1 funding type (CGIAR)
W2	Window 2 funding type (CGIAR)
W3	Window 3 funding type (CGIAR)
WLE	CRP on Water, Land and Ecosystems

Executive Summary

Background, context and overview

The CGIAR Research Program (CRP) on Livestock and Fish (L&F) aims to increase the productivity of poor livestock and fish farmers and increase the availability and affordability of meat, milk and fish for poor consumers. Unusually for the CGIAR, it combines livestock and aquaculture research in one program. An important feature of the CRP is a value chain transformation and scaling approach that seeks to make research more relevant to developing countries, and to increase the potential for impact, by implementing applied research in nine target countries.

The CRP was conceived and designed as a ten year program, whose life-span was subsequently reduced to five years. It has been operational since January 2012 and submitted a proposal in November 2014 for an extension to the end of 2016, with some revisions to the program structure. A second phase of CRPs is due to start in 2017 and is likely to involve more substantive changes. Separate pre-proposals for livestock and fish were submitted in August 2015.

The initial three-year budget was USD 99.5 million (including institutional overhead), with a yearly budget of approximately USD 30 million, rising to USD 36 million in the third year of operation. Until the end of 2014 and thus after three years of operations, the total of approved funding was USD 85.1 million and L&F had spent a total of around USD 73 million, of which around half was funded from Window 1 and 2 and half from Window 3 and bilateral projects.

Initially L&F was structured around three different Research Themes with a total of nine components. In 2012, the first year of operation, L&F streamlined its structure, reducing the original three Themes to a new structure of six Themes without components. At the end of 2014 the program was further streamlined, reducing the six Research Themes to five, and renaming the Themes to Flagship Projects (FPs) in accordance with Consortium Office guidelines. The FPs are: Animal Health; Animal Genetics; Feeds & Forages; Systems Analysis for Sustainable Innovation (SASI, which houses social science, environment, systems analysis and nutrition, and the development of the theory of change and monitoring and learning system), and Value Chain Transformation and Scaling (VCTS). VCTS is termed the “delivery” FP while the others are “discovery” FPs. Animal Health has the largest budget, with considerable bilateral funding, followed respectively by Animal Genetics, Feeds & Forages, VCTS and SASI. ILRI, the lead Center, has the largest W1/2 budget and the largest number of bilateral projects, followed by WorldFish, CIAT and ICARDA. The split of W1/W2 funds between Centers was based on the shares of their previous core funding that each Center decided at the outset to allocate to L&F and was maintained throughout.

Evaluation approach and methodology

Approach. The purpose of this evaluation is to inform decision-making and planning by program management, supervisory bodies, CRP donors, partners and other stakeholders with respect to program performance and the potential options for the future. The main stakeholders of the evaluation are the management of L&F, all participating Centers, the ILRI Board, partners associated with the Program, the CGIAR Fund Council, ISPC, the Consortium Office and the Consortium Board.

The remit of the evaluation is to review the existing program, but the findings are relevant to the design of phase 2 programs. The evaluation team has therefore provided feedback on preliminary impressions at each Center and field visit in addition to a more comprehensive feedback session for ILRI and CRP management just prior to the submission of pre-proposals. The evaluation process has been

participatory and forward looking, with wide consultation among a range of stakeholders in order to capture a representative range of viewpoints.

The evaluation covers all research activities included in L&F, and the processes related to its implementation, and all funding sources. It includes all research lines developed under the present CRP as well as the outputs from relevant "legacy" projects that were initiated in previous CGIAR programs and have carried over into L&F.

Analytical framework. The evaluation was based on a dual analytical framework, consisting of thirteen overarching questions addressing major issues, as well as questions related to the evaluation criteria required by the IEA, namely: relevance; quality of science; effectiveness; efficiency; impact, sustainability and cross-cutting issues (partnership, organizational performance, capacity building, gender and environment).

Methods. The team drew information from over 370 published document, databases provided by L&F, and the expert knowledge of over 270 stakeholders interviewed in person, by Skype or by phone. In addition, 95 CRP scientists responded to an electronic survey. Those interviewed included Center and CRP management, researchers, partners, representatives of the ILRI Board of Trustees, the Science and Partnership and Advisory Committee (SPAC), the Program Planning and Management Committee, and peer interviewees from intergovernmental organizations, non-government organizations and universities.

Evaluation team members visited three of the four Centers contributing to L&F (ILRI, WorldFish and CIAT). Visits by two team members were made to five of the nine value chain research hubs (Bangladesh, Ethiopia, Nicaragua, Tanzania and Viet Nam), while one team member interviewed the value chain coordinator from India in person and a Skype session was held with scientists at the value chain research hub in Egypt. Case studies were developed for the five value chain research hubs visited and for seven research areas within the discovery FPs. Gender mainstreaming and research into environment/natural resource management were separately reviewed as crosscutting areas.

Main findings and conclusions

Overall the evaluation concludes that L&F has added value to CGIAR research in livestock and aquaculture and should continue to be funded, either as a joint CRP or as separate Livestock and Aquaculture CRPs. There has been added value in having a multi-Center CRP rather than individual Center programs, in spite of high transactions costs. The value chain approach, although not yet delivering on its promise, is innovative and is generating valuable lessons. Progress in establishing an institutional base and development partnerships in the field has been especially promising. The program is working in several important research areas, has produced a small number of scalable outputs, has made a promising start in mainstreaming gender and is carrying out worthwhile work in environment/natural resource management (NRM). Governance of the program, after some adjustments, is working well.

The main concerns of the evaluation relate to a) lack of focus and coherence within the program portfolio as a whole and in the way the value chain approach is managed and b) inadequacy of the management system to cope with a complex, multi-site program. Both of these factors are impeding delivery of outputs and outcomes and must be addressed.

Beyond the control of L&F, the evaluation is also concerned about the potential impact on delivery of inconsistencies at Fund Council and Consortium level, namely the instability of core funding, frequent changes in reporting requirements and uncertainty about future directions of all CRPs.

Organizational performance

The governance arrangements of L&F are clearly structured, well-functioning and up to requirements in terms of legitimacy, accountability, transparency, equity, effectiveness, efficiency and independence, particularly after the recent adjustments made in the roles of and relationship between the Science and Partnership Advisory Committee, the Program Planning and Management Committee and the ILRI Board of Trustees. The evaluators advise against changing this well-functioning governance system in the second phase of the CRPs.

The evaluation has identified a number of problems with systems for managing research, reporting, staff and finance. The size and complexity of the CRP require management systems beyond those of an individual Center. The CGIAR One Corporate System should have met the requirements for CRP management but it has not been installed in all CGIAR Centers and is only in 2015 being introduced in ILRI, the lead Center for L&F, in accordance with the agreed sequence of adoption by Centers. L&F has installed a stop-gap system based on manual entry and spreadsheets for research reporting and financial management. This, with considerable work from CRP management, has enabled L&F to satisfy main reporting requirements but needs considerable work to update; there is a high and risky dependency on one person.

There is a need to make the entire reporting system more joined-up and efficient and to complete the recently initiated process of aligning research reporting with the CRP's Theory of change. It is also essential to transition the financial reporting system from one that is spreadsheet-based to a centralized and modern database. L&F will naturally continue to depend on the financial systems of participating Centers, but should build on systems already developed by other CRPs to more effectively and efficiently collect and collate CRP-related information. The evaluation team recognizes that the transition process is likely to be painful but it is necessary to create long-term transparency and efficiency.

L&F management has been inclusive, transparent and serviceable; program staff in particular appreciate the management style. The system of internal and external communication of L&F is timely, comprehensive and open-access; it builds on the effective communication system of ILRI. The evaluation commends the transparency and inclusiveness of L&F's management but considers that the complexity of the CRP and the need to focus and make choices at times require a management style that is strategic rather than coordinative.

CRP management has benefited from a high degree of continuity from 2013 until early 2015. However four out of the seven persons in the management team left by the end of September 2015 as a result of the 19 percent cut in W1/W2 funds communicated in March 2015. The evaluation team is concerned that this may, in the future, reduce management effectiveness and efficiency.

Approximately 50 percent of the funding came from central W1/W2 sources; for the other 50 percent bilateral projects are mapped against the CRP. Overheads generated by bilateral projects are insufficient to cover all the maintenance and capital costs of a large Center rich in laboratories like ILRI, whose long-term sustainability will be threatened without a sustainable source of such funding.

Outwith the responsibility of L&F but within the remit of the Consortium Office is the need to stabilize core funding. Allowing Centers to carry-over funding within the life of a CRP, and thus create strategic funds, is an important tool for stabilization. So is improved long-term forecasting in order to prevent sudden downward changes in fund allocations compared to budget forecasts.

The CRP portfolio

The evaluation addressed two aspects of L&F's research portfolio, namely relevance and design coherence. L&F works towards the program maxim of "more meat milk and fish, by and for the poor", and six key Intermediate Development Outcomes (IDOs) that between them encompass international public goods and every major global development need to which research in livestock and aquaculture might be expected to contribute. The targets set for the IDOs have taken time to develop for a variety of reasons, some relating to system-wide changes in the way that IDOs were defined, and these targets are still vague. All of this gives the CRP scope to work on more topics than it could possibly manage, even with the capacity of four contributing Centers.

The evaluation concluded that all of the discovery FP research activities currently conducted are broadly relevant, in that they fall within the scope of the IDOs and the remit of the CRP. Some are more obviously relevant than others but none are irrelevant. Likewise, all of the value chains under the VCTS FP are relevant to the needs of the countries in which they are located and the L&F IDOs.

However there is a great need to focus and streamline the portfolios. Delivery of international public goods will require scalable, game-changing outputs. L&F has delivered few outputs so far that fit this description or could be considered substantial progress towards game-changing outputs. The program will be better able to deliver international public goods (IPGs) if it is more clearly focused around a limited number of key research areas. Rather than provide prescriptive recommendations about the content of the portfolio – since it was not realistic to attempt a comprehensive prioritization process within the time frame of the evaluation - the evaluators have made broad suggestions about streamlining and the delivery of IPGs in a phased process that continues during the formulation of phase 2 proposals.

Two areas would merit a higher profile in the future. One is environment and NRM research, given the global importance of this topic, which could merit an FP on the subject to make it more visible. The other is aquaculture genetics, which has already generated a scalable output. In a combined L&F CRP this would justify a higher profile and in a fish CRP it would merit a FP.

Environment and gender

Environment was specifically assessed because it is a topic of global importance to the livestock sector that is addressed as a cross-cutting issue within L&F. The environmental and NRM activities of L&F have included some very high-quality science. The global-level environmental impacts of livestock and fish value chains have been the subjects of significant research within L&F, the country- or region-specific issues much less so. For vulnerabilities of livestock and fish value chains to environmental shocks and trends the situation is somewhat reversed, as these have been addressed in local forms heighted by the value chain research, rather than at the global level.

Work has been of particularly high quality around global-level modelling, collating evidence on the environmental impacts of aquaculture, and breeding of Brachiaria for biological nitrification inhibition. There is a clear possibility that the first two could have impacts on policy, though extra steps of policy engagement by the program will be needed. The Brachiaria work also will require several further well-planned steps before it can contribute to greenhouse gas emission reductions at scale. At the level of local landscapes or farms the work in Nicaragua show the greatest indications of future impact – it is working on a problem identified with local partners, towards locally-established partners, in close co-operation with farmers, and has produced promising early results.

The research that has been done is very important for the essential tasks of managing livestock-related environmental (including climate impacts) and impacts of environmental (including climate) trends on

livestock value chains. It has been even more important as work on these themes, and especially on climate adaptation for livestock systems under the CRP on Climate Change, Agriculture and Food Security has apparently been very limited. However, under L&F, the position of environment/NRM research as a sub-cluster under SASI, in other words two organizational levels below a FP, has limited its effectiveness and ability to respond to environmental priorities identified within the country hubs. A higher profile would be beneficial.

Gender was specifically assessed because it is important within the CGIAR as a whole. The positioning of gender within the L&F structure was reviewed, because gender has been moved each time the program has been restructured. The evaluation concluded that re-positioning of gender within the CRP structure has not so far affected its ability to deliver. A strong strategy and team have been more important than the precise position of gender within the program.

The evaluation also assessed the extent to which gender has been operationally mainstreamed within L&F, and the delivery of the research program. There has been good progress in mainstreaming within the VCTS FP. Progress has been slower in the other FPs and mostly limited to scientists with strong field interests and experience. The gender team needs to build momentum in working with the technology FPs and would see the greatest impact from working with selected research groups that have already shown interest, to build positive examples of good practice.

Delivery of outputs has been slow but has speeded up after engaging a strong partner, the Royal Tropical Institute (KIT). The evaluation considers that the engagement of KIT has been positive. Progress towards outcomes will require the gender team to expand the scope of its work and is hard to assess at present.

The capacity of the gender team, together with the key partner KIT, has been sufficient for the work it has needed to until now, but it will have to be expanded in number and skills to deal with future needs. This could be done through core staff recruitment or international research partners. Lack of a senior gender scientist to lead the team is a concern and likely to be a constraint to future development.

Science quality

The evaluators have no serious concerns about the quality of scientific output. It is clear that L&F has the ability to produce outputs of high quality and indeed is doing so. There have been some excellent reports and peer-reviewed publications, mostly from legacy work. Every flagship has produced useful published material as have most value chain research hubs.

However the evaluation is concerned about the generally low level of publications in internationally recognised journals, and also considers that L&F should be producing more excellent rather than good or acceptable grey literature. A backlog of data awaiting analysis was reported from every FP and value chain research hub. There is also a greater need for consistency of attention in planning and design of field projects.

There have been some missed opportunities for cross discipline projects and greater use of cutting-edge technology and techniques. The program could also benefit from a more strategic exploitation of international collaboration with the intention of filling skill gaps and increasing the critical mass of researchers and resources in areas where they are lacking. The evaluation recognizes that this may take time as bilateral funding may need to be raised to enable new partners to collaborate.

Incentives for producing outputs were apparent at the Centers but not at L&F program level. There may be value in introducing CRP-specific incentives, provided they do not duplicate existing Center mechanisms. Several suggestions were made by L&F scientists for linking modest increments in funding, or other incentives, to research performance within the CRP.

The experienced scientists who lead teams throughout the program, and the highly committed researchers, are L&F's greatest asset but they are spread thinly across a wide range of projects and many of them are over-stretched. In most FPs and particularly VCTS there is a need for more human capacity in the form of postgraduate scientists, to provide a critical mass and/or fill gaps in specific expertise. There is a need to improve and perhaps formalize certain processes within the CRP in order to make best use of scientific capacity.

Mentoring of younger scientists is uneven across the program and highly Center-based. L&F would benefit from an expanded mentoring system across the CRP, developed in a way that is consistent with existing Center research management, to ensure that good practices are used more uniformly – this might involve more formalized mentoring processes within CRP research groups, or dissemination through a community of practice.

The value chain approach

The value chain transformation and scaling approach has been a keystone of L&F and one of its most appreciated features. It was initiated with the aim of making L&F's work more relevant to field problems and to help it deliver research outputs more directly and rapidly to potential end users. By working through nine country-based value chain research hubs, each focusing on a single species or commodity, it has achieved sufficient diversity to provide a broad spectrum of experiences from which to draw lessons.

The evaluation was impressed by the investment in institutional relationships and development partnerships, providing a solid foundation for applied research. The CGIAR Centers have reached far beyond their traditional national agricultural research system partners to work with government extension agencies, producer co-operatives and NGOs. Several of the development partners interviewed were clear that they see the relationship with the CGIAR as a strategic one with long term potential. They also talked of the value of having a closer relationship with the CGIAR and the mutual learning that has taken place. Donors who have provided bilateral funding to value chain research hubs were broadly positive about their experience of working with L&F and some have funded more than one project.

There are already visible outputs in some countries. Applied research involving national partners is taking place in seven value chains and planning and assessments have been conducted in the remaining two. Research is still concentrated at the producer end of the value chains, the "comfort zone" for the CGIAR, but has been spreading along the chains, with some work on inputs and recent collaborations with the CRP on Agriculture for Nutrition and Health. There has been strong collaboration between social and biological scientists.

However, L&F has only very partially delivered on the potential of the value chain approach, for a number of reasons. The resourcing of research hubs has been sub-optimal and this is a critical issue. The core teams are too small to carry out all of their necessary work in managing/conducting research, publishing, fund-raising and reporting to multiple stakeholders. While it is inevitable that they should need to prioritize what they work on, the funding deficit has resulted in a generally low level of published outputs as well as incomplete research portfolios where questions of potential importance to local stakeholders are not considered because the team does not include the skill-set to address them. Given inherent tension between funding limitations and the evolving research needs within livestock value chains, it may in hindsight have been preferable to find different ways to spread resources across research hubs, and this is a lesson to consider for the future. The abrupt funding cut in 2015 has seriously hampered research in some value chains and has created uncertainty about the

continuity of L&F into the second phase and future CGIAR commitment to the value chain research hubs.

Field testing and delivery has mostly been on a very small scale although there are indications it could expand nationally or internationally through development partnerships and local institutions. Substantive published outputs from individual research hubs, or a synthesis of work across several hubs, would be excellent vehicles for wider delivery of research outputs. However very few such outputs have yet emerged or appear to be in the pipeline. In addition, L&F has not capitalized on the opportunity offered by the CRP's field presence in nine countries to pursue research into action research processes, or the best strategies for scaling, both of which would be noteworthy IPGs. The evaluation recognizes that there may be challenges in obtaining funding for this type of research. However the results would be of great value to the donor as well as the research community and, if appropriately packaged, this type of research could be included within programs funded by development donors. Apart from the introduction of a few useful tools and techniques, the VCTS FP is not being managed in a coherent fashion to create economies of scope and scale. The research hubs largely operate as separate entities, with no systematic approach to seeking assistance from discovery FPs, developing a community of practice, sharing scientific findings, or collective reflection and learning.

In spite of shortcomings in the present management and delivery of the value chain approach the evaluation believes that it should not be abandoned but rather managed more effectively. It is taking L&F out of a CGIAR "comfort zone" and providing valuable lessons. L&F can function effectively in a field setting and with a more development-oriented approach than would have been possible in earlier CGIAR programs.

Effectiveness and impact

The evaluation reviewed delivery of activities and outputs and progress towards outcomes. The insufficiency of the reporting system made it challenging to assess progress on any level. It was particularly difficult to assess progress towards outcomes, because of the complex theory of change involving local research on interventions followed by upscaling largely through development partners, but also because indicators for IDOs are incomplete. In addition, notwithstanding the extensive information contained in local and national-level situation analyses and value chain assessments, there were no systematic early baseline surveys against which to make an assessment. The Theory of Change (including the impact pathways) has been redefined several times and has never been available in a complete form. Very recently a pilot project was initiated to report progress against impact pathways, and to include reporting on the change process. Early results look promising, and if extended across the program this initiative offers the possibility of more clearly aligning research progress to development impact.

The evaluation considers L&F's lack of a monitoring and evaluation (M&E) system to be a serious problem. CRP Management is aware of the problem, SPAC considers it to be a weakness and it has forced this evaluation to rely less than had been anticipated on facts and figures and more on expert opinion and qualitative assessments. There are several reasons why a M&E system has not been established. These include: the absence of a system-wide model or best-practice recommendations within the CGIAR on which to base the L&F model; the complex structure and geography of the CRP; the inconsistency between reporting requirements of L&F management, the Consortium Office and bilateral donors; multiple changes to the Theory of Change (TOC), which could otherwise have been an important monitoring reference; and a changing CRP structure with unclear reporting responsibilities. The evaluation is concerned that the CRP will not be able to develop a M&E system

until the end of the current program, particularly because one person dealing with M&E in the CRP management had to leave in the first half of 2015 due to the announced severe budget cuts.

L&F is making reasonable progress in delivering outputs and some progress towards outcomes, although it is hard to predict a delivery date for much of what it is working on. The evaluation found areas of good progress and others where progress has been slow, in every FP and Center. The more traditional discovery FPs (Animal Health, Animal Genetics and Feeds & Forages) have been more successful in completing planned activities and delivering outputs than the novel VCTS and SASI FPs. The VCTS FP has been slow in developing research activities because of the time needed to make investments in institutional relationships and seek operational funding, the small size of core teams, and changes in the countries chosen. The SASI FP is a recent entity, assembled in 2014 from parts of previous Themes. It has an incoherent structure and delivery is hard to assess. However, both of the novel FPs have the potential to deliver well if their structural incoherence can be overcome and each is doing innovative work. It is also important to remember that every FP has a role to play in overall coherence of the CRP beyond the delivery of specific research outputs.

Center-based research includes outputs that have potentially high impact but very uncertain and potentially distant delivery dates – these include livestock vaccines and diagnostics and livestock and forage germplasm. L&F could be more explicit in about reviewing their progress in annual meetings and Annual Reports. It could also do more to explore the delivery pathways that will eventually be needed for these outputs – which might include connections with delivery partners, including those in the private sector. There is also need for explicit consideration of the route by which these technologies will reach small-scale farmers. A good start has been made by WorldFIsh, which has developed policy papers on technology transfer. Country-based research has the potential to deliver more quickly. However there is a need for L&F to be clearer in conceiving and communicating to donors the path it is following towards development outcomes and for donors to be realistic about the time needed for meticulous research.

There is a good chance that L&F will create local impact within the countries where it works and in most countries it is beginning to do this. However at the current stage in L&F's life-cycle there are only very few examples where a broader national impact has been created, and even fewer where impact has been seen in more than one country. L&F will need to pay attention to synthesis and coherence across the VCTS FP, and indeed across the whole CRP, if it is to deliver IPGs. For example, there has been interesting work in environmental analysis that has potential to contribute to IPGs. Some of this is reported within SASI and some from value chain hubs and only by reviewing the entire program is it possible to see the full value of the research. CRP management's proposals to convert the VCTS Flagship Leader from a part-time to a full-time assignment and establish a Research Methods specialist position within VCTS, responses to recommendations of the CRP-commissioned evaluation of the value chain approach, would be positive steps towards improved synthesis and coherence.

The evaluation has made the following ten recommendations.

Recommendation 1: Capitalize on the benefits of being a CRP

It has been valuable to have a CRP that brings Centers together within one program and this should continue. However, L&F has failed to fully capitalize on the benefits of being a CRP. The following are recommended to CRP management. The strategic leadership of the CRP Director will be important in accomplishing these goals:

- a stronger emphasis on CRP-wide research initiatives that will produce game-changing outputs;

- stronger engagement as a CRP in global public debates on livestock, poverty and development;
- whole-CRP approaches to major donors.

L&F has also has not fully succeeded in managing the complexities of the CRP. Recommendations 4, 7 and 9 all deal with this issue.

Recommendation 2: Increase synergies between livestock and aquaculture

Regardless of whether livestock and aquaculture remain together in one program, stronger attempts should be made to capitalize on potential synergies between them, including the development of a larger portfolio of substantial projects that brings them together.

Recommendation 3. Streamline the portfolio

In order to deliver game-changing outputs in the future, and considering the resources that are available and the system complexity, the portfolio will need to be streamlined into areas of greatest potential impact on IDOs taking into account scientific capacity. The streamlining should take place in the context of the TOC and should ensure a balance between short, medium and long term outputs, based on very clear decision criteria. A discussion on streamlining/prioritisation should be started immediately, with changes implemented gradually and realized fully under phase 2.The evaluation acknowledges that this is a substantial task that is likely to need outside assistance, since it has not been possible within the scope of the present detailed examination of the CRP to make specific recommendations on streamlining. It is likely that L&F can achieve part of the desired result by implementing changes suggested under other recommendations. In future proposals the evaluation would strongly recommend not increasing the number of FPs or value chain sites. CRP management will also need to at times to use a more strategic leadership to guide the development and delivery of a more streamlined portfolio.

Recommendation 4: A higher profile for environment/NRM

A higher profile for work on environment and natural resource management is recommended. In Phase 2 this could take the form of a flagship program on the topic, which would allow a) more space to develop objectives and workplans that covered a range of livestock-environment interactions, b) more visibility for environment in reporting and M&E and c) clearer lines of accountability through a flagship leader compared to the current complex leadership arrangements.

Recommendation 5: Establish a M&E system based on the TOC

L&F should complete the development of the TOC (including impact pathways) and ensure that a M&E system is established in line with the TOC, building on the pilot initiatives carried out during 2015. It should also ensure that baseline studies are carried out that will facilitate impact assessment of key research areas

Recommendation 6: Build private sector partnerships for technology delivery

Build carefully-chosen partnerships with commercial companies, including partners in developing countries and multinationals with expertise in developing country markets, in order to deliver the pipeline from technology research to application. Potential commercial links/partnerships could be established to allow research to follow commercial requirements for registration/target product profiles. These should be seen as strategic public-private partnerships linking the national governments, the CGIAR and private companies. At the same time it is important to continue building

and strengthening strategic relationships with development partners to ensure that delivery channels for technology take account of the needs of poor farmers.

Recommendation 7: Maintain the governance arrangements but with some adjustments

a) associate the Director General of ILRI more with SPAC deliberations in order to align ILRI and CRP programs (by more extended participation in SPAC meetings);
b) establish a periodic interaction between the SPAC chair and ILRI Board program committee chair (an annual physical meeting is suggested);
c) provide the SPAC regularly with summarized (gross) financial and administrative information so that it is aware of the financial constraints of the CRP.

Recommendation 8: Modernize the financial management system

It is recommended that, as a matter of urgency, the systems of financial management are modernized to fit the requirements of a complex, multi-site program. In particular reporting relationships and products need to be simplified in order to reduce the administrative burden particularly on middle level managers. A move should also be made from present reliance on spreadsheets to adoption of a joined-up financial database. As One Corporate System is just being introduced in two of the Centers it will not bring the expected efficiency gains for some time to come. Instead L&F should urgently explore the possibility to introduce its own project management system, drawing from the experience of other CRPs, such as Climate Change, Agriculture and Food Security and Water, Land and Ecosystems to more effectively and efficiently collect information from participating Centers. Ideally, structures of the participating Centers and L&F should be harmonized.

Recommendation 9. Maintain the value chain approach but manage it much more effectively

The evaluation recommends that the value chain approach or its functional equivalent is continued but that considerable changes are made to increase the value added by the approach: a) every value chain hub should be properly resourced, at a higher level than is currently the case – even if this means working in a smaller number of countries or establishing a 2-tier system of value chains ; b) the roles of the VCTS flagship, the country research hubs and SASI should be clarified with respect to producing knowledge to transform and scale up value chains; c) the role of the leader of the VCTS should be reformulated with a strong emphasis on communication and learning across value chains and a mandate to interact with every value chain; d) there should be a much stronger emphasis on synthesis of results in published papers.

Recommendation 10: Generate more high-quality published outputs

While the evaluation has no serious concerns about quality of science, the following recommendations are made. L&F should:

a) clear the backlog and increase effort on producing high-quality peer-reviewed publications aiming for internationally recognized journals (where appropriate in collaboration with outside scientists);
b) continue to produce non externally peer reviewed high-quality outputs but thoroughly and systematically peer reviewed internally that can be disseminated broadly and quickly– but with more focus on syntheses and big-picture analyses;
c) increase the number of publications that are interdisciplinary (e.g. genetics and feeds; animal health and social science; animal genetics and animal health);
d) increase and systematize mentoring for young scientists.

1. Introduction

1.1 Background and context

The research agenda of the CGIAR is implemented by the CGIAR Centers and their partners through 15 multi-partner CGIAR Research Programs (CRPs), along with additional work undertaken by the Centers directly. Research is funded through a pooled funding mechanism[1], and through bilateral funding to Centers. All CRPs contribute to Intermediate Development Outcomes linked to high-level impact goals. The multi-Center structure of the CRPs reflects the reform principles of the CGIAR, which include streamlining, collaboration and co-ordination.

The Independent Evaluation Arrangement (IEA) Office is responsible for System-level Independent External Evaluations, with a mandate to facilitate the implementation of the CGIAR Policy[2] for Independent External Evaluations, through strategic evaluations of the CRPs and institutional elements of the CGIAR, and through the development of a coordinated, harmonized and cost-effective evaluation system in the CGIAR. The CGIAR Research Program on Livestock & Fish (L&F) is one of the ten CRPs chosen for evaluation between 2013 and 2015.

L&F was conceived and designed as a ten year program, whose life-span was subsequently reduced to five years. It was approved at the end of 2011 and began operating in January 2012. An Extension Proposal for 2015-2016[3] was submitted at the end of 2014. The extension of the program is an intermediate step, while a second phase of CRPs, which will start in 2017, may involve more substantive changes.

An important feature of the program is the "value chain transformation and scaling" approach that seeks to make research more relevant to developing countries, and increase the potential for impact, by implementing applied research in nine countries, in close collaboration with national research partners and development partners. Four "discovery" Flagship Projects (FPs) providing strategic research in livestock and fish health, livestock and fish genetics, feeds and forages and social science interact with a "delivery" FP responsible for the in-country applied work.

Another innovative feature from the CGIAR's perspective is that the program attempts to bring together research on livestock and aquaculture, with the intention of exploiting potential synergies.

1.2 Purpose

The principal purpose of this evaluation, a forward looking process, is to enhance the contribution that L&F is likely to make to reaching CGIAR goals, in particular food and nutrition security, and the program objective of increasing productivity of small-scale livestock and fish production systems and performance of associated value chains.

[1] The CGIAR Fund is a multi-donor, multi-year funding mechanism that provides funding to (i) CRPs through two "Windows"; Window 1 across CRPs as per Consortium decision and Window 2 to donor-specified CRP; and to (ii) donor-specified Centres through Window 3

[2] http://www.cgiarfund.org/sites/cgiarfund.org/files/Documents/PDF/CGIAR_evaluation_policy_jan2012.pdf

[3] CRP Livestock and Fish. 2014. Extension Request 2015 – 2016 CRP 3.7 Livestock and Fish. Submitted April 2014

As for all CRP evaluations, the purpose of the evaluation of L&F is to inform decision-making and planning by program management, supervisory bodies, CRP donors, partners and other stakeholders with respect to program performance and the potential options for the future. The main stakeholders of this evaluation are the management of L&F, all participating Centers (CIAT, ICARDA, ILRI[4], WorldFish), partners associated with the Program, the CGIAR Fund Council, and the Consortium Board.

In November 2013, the Fund Council of the CGIAR agreed that the call for the second round of CRPs and full proposal development would not be initiated until all current CRPs have undergone some form of external evaluation, yet a call for pre-proposals has already been initiated, with a deadline in mid-August 2015. The remit of this evaluation is to review the existing program, but the findings are relevant to the design of phase 2 programs. The evaluation team has therefore provided feedback on preliminary impressions at each Center and field visit in addition to a more comprehensive feedback session for ILRI and CRP management just prior to the submission of pre-proposals.

1.3 Scope

The evaluation covers all research activities included in the L&F CRP, and the processes related to its implementation.

While several L&F activities are fully funded through the unrestricted funding channels (Windows 1 and 2), L&F also includes Center- or project-specific Window 3 funding and project-specific bilateral grant contracts between the implementing Centers and donors. The evaluation considers research funded by all funding sources.

L&F started in January 2012, yet some of the research carried out by Centers and now included under the L&F umbrella has been underway for a number of years, generally termed legacy projects. The inclusion of legacy research has been useful, but a consequence is that, L&F is made up of research projects with multiple timeframes. The last CGIAR evaluation that covered livestock research was published in 2008 for ILRI, while fish research in WorldFish was reviewed in 2007. The scope of the present evaluation covers outputs resulting from legacy projects relevant to L&F that have been published since 2012, as well as legacy work that has continued within L&F, in addition to new research lines developed under L&F.

L&F is a global research program with projects and activities that are global, regional, multi-country and country-level in scope. Its value chain approach uses localized interventions in a small number of research sites, but aims to achieve outcomes at national level within countries where L&F is based, and in some cases at regional or global level. Therefore the overall geographic scope of the evaluation was global, while the in-depth analyses covered value chain research hubs in five countries on three continents.

The evaluation reviewed L&F's overall performance with regard to the key evaluation criteria used in all IEA evaluations and listed in 1.5.2.

[4] CIAT= Centro Internacional de Agricultura Tropical / International Center for Tropical Agriculture, ICARDA= International Center for Research in the Dry Areas, ILRI= International Livestock Research Institute

1.4 Overview of the program

1.4.1 Objectives

The title of the original L&F proposal is "More meat, milk and fish by and for the poor" and the stated objective of the CRP is to "increase productivity of small-scale livestock and fish systems so as to increase availability and affordability of meat, milk and fish for poor consumers and, in doing so, to reduce poverty through greater participation by the poor along animal source food value chains".

The program contributes to six Intermediate Development Outcomes (IDOs) (Box 1-1) for which generic indicators were defined in the extension proposal of November 2014. Each IDO is associated with one or more system-level outcomes (SLOs). Some progress has been made towards developing quantitative and qualitative targets for the IDOs but this process is not complete.

Box 1-1: IDOs to which Livestock & Fish contributes

IDO	Generic IDO Indicators
#1 Increased livestock and fish productivity in small-scale production systems for the target commodities (SLO2)	Yield of target commodity
#2 Increased quantity and improved quality of the target commodity supplied from the target small-scale production and marketing systems (SLO2)	Quantity of target commodity supplied from small-scale producers
#3 Increased employment and income for low-income actors in the target value chains, with an increased share of employment for and income controlled by low income women (SLO1 and SLO3)	Total household income Total household income in value chain actor household controlled by women Employment in value chain actor households
#4 Increased consumption of the target commodity responsible for filling a larger share of the nutrient gap for the poor, particularly for nutritionally vulnerable populations (women of reproductive age and young children) (SLO3)	Dietary Diversity
#5 Lower environment impacts in the target value chains (SLO4)	Emission Intensity of Green House Gases (GHG)
#6 Policies (including investments) support the development of smallscale production and marketing systems, and seek to increase the participation of women within these value chains (SLO2 and SLO4)	Conducive policy and legislative environment in support of small-scale production and marketing systems Private, donor and public investment
Note: These six IDOs were maintained for the Program of Work and Budget 2014, the Extension Proposal 2015-2016 and the Annual Report 2014 and are the ones to which the evaluation refers. They are being replaced by those being proposed under a donor-defined Results Framework as part of the revised Strategic Results Framework.	

Source: Livestock & Fish Extension Proposal 2015-16.

The program's impact pathways are not presented here because it is not clear to which version of the Theory of Change, including the impact pathways that inform it, the CRP is currently working, a topic explored in section 7.1

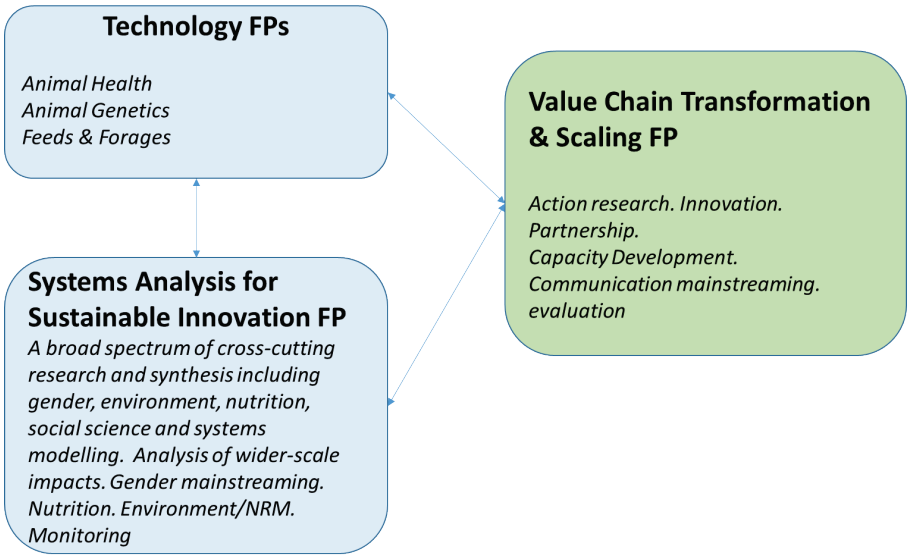
1.4.2 Portfolio and funding

The initial three-year budget was USD 99.5 million (including institutional overhead), with an initial yearly budget of approximately USD 30 million, rising to USD 36 million in the third year of operation. Until the end of 2014 and thus after three years of operations, L&F has spent a total of around USD 73 million, of which around half was funded from W1/2 and half from W3 and bilateral projects.

Initially L&F was structured around three different Research Themes with a total of nine components. In 2012, the first year of operation, L&F streamlined its structure, reducing the original three Themes to a new structure of six Themes without Components. The six themes were animal health, genetics, nutrition, value chain development, targeting for sustainable interventions and gender. At the end of 2014 the program was further streamlined, reducing the six Research Themes to five, and renaming the Themes to Flagship Projects (FPs) in accordance with Consortium Office guidelines. All CRPs are now structured as FPs each with a set of "clusters of activities". Gender is no longer a separate theme/FP in L&F, and is intended to be addressed as a cross-cutting issue across the CRP. One of the main changes relates to the creation of a new FP called "Systems Analysis for Sustainable Innovation" (SASI), which is a merger of different components of several previous research themes. This FP started operations in January 2015. The Value Chain Development FP was renamed Value Chain Transformation and Scaling (VCTS) to reflect the role of the FP in working with development partners to deliver research outputs at scale.

During the period of the evaluation the structure of the program was as shown in Figure 1-1. The distinction between "discovery" (basic research conducted at Centers) and "delivery" (applied research conducted in value chain research hubs in nine countries) is useful. This report refers to the current FPs and the discovery/delivery components, although some of the material reviewed was based on earlier program structures.

Figure 1-1: L&F Flagship Projects



Source: Adapted from figure in L&F Extension Proposal (April 2014, p4).

The L&F portfolio is composed of activities which are mostly funded through a combination of L&F core funding (W1/2) and bilateral/W3 funded projects.

All participating Centers (ILRI, WorldFish, CIAT and ICARDA) have matched projects funded by bilateral donors to the L&F program. Some of the projects are classified as so called “legacy research”, meaning they started before L&F was initiated, whereas other projects are classified as “new”.

The Program of Work and Budget (POWB) for 2015 provides information on the distribution of funding among FPs, including W1/2 and W3/bilateral funding

FP 1 (Animal Health) is by far the largest FP, with a very high budget coming from bilaterally funded vaccine development projects (Cluster 1.3. Disease Diagnostics and Vaccines) implemented by ILRI. Cluster 1.1. on Animal Health Assessment and Prioritization is almost exclusively funded by W1/2 and includes activities in smallholder systems in Tanzania dairy, Ethiopian small ruminants and Uganda pigs VCs as well as the fish value chains in Bangladesh and Egypt.

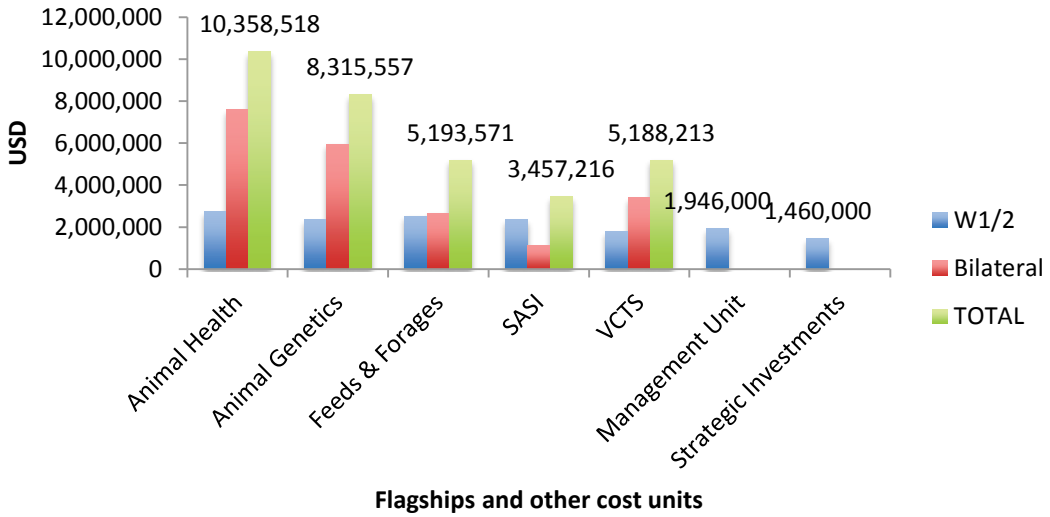
FP 2 (Animal Genetics) has received considerable funding from bilateral projects, particularly in cluster 2.1. (System, Strategy and Genome Assessment). Projects mapped to FP 2 are the WorldFish projects EC-Genetics (Egypt and Bangladesh), Feed the Future Aquaculture for Income and Nutrition (Bangladesh), dairy genetics and dual-purpose cattle projects by ILRI.

FP 3 (Feeds & Forages) is the technology FP with the least contribution from bilateral funding. It includes a feed technology platform (Cluster 3.1. funded by W1/2) and various activities relating to the Feed Assessment Tool (FEAST). Several of the large bilateral projects which CIAT implements (Nicaragua mostly) are mapped to this FP. Also, the Cereal System Initiative for South Asia -Phase 2 project, led by CIMMYT and funded by USAID and Bill & Melinda Gates Foundation (BMGF), has activities relating to forage cultivation mapped and co-funded by W1/2 to this Theme.

FP 4 (SASI), which started operations in 2015, is the smallest FP and has received little contribution from bilateral funding. It has by far the highest allocation of budget to gender, which is used for capacity building, development of gender assessment tools and the integration of gender activities along the value chains (planned for the Tanzania value chain). Other activities relate for example to the research on issues like nutrition, natural resources and the environment.

FP 5 (VCTS) includes the development of tools for value chain assessments, and the identification and piloting of so-called “best bet interventions” in the targeted value chains (cluster 5.1.). Cluster 5.2 deals with the scaling of interventions and therefore includes a lot of partnership and capacity development activities. The third cluster relates to monitoring, measurement of impact and learning. Two large ILRI projects are mapped to this FP: the now-completed “Catalysing the emerging smallholders pig value chains in Uganda to increase rural income and assets” (EC/IFAD funded) and “More Milk by and for the poor-Adapting dairy market hubs for pro-poor smallholder value chains in Tanzania” (Ireland).

Figure 1-2: L&F budget overview by FP, 2015



Source: POWB 2015 budget overview from L&F management during Inception Phase. Note: The POWB has been revised several times during the evaluation.

A database of bilateral projects provided by the CRP management shows 129 project grants, of which 66 had no activities in 2014, and three grants initiated early in 2015. 55 projects have been classified as "legacy" grants with the remaining 74 projects being new research. ILRI maps the highest number of bilateral projects to L&F, followed by WorldFish and CIAT and very few projects from ICARDA.

1.5 Methodology

The evaluation process has been participatory and forward looking, with wide consultation among a range of stakeholders in order to capture a representative range of viewpoints.

1.5.1. Phasing of the evaluation

The evaluation took place in four phases, starting in November 2014. In the Preparatory phase IEA complied and reviewed key documentation, recruited team members and established a Reference Group and a peer review panel. During the Inception phase two team members prepared a draft inception report, which was reviewed by the entire team during an inception meeting held in Nairobi, and published in April 2015. During the Inquiry phase, between March and October 2015, team members gathered data and information and analysed findings as described below. The Reporting phase included a meeting in Rome in October 2015 to review and distil the various products of the evaluation and agree on the content of the report. Text was then prepared by each team member and the report drafted by the team leader under guidance from IEA. Annex A provides a detailed timeline.

1.5.2. Evaluation framework

The evaluation was based on a dual analytical framework, consisting of:

- thirteen overarching questions addressing major issues;

- evaluation criteria as defined in Annex 2 of the CGIAR standards[5] and in IEA's guidance note on the Evaluation of CRPs[6]. These consist of: relevance; quality of science; effectiveness; efficiency; impact, sustainability and cross-cutting issues (partnership, organizational performance, capacity building, gender and environment).

The two frameworks are related but not identical. A complete list of questions and criteria is provided in Annex C.

1.5.3. Sources of data

The team drew from a number of sources of information and data.

Documents

Over 370 documents were reviewed. They included:

- reports from governance and management committees of L&F;
- published outputs of the program drawn from a database provided to the evaluation team, from specific requests made to program leaders, and from the CRP's wiki;
- program and project proposals and reports to the CGIAR consortium and bilateral donors;
- management reports;
- the CRP-commissioned external evaluation (CCEE) on the value chain approach[7].

Databases

Databases accessed by the evaluation team included:

- list of published outputs;
- list of projects;
- list of researchers;
- financial data

Expert knowledge of researchers, partners and peer reviewers

Over 270 stakeholders were interviewed in person during visits to Centers and value chain research hubs, or by Skype or phone. Annex D provides a list of those interviewed. Evaluation team members visited three of the four Centers contributing to L&F (ILRI, WorldFish and CIAT). Visits by two team members were made to five of the nine value chain research hubs (Bangladesh, Ethiopia, Nicaragua, Tanzania and Viet Nam) while one team member interviewed the value chain coordinator (VCC) from India in person and a Skype session was held with scientists at the value chain research hub in Egypt.

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[5] CGIAR standards for independent external evaluation, January 2015, http://iea.cgiar.org/sites/default/files/Standards.pdf

[6] IEA Guidance Note G1: Guidance for Managing the Independent External Evaluation of CGIAR Research Programs (CRPs) January 2015 http://iea.cgiar.org/sites/default/files/G1.pdf

[7] Baker, D., Speedy, A. & Hambrey, J. 2014 Report of the CGIAR Research Program on Livestock and Fish CRP Commissioned External Evaluation of the Program's Value Chain Approach

Interviews were conducted with:

- management of three Centers;
- management of the CRP;
- representatives of CRP governing committees;
- scientists at all levels. They included representatives of all discovery FPs and seven of the nine value chain research hubs.
- representatives of research and development partners for all discovery FPs and five value chain research hubs;
- peer reviewers from international development organizations and universities.

In addition, 95 CRP scientists responded to an electronic survey. Results can be found in Annex G.

Observation

The evaluation team visited laboratories, animal houses, greenhouses and on-station experiments at the headquarters of three of the four Centers contributing to L&F (ILRI, WorldFish and CIAT).

Field visits were made in five of the nine countries in which value chain research hubs are based (Bangladesh, Ethiopia, Nicaragua, Tanzania and Viet Nam).

Published sources of information on research publication and citations

These included Google Scholar and Scopus.

Analyses broadly followed the intentions of the inception report, with minor modifications for practical reasons.

Portfolio and coherence analysis

The team reviewed the scope of projects and activities mapped to L&F, including the bilateral project portfolio as well as the POWB 2015, which also includes W1/2 funded activities. This proved to be a more time-consuming task than originally expected, requiring not only a review of databases held by CRP management but also detailed enquiries during field and Center visits. The scoring system envisioned during the inception phase was abandoned because the information available was too variable to allow consistent scoring to be carried out. Instead the team used a qualitative approach and drew heavily on their expert assessment, observation and interviews with scientists and partners. Coherence of the program was assessed primarily during the development of FP and value chain case studies (described below) and in reviewing the Theory of Change (described below). Coherence assessment focused on i) the extent to which the activities of the CRP matched flagship and program objectives and ii) the coherence between research done by discovery FPs and findings from value chain research hubs.

Review of the Theory of Change

This was done through a review of the various documents and wiki pages where the TOC and efforts to develop it have been described, as well as interviews with CRP management, senior scientists in Center management, lead researchers in the CRP and scientists and partners at Centers and field sites.

Review of progress against work plans

Described in the inception report as "Output analysis", the review of progress compared outputs and activities against work plans and impact pathways. It was done by desk review of program reports, viewing of presentations made by FP and VCCs, and through questions put to FP and VCCs. The review considered progress made and factors that promoted or impeded progress.

Quality of science analysis

The evaluation used the framework for qualitative assessment of quality of science which has been developed for CRP evaluations by the IEA. It included:

- peer review scoring of 223 publications chosen by stratified random sampling. The process used for sampling and scoring is described in Annex E
- bibliometric analysis of peer reviewed papers (Annex E describes the process)
- review of quality of inputs. This assessment was done at the level of the FPs and covered both activities funded under the W1/W2 windows as well as bilaterally-funded projects. It included i) track record and competence of team leaders; ii) composition and competence of teams; iii) quality of research proposals (where available) and research designs; and iv) quality of data management.
- review of processes and practices at L&F participating Centers that contribute to science quality within L&F.
- extraction from information from past evaluative assessments on quality of science

Information was gathered through literature review, interviews and a survey of researchers (see below).

Case studies of value chain research hubs

The work done at five value chain research hubs was reviewed, comprising one value chain of each species/commodity cluster covered by the CRP: i) small ruminants in Ethiopia; ii) dairy in Tanzania; iii) pigs in Viet Nam; iv) dual purpose cattle (meat and milk) in Nicaragua; v) aquaculture in Bangladesh.

The list includes three countries not visited in the CRP-commissioned evaluation of the value chain approach of L&F carried out in 2014[8], namely Nicaragua dual purpose cattle, Viet Nam pigs and Bangladesh aquaculture. During the visit to small ruminants in Ethiopia, the interaction with ICARDA, which has devolved some of its activities to Addis Ababa, was also evaluated. The visit to aquaculture in Bangladesh drew on the recent evaluation of the CRP on Aquatic Agricultural Systems (AAS) and explored the interaction of AAS and L&F.

The assessment consisted of:

- review of documentation generated by the value chain research hubs and the M&E system

[8] Baker, D., Speedy, A. & Hambrey, J. 2014 Report of the CGIAR Research Program on Livestock and Fish CRP Commissioned External Evaluation of the Program's Value Chain Approach

- field visits of between 4 and 10 days per country made in each case by two members of the evaluation team with complementary expertise. Scientists and partners were interviewed and visits were made to research sites to observe field conditions and interact with farmers
- follow-up Skype calls with a small number of key CRP scientists and partners not present at the time of the visits.

Prior to the field visits, checklists were developed for each key area of inquiry. The team also referred to the results of the CRP-commissioned evaluation of the value chain approach of L&F. They made contact with the authors of the report but did not need to interview them as the report was comprehensive and self-explanatory.

Case studies were prepared to a standard format and are reproduced in Annex F

Review and synthesis studies of animal health, genetics and feed and forage FPs

This analysis consisted of two components. The first was a broad assessment of progress made in each of the three FPs, analysing areas of work, design, products, partnerships and linkages. The information for the assessment was drawn primarily from visits to Centers, supplemented by material from value chain visits, additional interviews as required, and examination of program documents. It contributed to the portfolio analysis and review of progress previously described. Relevance of the portfolio was considered, taking into account global development issues identified during the inception period, needs identified by peer interviewees, and needs articulated by national stakeholders as reported in program documents and communicated during visits of the evaluation to research hubs.

The second component was a purposive selection of case studies in seven research areas within the discovery FPs for more detailed assessment of their relevance, science quality and coherence. Research areas chosen were those that, in the opinion of the evaluation team, made an important contribution to the flagship and covered at least two clusters of activities. The finals election included some research areas with a long legacy history and some more recently introduced. In the inception report it was envisaged that case studies would be of clusters of activities. However this approach proved not to be the most effective for achieving the objective as it did not help the team to learn about the coherence of FPs, or to assess whether they were designed to progress along an impact pathway. Development and delivery of a specific technology often spans more than one cluster.

The research areas chosen for review were from three of the four discovery FPs:

Animal genetics	Small ruminant breeding Tilapia Genetic Enhancement
Animal health	East Coast Fever Vaccine Development Research on African Swine Fever
Feeds & Forages	WorldFish Feedstuffs Improved forages for livestock Feed Conservation and Processing

No case study was chosen for the fourth discovery FP, on Systems Analysis for Sustainable Innovation, because two areas covered by that FP, namely gender and environment, were cross-cutting issues reviewed separately.

The inception report envisaged that separate case studies would be done for legacy projects. However most of the research areas chosen for FP case studies had some connection to legacy work, with the exception of research on African Swine Fever. In some cases the link was very strong – for example, research on East Coast Fever Vaccine has been carried out by ILRI for many years and one aspect of L&F work is on delivery of a vaccine produced before the program started. There would have been no value in reviewing legacy projects separately.

Information for the case studies was drawn from Center and value chain visits and the document review carried out for the quality of science assessment (see below), with additional review of program documents and supplementary interviews as needed. The case studies reviewed relevance, coherence of the research area within L&F and quality of science. The quality of science assessment was incorporated within the broader Quality of Science assessment for the CRP reported in Chapter 5. A summary of findings on relevance and coherence are provided in Annex I.

Review of governance and management

Interviews were conducted with Center directors of ILRI, CIAT and WorldFish, with CRP management and staff, with partners, stakeholders and beneficiaries. Representatives of the ILRI Board of Trustees, the Science and Partnership and Advisory Committee (SPAC) and the Program Planning and Management Committee (PPMC) were interviewed by Skype. Material was also drawn from reports of visits to Centers and value chain research hubs and from desk review of documents including PPMC and SPAC meeting documentations, ILRI Board of Trustees minutes, program proposals and annual L&F reports.

L&F Researcher survey

An electronic survey was conducted among L&F scientists. The survey was sent to 194 researchers from a list of L&F scientists provided by CRP management and received 95 responses (a 49 percent response rate). Those responding listed their roles as: PPMC members, researcher/management, scientist/focal point, research support, research officer, scientist, program officer and capacity Development. The results are reported in Annex G.

Review of crosscutting research areas – gender and environment/NRM

Gender and environment/NRM are treated as crosscutting areas of research in L&F – that is, they are not assigned only to one FP (although both are currently "housed" under Systems Analysis for Sustainable Innovation) but are expected to be considered within all program areas. The strategy used for each was reviewed, published outputs were reviewed as part of the Quality of Science assessment and by scrutiny of additional published documents, and during each field visit specific questions were asked about the approach to dealing with these crosscutting topics.

Review of partnership strategy

L&F has developed a partnership strategy paper, and this was reviewed, but the evaluation team paid more attention to the lived reality of partnership arrangements. Representatives of partner organizations were interviewed during field visits and by Skype, and the relationship between L&F and its research and development partners was observed.

Analysis of L&F's comparative advantage

This assessment was based primarily on interviews with stakeholders and external peer/experts working within the program context, who were interviewed by Skype and during country visits following a standardised checklists of questions.

Stakeholder feedback following each site visit

At the end of each study visit a debriefing session was held with at the CRP team. A formal presentation was made by the evaluation team members at the end of each study visit of the key observations made during the visit, and a feedback session held to solicit comments on the observations from CRP scientists. A briefing session was also held in September for ILRI and CRP management to present some of the emerging findings from the evaluation, as a contribution to the process of preparing pre-proposals for Phase 2 of the CRPs.

1.6 Limitations and constraints

L&F has been in operation for only 3 ½ years out of the 10 or more originally planned for the CRPs, so the evaluation could not realistically review impact but only assess indications that impact might be achieved. he evaluation was expecting to cover impacts of legacy work that is still ongoing, based on any available published material from impact studies. However the Standing Panel on Impact Assessment (SPIA) commissioned an evaluation of CGIAR Centers' impact assessments of livestock-related research, covering the period 1990-2012[9]. Rather than duplicate the work of this detailed evaluation, the present evaluation has consulted the draft report dated 27 November. However the SPIA evaluation found only 12 reports that met their criteria to qualify as an ex-post impact assessment and only one of them related to legacy research of L&F. Therefore the present evaluation's commentary on the impact of legacy research in section 7.1.3 is very limited.

For reasons previously mentioned, the CRP has a moving target nature, having evolved considerably during its short life as research has transitioned from completion of legacy projects to a greater emphasis on new partnerships and areas of work. There have been alterations in the program structure, the Theory of Change (ToC) and the positioning of gender within the program, among other adjustments. The M&E system is not fully developed and it has been challenging to access information on allocation of budget and progress against work plans to the level of detail required. For all of these reasons there are very few quantitative metrics that can realistically be applied, and a careful and triangulated qualitative assessment has been essential to the review.

In addition the CRP has had to accommodate changes in the demands placed on it by CGIAR management and unexpected cuts in core funding and adjust the portfolio accordingly – this is one reason why the formative element of the evaluation has been important.

[9] Jutzi, S. and Rich, K.M. (draft, 2015). An Evaluation of CGIAR Centres' Impact Assessment Work on Livestock-Related Research (1990 – 2014)

2. Organizational Performance

This chapter analyses the governance and management of L&F. It reviews the extent to which governance and management arrangements and functions, including the lived reality, conform to program partnership requirements and have been able to take into account risks related to the CRP implementation. Section 2.1 examines governance functions and performance while section 2.2 reviews management. The analysis has drawn on an extensive review of program documents, interviews with L&F management and members of governance bodies, interviews with L&F researchers and the results of the staff survey.

2.1 Governance

The CRP has a complex structure; its governance arrangements cannot be linear and hence tend to be inefficient by design: financial accountability is with the lead Center, accountability for results is shared by all participating Centers and there is an independent body, the Science and Partnership Advisory Committee (SPAC) in charge of science oversight. The following is an example of the complexity of governance in this CRP: according to the Program Implementation Agreement signed between the Consortium Office (CO) and ILRI, the Lead Center is responsible for ensuring that other participating Centers comply with certain guidelines regarding procurement, lobbying etc. The CGIAR Internal Audit Unit criticized in its recent review that ILRI did not actively monitor compliance of partner Centers with these guidelines. The evaluation team however considers it not practicable to hold the Lead Center accountable for compliance issues of participating Centers working in the same CGIAR system – instead the Consortium should develop central mechanisms for ensuring compliance with rules. The CRP management proposes instead (a) notifying the participating Centers and (b) obtaining a signed management letter from them, including from the Lead Center, confirming their compliance with the guidelines. The evaluation considers that this would be a more practical arrangement than the present requirement and would satisfy the need for monitoring compliance.

Financial and management oversight of L&F is ensured by the Director General (DG) of the lead Center, ILRI to whom the CRP Director reports, by the board of trustees of ILRI and by the consortium office to whom the CRP is financially responsible. Fiduciary responsibility clearly lies with the ILRI Board of Trustees (BoT), which is also responsible for risk and conflict management. The ILRI BoT is aware of its fiduciary role for L&F and takes it seriously. The Program Committee of ILRI is congruent with the BoT and the Program Committee chairperson is given additional days to interact with ILRI management and science leaders and thus to prepare the PC meetings.

Science oversight is provided by the Science and Partnership Advisory Committee (SPAC). SPAC was only established in late 2012 by the CRP management and had difficulties in getting started. Its composition underwent frequent changes. SPAC is made up of independent experts in different fields from outside the CGIAR and had six meetings between end of 2012 and early 2015. Meetings usually overlapped with Program Planning and Management Committee (PPMC) meetings; two were held in Value Chain hubs. SPAC reported until end of 2014 to the CRP management. After meetings SPAC produces extensive narrative reports which are shared with management. According to SPAC the CRP does not take criticism seriously enough; CRP management on the other hand thinks that SPAC does not fully understand L&F. The evaluation is of the opinion that these small frictions between SPAC and management resulted from procedural issues and personality clashes rather than differences on substance; it has observed that the relationships have improved lately.

The improvements are partly due to the fact that based on the recommendations of the CRP Governance and Management Review (CGIAR, 2014) the role of SPAC has been strengthened[10]: the SPAC members are now formally appointed by the ILRI BoT who also receive the SPAC reports; the SPAC chairperson was in early 2015 given space to interact virtually with the BoT; the SPAC has to be consulted in the performance assessment of the CRP Director and the SPAC is represented on the panel for the appointment of a new CRP Director; individual SPAC members can establish direct contacts with FP leaders and value chain coordinators (VCCs). Through these adjustments the science oversight of the CRP is now more effective. All interviewees agreed however that so far the SPAC has not influenced the L&F CRP in a major way. This does not speak against the governance arrangement chosen. It is rather that the research strategy of L&F has in general been adequate, while many of the constraints of L&F have had to do with the complex set-up of the program, unpredictable finances, inefficient management systems and changing rules of the game (all discussed in this chapter and chapters 6 and 7).

Transparency in governance is assured by well-structured and documented discussions and decisions of the involved bodies and by regular self-evaluations building on a good system of internal and external communication. The evaluation suggests to maintain the present structure of the governance system of L&F but to improve its effectiveness by providing SPAC more information on finance, management and partnership issues and by having more regular and intensive exchanges between SPAC ,the Director-General of ILRI and the Program Committee of the ILRI Board. This is justified by the fact that L&F represents a substantial part of ILRI's budget.

The cost of SPAC of between USD 93,000 and 107,000 in a year for 2013, 2014 and 2015 (budget figures provided by CRP management) is only around 0.3% of the CRP budget and is justified by the important role it plays in the governance system of checks and balances. This amount is below the average reported by the CRP Governance and Management Review of USD 120,000 a year for governance bodies.

Stakeholder participation in the governance of the CRP is achieved by the integration of senior management members of the participating Centers into the PPMC which has a steering and strategic management function. The PPMC is characterized by continuity in its membership and constructive deliberations. In the value chain research hubs in nine countries, stakeholder participation occurs through various fora and partnerships specific to the country and mainly influences strategy related to the portfolio of research. For example in Tanzania a stakeholder voice is provided through a Dairy Development Forum (DDF); in Viet Nam and Ethiopia there is a strong rapport with the government research and extension services; the commendable inclusion of goats into the Ethiopia small ruminant value chain happened at the request of one of the important government stakeholders. In the case of the India VC hub, due to lack of funds the planning with partners and stakeholders did not immediately lead to the implementation of concrete activities which created mistrust among these partners.

Risk and conflict management are the responsibility of the ILRI BoT. A rather recent risk management policy and, among other things, – a policy on conflict of interests are in place, but they have not had to be applied so far in the case of L&F. In the opinion of the evaluators, major risks for the effectiveness of the CRP emanate from unpredictable funding and changing rules particularly regarding fund use, which makes it hard to plan ahead with partners and to build an appropriate balance of short-, medium- and long-term research. These are outside the sphere of influence of the CRP. The

[10] SPAC Issue Brief 5-1 Governance Changes, November 2014

evaluation's assessment that most of the risks are outside the purview of the CRP is corroborated by the fact that the audit review addresses only 9 recommendations to the Lead center, of which 5 are Significant and 4 are Medium in risk rating, but addresses 24 recommendations to the Consortium Office, of which 4 are High, 15 are Significant and 5 are Medium in risk rating. Other risks (for example major personnel conflicts or mission creep) have not arisen.

2.2 Management

It took until late 2012 to establish a fully-fledged L&F management unit within ILRI and this contributed to a low implementation capacity and financial performance at the start of the program. At the beginning of 2015 the CRP management consisted of the Director, a Program Manager, one person responsible for Development Partnerships, one responsible for monitoring, learning and evaluation (MLE), one for capacity development and two assistants, all to a large extent paid out of W1/W2 funds. The MLE and capacity development specialists were ILRI staff who had only part-time responsibilities to L&F, and so were not directly managed as part of the CRP management unit. – their contractual conditions are the same as for ordinary ILRI staff. CRP management has benefited from a high degree of continuity from 2013 until early 2015. However three out of the seven persons left by the end of September 2015 as a result of the 19 percent cut in W1/W2 funds communicated in March 2015. The evaluation team is concerned that this may, in the future, reduce management effectiveness and efficiency.

Four aspects of L&F management are elaborated in the following sections: human resources management; financial management; management of the research program and overall administrative efficiency.

2.2.1. Human resources management

This section outlines the human resource available and discusses the processes in place to manage L&F's human resources. The relationship between staff qualifications and team capacity and research outputs is reviewed in chapter 5.

L&F human resource

According to the information provided, approximately 210 scientists were working under L&F at the beginning of 2015, corresponding to around 150 full time equivalents (FTEs). 40 percent were funded from W1/W2 funds and 60 percent from bilateral funds. Slightly below half of the researchers were internationally recruited staff (IRS), the remainder nationally recruited staff (NRS). On average 22 percent of the scientists were female; in ILRI the proportion of women was by far the highest with 36 percent. Staffing is also discussed in 5.2.1 with reference to research inputs.

However the evaluation team has doubts about the precision of the information provided. The following examples illustrate the problem of obtaining accurate staff numbers from the reporting system: a) the review of the Internal Audit Unit initially noted that for 33 percent of a sample of 21 staff whose time was 100 percent charged to L&F no direct association with the CRP could be established – this was later found to result from a temporary budgetary device, as the staff time was re-charged to projects on a pay-for-use basis; b) in India the outputs of several projects were mapped against L&F, not however the time of researchers involved – on closer questioning the evaluation learned that this reflected the budgetary allocation of NRS staff hosted by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), whose time was budgeted as "supplies and services" rather than staff costs. The inconsistent quality of the data reflects the lack of automatized

management systems in the Centers, requiring a lot of error-prone manual compilations. Additionally there are no clear rules set by the Consortium Office (CO) of what can be mapped against what CRP; this relates not only to staff time but also to expenditure and outputs. Further, some staff work within more than one CRP and in some cases joint outputs are produced. Consequently, staff numbers quoted in this report can be regarded as reasonable approximations rather than precise figures.

At the start of the program, effectiveness was affected by restructuring of ILRI' s research program, by large management turn-over and by difficulties in filling key positions. Presence, continuity and a good local anchorage of IRS have been important factors for the success of some of the value chain hubs. However postings of specialized IRS to Bangladesh (due to hardship conditions) and more recently to Kenya (due to security concerns) are difficult.

The process of staff retrenchment resulting from the budget cut was challenging but handled quite well. In ILRI, 4 IRS and 2 NRS related to L&F were laid off in Nairobi, 1 NRS in Addis Ababa. One L&F position became redundant in CIAT, none in ICARDA and none in WorldFish. CRP management lost three positions (one part time), proportionally more than other units, for two reasons: i) dependency on W1/W2 funds; and ii) Centers under pressure tend to protect their core scientific body and rather retrench staff considered to work on the margins of their mission. As previously mentioned the evaluation has concerns about the future impact of this reduction in management capacity on the long term effectiveness of the CRP that is discussed in chapter 6.

Allegiance to L&F

All researchers working for L&F are fully integrated into the research programs of their Centers and they have well elaborated and detailed job descriptions for their Center jobs. By comparison, and based on examples seen for VCCs and FP leaders, the tasks they are expected to perform for the CRP are rather cursorily described in a one page Terms of Reference. In some cases L&F researchers have limited knowledge of what they are expected to do for the CRP. Their administrative and research supervisor rarely coincides with people they report to in the CRP. Consequently, their main allegiance is with the Center and not with the CRP. This was confirmed by the results of the staff survey. It is not unusual in a matrix management arrangement for staff allegiance to lie with the unit in which they are administratively housed, and there is no evidence that allegiance to Centers rather than L&F is affecting research performance – however it does create a challenge for the visibility of L&F as a program. Also, in times of reduced funding – as lived through in 2015 – people tend to take refuge in their home base.

Recruitment

Human resources recruitment and management arrangements in the CRP are controlled by the rules and regulations of the participating Centers. In the Centers examined (WorldFish and ILRI were examined in detail; CIAT and ICARDA were not) they fulfil the requirements of a modern human resources system. In ILRI and WorldFish scientists have three year contracts, in CIAT and ICARDA contracts can be of two or three years, in ICARDA with annual extensions. Recruitment procedures are transparent in ILRI and WorldFish. In both Centers there is a provision and an incentive for continuous learning. Scientific performance is a criterion in the annual performance reviews of these Centers and of CIAT and can lead to faster promotions (ILRI) or a salary bonus (WorldFish, CIAT). There are some differences in policies regarding remuneration and incentives, for example in WorldFish there is no consistent salary system for NRS, particularly in Bangladesh while ILRI has a consistent system for its Nairobi and Addis Ababa campuses. A persisting issue in the CGIAR is the difference in benefits

between IRS and NRS. L&F does not address this problem, however it has an encouragingly high percentage of IRS from the global South (46 percent).

Centers with a host country agreement usually hire all NRS in a country, including staff working for other Centers (e.g. ILRI hires NRS of ICARDA in Ethiopia; ICRISAT hires NRS of ILRI in India; World Agroforestry Center hires NRS of ILRI in Viet Nam). This is an efficient solution but there is evidence from the India VC that it has led to a lack of clarity regarding terms of reference and makes performance evaluations complex – however this is preferable to a situation like the one in Bangladesh where six CGIAR Centers and CRPs hire several hundred NRS under distinct conditions[11].

Reporting

All staff face complex reporting structures and those in the value chain research hubs particularly so. The case of the value chain research hub in India exemplifies the reporting complexity associated with decentralization. The VCC has a consultancy contract with ICRISAT, administratively he depends on ICRISAT whose performance assessment tool he has to use; he used to report to the regional director of ILRI in Delhi, now this has changed and he reports to the head of the Livelihoods Gender and Impact program in ILRI Nairobi; as VCC he also reports to the leader of the VCTS FP who is currently based in Nigeria; he also maintains a direct link with the CRP Director. The three-dimensional matrix-structure of ILRI plus the collaboration with other Centers has led to an inefficient reporting system within L&F. This not only adds to transaction costs but also to the frustration of collaborators who receive different feedback from different sources, e.g. the FP leader and the leader of the research program where the FP is housed. This is a particularly complicated case, but other VCCs also have multiple reporting lines within the CRP and must in addition report to the donors of bilateral projects. Case studies provided in Annex F show typical reporting structures.

The concern of the evaluators with respect to reporting complexity stems from the time that research leaders must devote to produce reports, a topic that came up many times in discussions with L&F staff at all levels and is revisited in other chapters. L&F management is aware of the problem but has not been able to find a solution. The evaluation considers that certain adjustments could bring relief in this respect:

a) structure the Center programs and the CRP flagships in a compatible manner (this particularly applies to ILRI, which has L&F research in more than one research program and a substantial part of the budget, around one-third of the budget, from L&F) ;

b) harmonize reporting requirements within the system so that the same report serves the information needs of various bodies, e.g. CO, ILRI BoT, SPAC, PPMC) introduce a modern management information system which is able to automate the compilation of quantitative information (see 2.2.2. Financial Management).

2.2.2. Financial management

This section reviews the finances provided to and used by L&F and the processes in place to manage finance and report against expenditure. The impact of financial management on L&F performance is discussed in more detail in chapter 6.

[11] CGIAR shared services report, 2013

Available finance and expenditure

The total annual budget of L&F increased from USD 22.5 million in 2012, to USD 27.4 million in 2013 to USD 35.1 million in 2014 (Table 2-1). The budget for 2015 was a total of USD 32.5 million during the inception phase, but has been amended several times. At the start of the program these amounts were well below the forecast annual figures in the original proposal: USD 29.7 to 33.8 million 36.1 million. The split of W1/W2 funds between Centers was based on the shares of their previous core funding that each Center decided at the outset to allocate to L&F. This proportion was maintained throughout although WorldFish requested a larger share because it faced problems with some bilateral funding. PPMC decided against a change in the proportion because it lacked any objective criteria to do so. In the view of the evaluation team this was a reasonable decision. A commendable element of competitiveness was introduced in 2014/15 through three calls for proposals, namely a cross-program call, a value chain call and a gender mainstreaming call. The split between W1/W2 and bilateral/W3 funds has been approximately 50/50.

Table 2-1: Approved program funding by source of funds (USD million)

	2012	2013	2014	2012	2013	2014
W1 +W2	10.33	14.20	17.02	46%	52%	49%
W3	1.05	2.23	6.63	5%	8%	19%
BILATERAL	10.13	11.02	11.48	45%	40%	32%
CENTER FUNDS	1.01	-	-	4%	0%	0%
Total Funding	**22.53**	**27.44**	**35.14**			

Source: L&F annual reports, L121. Note approved funds are those approved for Centers to spend. Budgets refer to total net costs (which does not include W1/W2 funds in the lead Center budget that are passed through to the participating centers and also appear in their budgets).

The high expectations towards the CRP were linked to the hope of getting greater and more consistent funding. Overall this was achieved between 2012 and 2014. The situation worsened dramatically in spring 2015 when a 19 percent cut in W1/W2 funds for L&F led to the retrenchment of 6 staff in ILRI alone (a further staff member left at the end of contract and has not been replaced) and required a substantial re-planning of 2015 activities. The situation is such that bilateral funds, normally contracted for three years, are now considered more reliable during that short period than W1/W2 funds with their lack of predictability from year to year.

Table 2-2 and 2-3 summarize funding and expenditure of L&F from 2012 to 2015 according to Center and type of funding. Expenditure went up from USD 15.4 million in 2012 to USD 31.6 million in 2014, in parallel with the growing management capacity of the program and participating centers. In 2014 expenditures were distributed as follows: ILRI 58 percent, CIAT 13 percent, WorldFish 19 percent, ICARDA 2 percent and project management 8 percent. The CRP as a whole has spent less than has been approved each year, and the pattern of expenditure against budget has varied by Center.

ILRI, which participated in eight CRPs, had great difficulty in executing planned activities at the start of the CRP. This led to severe underspending of ILRI's share in L&F in 2012 and 2013 and ILRI hence had to carry-over unfinished activities and unspent funds into the following year. CIAT had an even slower disbursement of funds than ILRI, mainly with regard to its bilateral projects. For the management it is difficult to predict bilateral projects, and CIAT, more than other Center is flexible in mapping these projects to the various CRPs in which it participates. WorldFish has a high proportion of bilateral funding and had the capacity to spend the funds assigned to it under L&F; in 2013 it even overspent its share by 43 percent, mainly in W3 funds. The yearly amounts assigned to ICARDA were

comparatively small and were all allocated to one country, Ethiopia; among the four Centers, ICARDA had the best budget performance with regard to spending the allotted amount each year.

Table 2-2: L&F funding and expenditure by source (USD million)

	2012					2013					2014				
	W1/2	W3	BIL	CENT	TOT	W1/2	W3	BIL	CENT	TOT	W1/2	W3	BIL	CENT	TOT
BUDGET	10.33	1.05	10.13	1.01	22.53	14.20	2.23	11.02		27.44	17.02	6.63	11.48	0	35.14
EXP	7.72	0.35	8.900	1.01	17.02	11.39	4.3	8.76	0.06	24.50	15.23	7.05	9.34	0	31.62
% EXP					76%					89%					89%

Source: L&F Annual financial reports 2012 -2014.

Table 2-3: L&F funding and expenditure by center (USD million)

	2012			**2013**			**2014**		
	BUDGET	**EXP**	**EXP/TOT**	**BUDGET**	**EXP**	**EXP/TOT**	**BUDGET**	**EXP**	**EXP/TOT**
ILRI	13.89	9.80	58%	16.11	13.85	57%	20.19	18.22	58%
ICARDA	0.59	0.53	3%	0.78	0.70	3%	0.80	0.77	2%
CIAT	3.69	2.70	16%	4.78	3.00	12%	6.18	4.23	13%
WorldFish	4.36	4.02	24%	3.91	5.59	23%	5.61	5.87	19%
Management Unit	n/a	n/a		1.86	1.37	6%	2.36	2.53	8%
TOTAL	22.527	17.02	100%	27.44	24.50	100%	35.14	31.62	100%

Source: L&F Annual financial reports 2012 -2014. L131.

The Fund Council (FC) through the CO gives the CRPs a forecast of allotted funds in October for the following year. In every year of L&F there were many revisions of the financing plans with at times large deviations from the originally approved CRP budget. Table 2-4 shows the W1/W2 funding received by L&F annually. Comparing this with Table 2-2, it can be seen that in 2012 considerably more was received than approved, while in 2013 considerably less was received than approved. If commitments are made late in the year Centers may pre-finance activities in order for work to continue.

Table 2-4: W1 and W2 funding received by L&F (USD million)

	2012	2013	2014	2015	TOTAL	SHARE
W1	0.7	0.0	1.4	1.1	3.2	6%
W2	19.2	8.4	15.1	8.8	51.5	94%
W1+2	20.0	8.4	16.4	9.9	54.7	

Source: Evaluation team, based on data received from CRP management.

The difference between approvals and receipts is due to inconsistent donor behaviour but partially also to late reporting by certain CRPs which delays the reassignment of W1/W2 funds between CRPs. It is obvious that planning in this financially unstable environment is challenging. When receipts are greater than approvals the challenge is positive, and L&F was able to create a "Strategic Investment Fund" from large receipts early in the program. With these funds the CRP management was able to organise three calls for research going well into 2015. The funds in the gender, value chain (VC) and cross-CRP research calls were allotted in an egalitarian manner; they were available across the board also to junior researchers irrespective of their hierarchical position. The calls had a motivating effect and brought an element of competition into this otherwise rather unwieldy construct, but

unfortunately the calls could not be repeated in 2015 due to lack of funds. In 2015 the sudden and severe budget cuts made it difficult to keep to the planned research program.

L&F was very effective in attracting W2 funding (specifically earmarked for the CRP) and received as a consequence very little W1 funds which the FC/CO can attribute freely, see Table 2-4. The fact that success in attracting W2 funds leads to a reduction in the attribution of W1 money was resented by senior CRP and ILRI management. A representative of the FC on the other hand stressed the need for the FC to see the entire system and not to look only at individual CRPs. In 2014, unlike earlier years, L&F was unexpectedly denied by the CO/FC the right to carry-over unspent funds from 2014 to 2015 – although this decision was later partly revoked to allow carry-over of funds that could be shown to have been committed and documented. In the present uncertain funding climate the evaluation team believes that prudent financial management should be encouraged rather than penalized. The high reliance on bilateral funding (approximately 50 percent) combined with unpredictable core funding create risk for the CRP of not fulfilling its commitment to partners.

Financial management processes

L&F financial management relies on the structures and procedures of the participating Centers and in particular the lead Center. The CGIAR introduced the One Corporate System (OCS) in 2013 but ILRI only began adopting it in 2015 and has, in parallel to OCS, mandated the Accenture consulting group to develop a project management system. ILRI's late adoption of OCS is in accordance with the sequence of adoption that was agreed by all Centers – however during these discussions ILRI did not lobby for early adoption. WorldFish adopted OCS in 2013 and has developed an effective project management system. The view of staff, management and board representatives is unanimous that the finance management systems of ILRI are well below standard - at the beginning of 2015 there was no cost-accounting, no online data entry, no project management system, no uniform time control, and no enterprise resource planning system. In CIAT (a late-comer to OCS) the situation appears to be similar. ICARDA does not face the same problems because of its smaller L&F budget. There are high expectations within ILRI and CIAT that the introduction of the OCS will improve operational management – however introducing this system at this point in time of program implementation is a challenging exercise.

The Project Partnership Agreements (PPA) between the Lead Center and participating Centers define funding forecasts for the entire CRP period. Given the level of uncertainty regarding the levels of funding, this is translating into delays in PPAs being signed between the Lead Center and the participating Centers. This leads to delayed transfers of funds and potentially impacts on the activities at the participating Centers[12]. The evaluation team considers that the varying amounts of funds transferred from the Lead Center to the participating Centers should be notified by simple exchange of letters rather than in a PPA.

The elaboration of a project or enterprise resource management system requires strong leadership and a close collaboration between administration and program people. The evaluation team is concerned that the slow process of arriving at a functional and compatible financial management for L&F has impeded the efficiency and effectiveness of the program. Complaints about unacceptably high transactions costs heard from numerous sources during the evaluation are to a large extent due to the fact that the financial management structures and procedures of L&F are not fit for the multi-source

[12] Noted by the internal audit review of 2015

and multi-fund-allocation nature of the CRP and its relationship with other CRPs and Centers. The evaluation considers it absolutely essential for the Centers to have real-time and efficient financial and management systems (including individual time-sheets) to be able to run several multi-location programs (like CRPs) with multiple funding sources in an efficient manner. For this, L&F may not be able to wait until the OCS is fully functional in all participating Centers. It could however try to make use of management information systems which have been developed by other CRPs like Climate Change, Agriculture and Food Security (CCAFS) or Water, Land and Ecosystems (WLE).

Despite difficult conditions L&F and participating Centers have been able to deliver work plans, budgets and financial reports on time. Credit is due to a highly effective, creative, diligent and service-minded CRP manager who has developed specific planning and reporting templates for L&F. However the large amount of spread-sheet and manual work involved is inefficient and puts the quality of the information at risk. Middle level managers like FP-leaders (20 percent time is allocated for this function, paid from W1/W2 funds and not considered sufficient) and focal points (0 percent time is allocated for this function) are under pressure because they have to collect the information on planning and reporting from their programs, compile and check it and forward it to the CRP manager.

2.2.3. Management of the research program

The L&F research program is managed through a complex and interwoven set of plans and reports, some of them prescribed by the CO/FC, others developed by L&F. These tools provide an overview of what is happening and satisfy the reporting requirements of many stakeholders but it was clear from interviews with research managers at all levels that the reporting process is not clearly linked to the strategic direction of the program. The CRP Director manages at arm's length and does not see himself in a control and command function. L&F is managed as a portfolio of separate projects rather than as a unified program.

Research planning

The main strategic references for L&F are the original proposal of 2011 and the extension proposal of 2014. As previously described (Chapter 1) the program structure has been reorganised three times, and has moved from three research themes, each with three components, to four discovery and one delivery FPs. The restructuring (partially imposed by the CO) has largely consisted of reshuffling of components and has not necessarily made the program any more coherent, but each restructuring has required partners and staff to adjust to new names and new structures for progress reports.

Work planning is done annually by research teams. Each FP develops a rolling pluri-annual strategic implementation plan. These provide a detailed rationale and roadmap for the Annual Program of Works and Budget (POWB) prepared for the CO, which include details of expected outputs, activities and expenditure in very large spreadsheets. Outputs, outcomes and deliverables from the POWB are performance indicators. In practical terms the CRP manager compiles the POWB from activity sheets which contain details about tasks, budgets and staff involvement including the share of gender-related research and associated investment. These activity sheets are the main reference for the research leaders when reviewing the performance of their teams.

There is not yet a clear flow of logic from the CRP's Theory of Change (TOC) (including impact pathways) through the strategic implementation plans to the annual POWB. The L&F's TOC has been a moving target since program inception (see Box 2- 1 and Annex H). TOC and impact pathways are also discussed in chapters 4 and 6). By March 2015 it was still incomplete, not covering all of the program, and lacked important information on assumptions, change processes, partnerships, relationships, and explicit reference to lesson-learning and adaptive program execution, all of which are important to

understanding the potential for research to deliver impact. Revisions made between March and September 2015 have been an improvement, but the TOC is not yet an integral part of research planning and few L&F scientists can describe the impact pathways or the TOC. It is not evident that they have used it as anything other than a mechanism to explain the program to outsiders.

Box 2-1: A short history of L&F impact pathways and Theory of Change

The original program proposal included impact pathways but did not include a Theory of Change (TOC) as this was not part of the CGIAR's language at the time. The proposal showed two pathways from research outputs to impacts, in one of which the CRP acted as a catalyst while in the other it had the role of a knowledge partner.

Since 2013, TOC has been introduced into to L&F vocabulary. Initially, impact pathways and TOC were discussed somewhat separately but over time, they have been brought together and impact pathway diagrams have largely been replaced by TOC diagrams. The evaluation considers bringing together the two concepts to be a positive step.

A Theory of Change presented to donors in 2013[13] included two revised impact pathways. One addressed Research for Development within selected value chains, while the second addressed the provision of international public goods. This version still appears in the L&F wiki.

In the program's extension proposal in 2014[14] the Theory of Change was described in detail for the first time. The proposal showed a ToC flow diagram (equivalent to impact pathways) from research outputs to SLOs that included two pathways, one for commodities and the other for value chains. This version of the TOC also discussed the assumptions that underpinned it and included feedback loops indicating that learning and iteration would be part of the program. In the opinion of the evaluation the addition of assumptions and feedback loops and changes made in developing this version of the ToC were positive and helpful.

The management team's response to comments by the CO and the ISPC on the extension proposal, presented in November 2014,[15] resulted in a substantially revised and somewhat expanded ToC, summarised by a series of flow diagrams that link the elements of the research program to four SLOs. A ToC is described for the whole program and one for each of the five flagships, all with the same overall structure but varying in detail. The assumptions were mostly removed from the diagram and narrative (although it was noted that they were to be reinstated) and feedback loops were no longer in evidence. While it was helpful to use a standard template, removal of assumptions and feedback loops resulted in an over-simplified representation of the change process.

The evaluation considers the November 2014 ToC to be the current version for the whole CRP, and was told in March 2015 that it was the current version. It is also noted that ToC have been developed for some individual value chain research hubs and research areas, in some cases including quite elaborate TOC diagrams.

Source: Evaluation team.

[13] Results Strategy Framework and Intermediate Development Outcomes (IDOs) for the Livestock and Fish Research Program (March 2013), presented at donor meeting in June 2013

[14] CRP Livestock and Fish (2014a). Extension Request 2015 – 2016 CRP 3.7 Livestock and Fish. Submitted April 2014.

[15] CRP Livestock and Fish (2014b). Response to the CO and ISPC comments to the Livestock and Fish CRP regarding the 2015-2016 Livestock and Fish CRP extension proposal. Working document submitted to the CGIAR Fund Council held in November 2014.

Research planning within L&F is fairly participatory. The FP leaders meet annually with VCCs and partners to define priorities. However, financial and human resources in ILRI and the other Centers are under the responsibility of the research program leaders in Centers. It is the understanding of the evaluation, based on interviews with L&F research managers, that positioning L&F activities within each participating Center is a process of negotiation between FP leaders/ focal points and Center research program leaders. The complexity of the process is reflected by a five page table elaborated by L&F managers: Terms of Reference for ILRI research leaders by Key Research Areas.

However the development community, as represented by those interviewed during this evaluation, has expressed the wish for a different approach to strategic planning in which L&F works more closely with development organizations. It is well recognized that L&F has been consultative in that new proposals relating to the entire CRP, such as the original L&F proposal and the pre-proposals for phase 2, are sent to large group of stakeholders for review. However several of those interviewed have suggested that they would prefer a different and more face-to-face approach, at an earlier stage of planning. It is likely that they would also prefer bilateral approaches, and this may not be practical, but there are many ways to organize face-to-face multi-lateral consultation. This would require support from the CO in providing a long lead-time to submission of major proposals.

Research reporting

The reporting to CO/FC follows a prescribed format. It is a reporting on achievements to give donors a consolidated picture across CRPs of what has been the result of their investments. The report does not compare progress with a plan and therefore cannot be directly related to planned targets. The CRP has therefore developed its own format for a narrative as well as for a traffic light report showing progress against plans in different colours. These reports are produced half-yearly by the VC coordinators and the FP leaders with the support of focal points. SPAC was not satisfied with what it found to be a too-general Annual Report for the CO and the too-detailed internal reports. It hence demanded a separate narrative report highlighting main issues and achievements for each FP and value chain. This may be helpful for research oversight but if implemented as a regular requirement it would add to an already considerable burden of research management reporting. The evaluation team considers that the only way out of this impasse is to establish an effective M&E system; all reporting would then be against indicators established in such a system. The evaluation acknowledges that, even with a more effective M&E system to collate reporting information there would still be a need to generate tailored reports from the system to suit the various demands of the CGIAR system and donors.

There are promising developments. A recent pilot in reporting against the TOC (from Tanzania and Ethiopia) shows considerable promise. However it is at a very early stage and there are two potential problems in expanding it: a) this reporting does not yet replace any of the existing reporting processes to CRP management or donors, and b) reduction in size of the CRP management team will place a large burden on the remaining small team if the new process is deployed across the whole CRP. The evaluation considers the pilot system to be a very positive development but the reduction in the size of the CRP management team will be a severe impediment to implementation. The IDO indicator manual elaborated in 2014 was going to be an important reference for this work but will need to be reviewed because the CGIAR approved a new Strategic Results Framework with changed IDOs.

2.3 Conclusions and opportunities for improvement

The evaluation concluded that the governance arrangements of L&F are now well established after some initial frictions; with the recent adjustments and some additional suggested changes in the roles

of and relationship between CRP-management, SPAC and ILRI BoT they are adequate in terms of legitimacy, accountability, transparency, equity, effectiveness, efficiency and independence. The evaluators advise retaining this governance system.

The following points were taken into consideration by the evaluation team when developing the recommendations provided in Chapter 8.

The systems for managing research reporting, staff and finance do not fully meet the demands of a large and complex program. There is a need to make them more joined-up and efficient. The following areas merit particular attention:

- Continuing the present initiative to align strategic planning and reporting with the TOC. At the same time efforts should be accelerated to streamline the reporting requirements for various internal and external stakeholders. Some of this work can be done internally by the CRP but much of it requires negotiation with the management of participating Centers, the Consortium Office and bilateral donors. Discussions have been underway for the past three years but with little visible progress.
- Transitioning the financial reporting system from one that is spreadsheet-based to a centralised and modern database. L&F will continue to depend on the financial systems of the participating centers and other institutions for its monitoring and reporting. These are of varying quality and only slowly becoming harmonized through OCS. L&F should however build on systems already developed by other CRPs like WLE and CCAFS to more effectively and efficiently collect information from participating centers. The evaluation team recognises that the transition process is likely to be painful but it is necessary to create long-term transparency and efficiency. Automatized systems will not solve all problems – they need to be accompanied by a change in culture towards better reporting discipline. Parameters in automatized systems can be adjusted when necessary (budget changes, new activities, changing outputs) and CRP management should invest time freed from manual compilations for improving the quality of input data.
- Outwith the responsibility of L&F but within the remit of the CO and FC is the need to stabilize core funding. Allowing Centers to carry-over funding within the life of a CRP, and thus create strategic funds, is an important tool for stabilization. So is improved long-term forecasting in order to prevent sudden downward changes in fund allocations compared to budget forecasts.

3. The CRP portfolio

This chapter addresses two aspects of L&F's research portfolio: relevance and design. It considers the current content of the program and gaps that may need to be filled in the future.

The analysis drew on program proposals, the case studies of five value chain research hubs and seven FP research lines as well as the records of interviews with peer reviewers knowledgeable about the sector and the review of sector needs carried out for the inception report. The evaluators also reviewed a selection of bilateral project proposals and other documents from the CRP's wiki although these were highly variable in the level of detail provided. Interviews with FP leaders and focal points and value chain research hub leaders, and the PowerPoint presentations provided by these senior scientists, were important for filling information gaps.

3.1. Relevance

The evaluation considered the relevance of L&Fs portfolio with respect to the global needs of livestock and aquaculture and the strategic objectives of the CGIAR defined in the Strategy and Results Framework[16].

In order to be relevant, L&F must contribute towards the very broad strategic objectives defined in the Strategy and Results Framework and meet targets for six IDOs defined for the CRP on income, employment and nutrition of the poor and mitigation of environment impacts, with an explicit focus on inclusion of women (see Box 1-1, Chapter 1). Within this broad mandate it must contribute to the livelihoods of the poor, including the very large number of relatively poor livestock and aquaculture producers that still exist. Several of the peer reviewers interviewed in the course of the present evaluation were emphatic in their support of the CGIAR's mandate to work on behalf of the poor, and some of these reviewers specifically mentioned the need to do research relevant to poor farmers.

The IDOs defined for the CRP are sufficiently broad that they cover all the major global development needs to which research in livestock and aquaculture might be expected to contribute.

The SLOs to which L&F contributes are at such a high level, and the IDOs cover such a broad range, that it would be hard to argue that any of L&F's current portfolio does not contribute to them. The TOC and impact pathways defined at various times and in various versions during L&F's lifetime (Box 2-1 in Chapter 2, and Annex H) show connections between broad areas of the program and the IDOs. Each cluster of activities in a Flagship Project (FP) can be mapped to an IDO and a current global need. The initial conclusion of the evaluation was that the program content is relevant in a broad sense. However L&F cannot be expected to address all research areas relevant to the global needs of livestock. There is scope for the CRP to work on more topics than it could possibly manage, even with the combined capacity of four contributing Centers and many outside partners. Therefore the evaluators looked within each FP to assess whether it covered the most relevant topics.

All of the discovery FP research activities currently conducted are broadly relevant to the IDOs and the remit of the CRP. However the portfolios of the Animal Health, Animal Genetics and Feeds & Forages

[16] The System Level Outcomes of the CGIAR defined in 2011 are i) reduced rural poverty; ii) improved food security; iii) improved nutrition and health; and iv) sustainably managed natural resources

FPs are still quite strongly influenced by Center legacies rather than guided by a systematic assessment of priorities – although this is changing. Animal Health, coming from a legacy of ILRI's strong focus on African cattle diseases, has broadened the species focus to include pigs and small ruminants and some work on aquaculture. However the FP still works mostly in Africa and with a portfolio skewed towards cattle diseases. The majority of funding is provided for laboratory-based and Center-based research and the composition of the portfolio has not been influenced by findings from the VCTS FP (a topic that is explored further in Chapter 5). Animal Genetics has a more balanced composition with respect to field and laboratory work and between livestock and aquaculture but has not managed to achieve global reach. Feeds & Forages, with a legacy of CIAT's work in Latin America, is still very much focused on that region, although even though useful work has also come out of Asia. A new initiative is attempting to increase research on grasses in Africa. At the same time, the useful inclusion of aquaculture in Feeds & Forages has been a new area for both CIAT and WorldFish. The evaluation considers it appropriate that L&F includes a balance of legacy and new work, since some of the research needed in livestock and aquaculture is of a long-term nature. In the same spirit it is to be expected that valuable research areas from L&F to be carried into phase 2. At the same time it is important for long-term research to be reviewed on a regular basis to ensure that it remains relevant and productive.

SASI, the cross-cutting discovery FP, is the anchor for the cross-cutting research that includes social science (including gender) and environment/NRM as well as development of the ToC and principles of monitoring, learning and evaluation. It is hard to comment on the FP as a whole because it is so diverse and has a somewhat incoherent structure – however, environment/natural resources management is an important topic in the global livestock agenda and was separately reviewed (see chapter 4). While not a large part of the program it is addressing some important issues. Gender research was also separately reviewed (see chapter 4). It has addressed the early needs of the program through work on tools for value chain assessment, but will need to expand the research portfolio, for example into policy issues, if it is to deliver the outcomes anticipated by the IDOs.

All of the value chains chosen for the VCTS FP are relevant to the needs and priorities of the countries in which they are located and the L&F IDOs. It could be argued that a strong emphasis on cattle (three out of nine value chain research hubs work on cattle) and a complete absence of poultry are skewing the emphasis away from the poor. However in the opinion of the evaluators the choice of research locations and activities shows consideration for the needs of the poor within the countries where value chain research hubs are based. For example, research in Tanzania does not include peri-urban dairy chains but is located in drier areas of the country further from large cities, while research in Viet Nam includes indigenous pigs kept by ethnic minorities.

L&F's original plan did not include poultry research[17]. In terms of global needs this could be considered a gap. However it has been argued by L&F management that i) the CGIAR has no comparative advantage in researching this area and ii) it is hard to identify research areas relating to small-scale poultry value chain development that are likely to offer sustainable benefits to the poor. Both are valid arguments and the initial decision of L&F not to focus on poultry was reasonable. However the evaluators do question why there has not been a scoping study in Nicaragua, given that poultry are of great importance to the food security of the poor in Central America. Funded by a BMGF grant, L&F has now decided to begin work on smallholder poultry genetics in Nigeria, a country that does not

[17] ILRI has done research on poultry in Ethiopia but it is not mapped to L&F

have a CRP value chain research hub, yet has not done scoping work in Nicaragua, This raises a question about the way new research topics are aligned with L&F structure and priorities.

The inception report questioned whether sufficient research was being done on value-adding "after harvest" i.e. through processing of products. Overall L&F is doing little work in this area, although it does some work on trading and markets. There could certainly be research opportunities here, for example in dairy value chains, but the evaluation did not identify any immediate and glaring gaps.

The conclusion of the evaluation is that for the future the program should continue to pursue the existing trend towards defining the portfolio according to global needs rather than the historic expertise of Centers. Environment/NRM would merit a larger space in the L&F portfolio in the future, particularly as livestock-environment issues are not well covered in other CRPs – even CCAFS includes little on livestock and the environment (also see Chapter 4, where L&F's work on environment/NMR is reviewed). The gender portfolio will need to move away from the current emphasis on tools development (also see chapter 4, where L&F's work on gender mainstreaming is reviewed). As the program continues to evolve it will be important for each choice of research topic to be deliberate and intentional and clearly mapped to expected outcomes.

The evaluation's initial review of portfolio relevance was necessary but insufficient, as it quickly revealed that choice of research topics was only part of the picture. The design of the program proved to be equally important, and this is discussed in section 3.2.

3.2. Design

The evaluation addressed three aspects of portfolio design, all of which relate to the internal coherence of the portfolio. Each is discussed separately here. The first two are issues that were important in the program's conception – the decision to bring together livestock and fish, and the decision to adopt the maxim "by and for the poor". The third design aspect reviewed was the relationship between L&F's portfolio coherence and the delivery of IPGs.

3.2.1 Livestock and fish

Livestock and aquaculture were not explicitly combined in CGIAR programs before the introduction of the CRPs. According to the original proposal for L&F, the CRP was seen as "an opportunity to integrate and exploit" the Blue Revolution (i.e. the revolution in aquaculture) and the Livestock Revolution. There is a rationale for combining them as i) there are commonalities in interests and approaches of livestock and aquaculture researchers that could lead to an expansion of scope and perhaps some scale efficiencies; ii) both contribute to nutrition in similar ways by producing a high-quality food that is beneficial to the poor but not always accessible to them; and iii) in some locations livestock keeping and aquaculture are practised by the same farmers. However the rationale was implicit rather than explicit in the program proposal, which gave equal status to livestock and aquaculture in the proposal's text but did not state clearly how they would collaborate.

On the positive side, many of the scientists interviewed for the evaluation found the notion of combining livestock and fish appealing – they could see benefits in working with others with different experience, and in tackling new research questions together. There has been some positive impact on the content of the research portfolio: i) the aquaculture program led by WorldFish has been motivated to have a more diverse portfolio – for example, WorldFish previously did little on feeds; ii) diseases are a major problem in farmed fish and ILRI and WorldFish are building a good relationship in this area; iii) collaboration is helping WorldFish to upgrade capacity in molecular genetics; iii) WorldFish has

provided useful examples of applied research with strong gender content in the value chain research hubs it manages in Bangladesh and Egypt.

However, few concrete outputs have been produced from the collaboration, and evidence of a collaborative and coherent research program is less strong than would have been expected after three years of program operation, given that one of the key points in the original design was combining livestock and fish. Although attempts have been made to bring the Center Boards closer together they have not yet managed a joint meeting. There has been very little cross-fertilization or joint learning between the aquaculture and livestock value chains (this is a general problem of the VCTS not limited to the livestock-fish nexus and discussed further in chapter 5). Neither has there been a much concerted effort to develop strong proposal for bilateral funding of joint projects.

The evaluation concluded that, while the concept of combining livestock and fish remains appealing, it has not yet been proven and there has been insufficient application to assess the value it could add. There would probably be little impact on final outcomes if livestock and fish were separated, and they could equally well collaborate as separate CRPs.

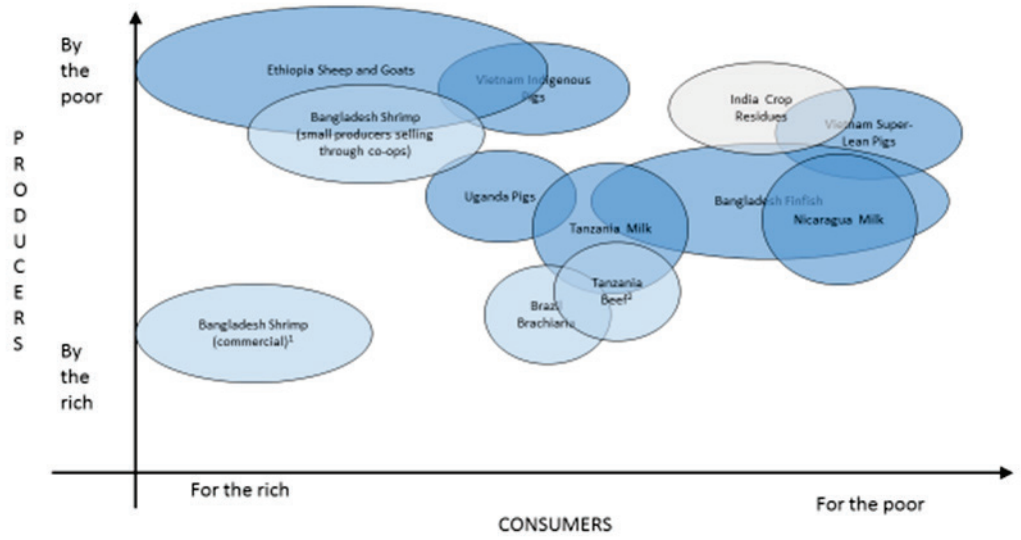
3.2.2 By and for the poor

The phrase "by and for the poor" has an inherent tension. When first introduced in the program proposal of 2011 it generated considerable debate among reviewers of the proposal. Some of those interviewed for the evaluation continue to believe that it is not possible to improve the livelihoods of poor livestock producers ("by") and poor consumers ("for") simultaneously, as separate approaches and policy instruments are likely to be required. Others lean in the opposite direction and point out that the CGIAR has been accused of focussing too heavily on farmers - by recognizing the needs of consumers L&F is attempting to address the SLOs on food security and nutrition and health more broadly than only for the livestock producers.

The most recent version of the TOC diagram (the present equivalent of impact pathways) for L&F as a whole was produced in November 2012 (see Annex H). It shows a progression, from research to impact that splits into three streams: for the poor, by the poor, and reduced pressure on the natural environment. The key to all of them is expected to be improved productivity and efficiency in target value chains, which is meant to deliver higher employment and incomes (by the poor) and affordable animal source food (for the poor). The TOC diagram is not a particularly satisfactory explanation of the impact pathways because at first glance it creates the same tension as the phrase "by and for the poor" – it seems to imply that both results can be created at the same time and by the same research. However the evaluation team believes that a simple reading of "by and for the poor" is unhelpful. It is not necessary or appropriate for all of the research done by L&F to address both parts of the objective, and for the program as a whole the two parts need not necessarily be in conflict with each other.

The evaluators together carried out a rapid and qualitative review of a selection of the portfolio, with reference to the reports of Center and value chain visits and notes from interviews in which "by and for" was discussed. They identified the extent to which certain research areas addressed the needs of the poor producing for the relatively rich (e.g. the small ruminant program in Ethiopia) and the poor producing for the relatively poor (e.g. parts of the aquaculture program in Bangladesh) as well as several shades between. Figure 3-1 shows the results of the analysis. While it is incomplete and intended for illustrative purposes only, it does demonstrate that within a program of this size both intentions can be accommodated.

Figure 3-1: By and for the poor - distribution of some L&F research areas



Source: Developed by the evaluation team. Note: L&F value chains are depicted in blue. L&F associated value chains are depicted in lighter blue.

Additional notes for Figure 3-1:
The Bangladesh commercial shrimp value chain generates substantial benefits to the poor through employment.
Shrimp can also be produced with fish in polyculture systems.
Tanzania cattle producers are considered the most likely users of the East Coast Fever (ECF) vaccine under development by the animal health FP
The figure is for illustrative purposes only. Value chains have been situated in the diagram by the expert judgement of evaluation authors. Placement on the y-axis indicates the poverty situation of the target producers (relative to nationally-specific poverty lines), not of all producers of that commodity in the country. Placement on the x-axis incorporates where appropriate the involvement of the urban poor as consumers. The size of the ellipses indicates the range of poverty situations of producers/consumers, not the importance of the value chains.

Characterization of the value chains on these axes does not incorporate changes over time. One can envisage ellipses being stretched upwards, as poorer households are incorporated in to the value chains, being moved downwards as producers in the value chains become less poor, or being stretched to the right, as the value chain is transformed to incorporate more poor consumers. For any of these trends, attribution to L&F vis-à-vis other actors would be very problematic. The concept of contribution, rather than attribution, is being discussed within the CGIAR[18] – however, use of contribution analysis would require very well-developed theories of change, agreed performance

[18] See, for example, Mayne 2008 http://www.ipdet.org/files/Publication-Contribution_analysis-_An_approach_to_exploring_cause_and_effect.pdf

measures and supporting evidence, which do not currently exist in L&F. It was evident in the review of work done at value chain research hubs and within FPs that there is still a concentration of work at the producer end of the value chain. There has been some expansion into trade and processing (e.g. in Bangladesh, Viet Nam and Uganda) as well as intentions to work with processors (e.g. Tanzania, Nicaragua), but very little has been done to look at the needs of consumers and in this regard L&F is not fully delivering on the promise implied by its maxim. There has been cross-CRP collaboration with the CRP on Agriculture for Nutrition and Health (A4NH) that allows a consumer perspective to be introduced (e.g. food safety in Viet Nam and Uganda) but little has been done explicitly by L&F.

The conclusion of the evaluation was that, on balance, the maxim "by and for the poor" has been useful. It has encouraged L&F to be intentional about the positioning of the research portfolio, particularly within the value chain research hubs, to address the needs of specific beneficiaries.

3.2.3 Provision of International Public Goods

The CGIAR has a mandate to deliver international public goods (IPGs) and L&F must contribute to this. Provision of IPGs requires L&F to be working on topics in livestock and aquaculture that are relevant to global needs and whose results have the potential to cross international borders (Box 3-1).

While comparative advantage is not the main focus of this section, the perceived comparative advantage of the CGIAR in delivering IPGs is important background to the present discussion and was considered by the evaluation team. A belief held by several peer interviewees and shared by the evaluation, is that L&F has little to no comparative advantage scientifically other than in a few specialist areas, but it has the undeniable and very important comparative advantage of a mandate to work for the poor and on IPGs. In addition, unlike many other agricultural research organizations the CGIAR does not have a commercial focus but pays attention to resource-poor farmers. CGIAR Centers have "name recognition" with national governments and are important in providing an integrating function through their closeness to national governments and their ability to work on "post-academic, pre-product" research questions that would not be economical for every developing country to address.

Box 3-1: International public goods in L&F

Sagasti and Timmer (2008) remind us of three characteristics of public goods: they produce significant externalities; they are available to anyone, even those who have not paid for them, and they generate opportunities for improving welfare through collective action. International public goods (IPGs) are, in the simplest terms, public goods that cross borders. To deal with their externalities requires collective action from actors in more than one country; their benefits may be available to many people in many places including large numbers who have not paid for them. Ryan (2006) considers that a public good is an IPG if the expected outputs are intended to be relevant to as many countries as possible, regardless of whether the impacts generated turn out to be as international as was intended.

The CGIAR is financed by many nations and it is expected to deliver IPGs. Based on the assessment of Sagasti and Timmer, L&F research can be considered an IPG when it:

a) Contributes to global knowledge in livestock, aquaculture, forestry, policy and environment, provided that the knowledge is made easy for others to access and apply and provided L&F makes an active attempt to promote its use by immediate partners and others.
b) Provides specific products and services that go beyond the generation and dissemination of knowledge and are made available to local, national and international users. Outputs must be relevant to the need of intended users, and delivery systems must be identified for research products.

c) Develops and maintains capacity for conducting and coordinating international research into livestock and aquaculture. This relates to the capacity of the CG Centers that contribute to L&F not only to conduct their own research but to deliver a coherent and co-ordinated international program.
d) Contributes to "international governance" in livestock and aquaculture through partnerships and networks with other international organizations. This relates to the presence of L&F in big global debates, physically or by producing "game-changing" outputs.

Having established that it is important for L&F to provide IPGs, it must be acknowledged that the portfolio has certain shortcomings in this regard. IPGs from the CGIAR need to include "game-changing" outputs that can make an impact in multiple countries. Peer interviewees stated that they hoped and expected that the CGIAR would deliver: syntheses of comparable studies carried out over a range of locations or time to provide solid, global information; thought-provoking analyses that change the global view of livestock or change development practices; as well as research outputs that help to solve national problems or change national policies. Interviewees could cite examples of research from L&F Centers in previous decades that met these criteria but none within the past ten years, and the evaluation could find very few L&F outputs to date with the potential to be game-changing. L&F researchers who responded to the evaluation survey scored the program poorly in its ability to influence policy and decision makers. There are exceptions, such as the environmental work carried out on methane emissions (see section 4.1.3). There are also research areas that could be game-changing with a more coherent program structure and/or a clear strategy to align them to the impact pathways and the CRP's TOC (also discussed in section 3.2 and 7.1). The following three examples, all from animal genetics, illustrate the principle:

- Tilpia genetic enhancement (discussed in chapter 7) has already delivered on one aspect of IPGs as it has created positive development impacts in more than one country where L&F has a value chain research hub (Egypt and Bangladesh) as well as countries where L&F is not currently based. To fully capitalize on the value of the research, L&F would have to embark on a forward-looking program of investigation into important traits that have been highlighted by beneficiaries but not yet researched, and use this to develop research capacity in national partners. Since this research area has a long legacy, the evaluation would have expected to find not only the present commendable outputs but also a clearly delineated program to take capacity building and research into the future.
- The application of genomics is changing the game worldwide in animal genetics. Applications in developing countries cannot follow the same models as those in developed countries, but the potential exists to make important discoveries of relevance to more than one country (e.g. recently a functional mutation was discovered in a cattle breed from the Caribbean that increases heat tolerance). The unique challenge for L&F is not only to make discoveries but also to find innovative ways to take them to the field in more than one country, allowing for limited national government capacity. Since this area of work is relatively new within L&F, the evaluation did not expect to see major visible outputs, but did expect to find a clearly delineated plan for dealing with the challenges of delivery in the field, in anticipation of future research outputs.
- Community based breeding programs as applied by L&F in Ethiopia appear to have effects lasting beyond the research phase in creating favourable social and environmental impacts. To become IPGs, these would need to be applied very widely within Ethiopia, ideally trialled in more than one country, and generate general principles with very wide application. This research area has been developed within L&F but was not entirely new. In addition to the good progress made at certain research sites, and the commendable decision to include both sheep and goats, the evaluation would have liked to see a clearer plan for expanding the field research beyond the current local focus and into new countries, and using the experience gained to develop general principles for

development practitioners, (whether these things were done entirely within L&F or through L&F's facilitation of a broader research network).

It could be argued that L&F is a young program and has not had time to produce such substantial outputs. Much of the work it is doing requires a long development time, or has required investment in institutional relationships prior to initiating research activities. However, there are also shortcomings in the design of the present portfolio:

- It is broad and diverse. Human and financial resources are spread very thinly over a large range of activities, many of which are small and cannot individually be expected to deliver great impact. There are exceptions to this in a small number of projects that have delivered scalable outputs, as mentioned above – although the results of this work have so far been confined to one country. There are also examples that may have great impact if research outputs can be produced, one being an improved East Coast vaccine that would be simpler and cheaper to deliver to African farmers than the widely-used infection-and-treatment vaccine formerly produced by ILRI. Others, such as work on adaptation of forages to climate change, could produce important outputs if they were conducted at scale, but currently are very small-scale and show little prospect of being expanded. The CCEE of the value chain approach recommended the development of effective scaling strategies, a recommendation that was fully accepted by CRP management and was taken into consideration in revising SIPs in early 2015 – however no impact of these revisions was visible at the time of the present evaluation.
- The program lacks design coherence, and opportunities to add value and synergy are missed. FPs are designed as clusters of activities that should each add up to a substantial whole, but when the evaluators looked for case studies to analyse they found a bewildering array of projects, many of them small, and only a few research areas where a sufficient body of work had been done to provide a case study. There has been limited influence of work done in value chain research hubs on research directions in the Animal Genetics, Animal Health and Feeds & Forages FPs, something that is discussed in more detail in Chapter 6.

The evaluation concluded that for the future, L&F should review and re-focus the portfolio. It should identify areas where there is greatest potential to deliver IPGs, either by scaling of existing outputs or through synthesis across the program. By implication, activities that are peripheral to these aims should gradually be discarded.

A coherent portfolio design is necessary but not sufficient for provision of IPGs. This also requires an active attempt to promote the use of research outputs, to ensure that suitable delivery vehicles are identified for technologies and ideas, and to be an exemplar in the way it conducts international research. These subjects are discussed elsewhere in this report (research quality in chapter 4; the delivery of research through the value chain approach in chapter 6).

3.3. Conclusions and opportunities for improvement

The overall conclusion of the evaluation was that L&F's program is broadly relevant, but will need to be focused and streamlined if it is to achieve what is implied by the CRP objectives and IDOs and the need to deliver IPGs.

The evaluation does not see the need for immediate radical changes of direction but has identified the following issues that were considered in formulating recommendations:

- The program will be better able to deliver substantive and game-changing outputs if it is more clearly focused around a limited number of key research areas. Considering the limited core

resources that are projected to be available and the system complexity discussed in chapter 2, it is likely that the overall number of activities will need to be reduced in order to provide sufficient capacity for areas most likely to deliver impact.

- The evaluation team has been encouraged to make concrete suggestions about directions for focus and streamlining. While fully appreciating the reason for this request, the team prefers not to make prescriptive recommendations about the content of the portfolio It was not realistic to attempt a comprehensive prioritization process within the time frame of the evaluation, and it would not be helpful to make recommendations based on an incomplete analysis, since there is often more than one way of arriving at a desired result. For example, chapter 6 discusses the value chain portfolio and notes that the small size of the core research team at each site may limit the disciplinary range of research topics that can be addressed. In the absence of expanded funds, there could be more than one streamlining approach to deal with the constraint. The most obvious would be to reduce the number of value chain hubs and redistribute saved resources among the remaining hubs – but there could be disadvantages to a reducing the diversity offered by the current country/species mix. An alternative might be to have staff "pools" that are designated to cover two or more hubs, thus increasing the diversity of disciplinary expertise and promoting sharing and collaboration between them. Rather than make specific suggestions, the evaluators prefer to suggest broad criteria for streamlining: a) Key areas chosen should be those that can be objectively demonstrated to have greatest potential impact on IDOs taking into account scientific capacity; b). The streamlining should take place in the context of the impact pathways and should ensure a balance between short, medium and long term outputs; c)Streamlining could include combining or linking of existing resources or activities to create greater value in terms of output generation; d) Clear detailed criteria will need to be agreed by all partners on which decisions will be based. In future proposals the evaluation would strongly recommend not increasing the number of FPs or value chain sites.
- A higher profile for work on environment and natural resource management would be advisable, given the global importance of this topic. This could include devoting an FP to this subject to make it more visible. There is already ongoing work that could provide the core of an environment/NRM FP.
- Within animal genetics a higher profile should also be given to aquaculture genetics, since this is an area where scalable outputs have already been produced.

4. Environment and gender

This chapter reports the results of the evaluation's review of two cross-cutting elements of L&F. One, environment/natural resource management (NRM), is an important global issue for livestock and aquaculture. The other, gender is a mandatory topic for CRPs, since the CGIAR requires that all CRPs should mainstream gender within their research programs.

4.1 Environment and NRM

This section addresses the cross-cutting question "does L&F adequately cover NRM and environmental issues associated with livestock and fish that are not captured within other CRPs?" It first considers where the greatest needs lie, and then reviews the positioning of environment and NRM within L&F and the progress made in delivering results. The assessment drew on L&F program documents and published outputs, value chain case studies and interviews with scientists and peers. The subject area is of considerable and growing importance for the livestock sector and therefore a detailed examination of the L&F research portfolio is discussed here.

4.1.1. Environment and NRM issues in livestock research and development

A variety of environmental and natural resource management issues arise for the L&F program, both as priorities revealed in field-level research in the value chains, and as issues already strongly associated with livestock and aquaculture production in existing scientific and policy debates. These can be categorised into a) the environmental impacts of livestock and fish value chains and b) the vulnerabilities of livestock and fish value chains to environmental shocks and trends.

Environmental impacts of livestock and fish value chains

This category includes several much-discussed global environmental impacts of livestock production and aquaculture:

- Greenhouse gas emissions associated with the livestock sector; since the publication of Livestock's Long Shadow in 2006, with its much repeated conclusion that the world livestock sector is responsible for 18 percent of anthropogenic greenhouse gas (GHG) emissions, this issue has become an important part of global debates, both about climate change mitigation and about livestock, in the scientific, policy and media spheres. While a number of other estimates, of very varying scientific quality, and both higher and lower than 18 percent have appeared, there have been increasing calls from media and public figures that people, at least those in industrialised countries, should substantially decrease their meat consumption in the cause of mitigating climate change. The issue is unavoidable for L&F.
- Livestock water consumption: while receiving less popular coverage than the issue of GHGs, the high consumption of water by the world livestock sector, absolutely and per unit of human food produced, has also been seen as an important issue, in the context of growing concern about global water shortages and the framing of freshwater use as a "planetary boundary".
- Concerns about the environmental impact of aquaculture have included the overexploitation of capture fisheries for feed production, and localised impacts such as those on mangrove ecosystems.

In addition, localised concerns about environmental impacts were identified during this evaluation in at least two L&F research hubs:

- Lower environmental pollution from pigs is one of the objectives of the L&F program in Viet Nam
- Risks to the biodiversity of wild fish species through the possible accidental release of imported improved strains in Bangladesh, and the weak enforcement of current regulations on importation, were identified during this evaluation as a concern.

Vulnerabilities of livestock and fish value chains to environmental shocks and trends

While livestock production and aquaculture are intrinsically vulnerable to climate variability, and to environmental trends such as desertification, these vulnerabilities are becoming more important for a research program like L&F as more becomes known of climate change and its impacts. Detecting and attributing an *observed impact* of climate change on livestock systems remains difficult; for example the latest IPCC report does not cite a livestock-related example of an observed impact. But climate change can be assumed to exacerbate existing challenges of climate variability to livestock and fish value chains, and bring new risks. CGIAR scientists have been at the forefront of identifying and scoping such risks to the livestock sector since before the establishment of L&F (see most notably Thornton *et al*. 2009). Climate risks to livestock and fish value chains appear:

- As explicit concerns of the research hubs, most notably the strong projected drying trend in Nicaragua, with accompanying risks of increased rainfall variability, alongside land degradation associated with non-climate factors such as overuse of marginal lands without soil conservation measures;
- As implicit concerns of the research hubs; most of the research on dairy value chains in Tanzania, and most of the research on small ruminants in Ethiopia, takes place in dryland areas, in some cases (Shinille, Yabello and Abergelle in Ethiopia) in extremely dry areas. These country programs appear very much to take into account aridity and rainfall variability, in focuses on seasonal feed gaps in Tanzania, and in Ethiopia in the species focus itself, and in specific work on genomic regions selected by environmental variables. They thus can be seen as building adaptive capacity for climate change;
- As concerns raised by farmers but not as yet incorporated into research. For example, farmers in Bangladesh saw both drought and floods (which can cause a catastrophic rise in salinity in farm ponds) as major risks to aquaculture production.

4.1.2. Positioning of environment and NRM research within L&F

The original proposal for L&F does not accord a high profile to environment and NRM issues. The proposal makes frequent use of the language of sustainability, referring in different contexts with different degrees of clarity to environmental, economic and institutional sustainability. Program objective 1 reads in this way: "increase sustainably the productivity of small-scale livestock and fish production and marketing systems". There are likewise numerous references to the environment and environmental factors, in terms of the environmental contexts for and stresses on livestock and fish production, and also the environmental impacts of, and risks related to, livestock and fish production. But neither climate, environment nor NRM are incorporated into program objectives or other headline statements.

In 2013 L&F introduced the Intermediate Development Outcomes (IDOs) into its program statements, including IDO5 which after slight elaboration now reads (as presented on the L&F website): "*Lower environmental impacts and higher benefits per unit of commodity produced in the target value chains"*. In the 2014 Extension Request 2015-16 the IDO carries the note "Targets GHG per unit produced as a proxy for enhanced productivity and value chain efficiency that contributes to reduced pressure on natural resources" and has as its sole indicator "Emission Intensity of GHGs". In the current website

version the accompanying note shows a broader vision of environmental impact: "Improving productivity and value chain efficiency will contribute to reduce the pressure on natural resources (e.g., use of fodder, improved grazing management, vaccines replacing acaricides, more efficient use of crop residues, management of excreta), but also will help reduce the emission of GHG per unit of product".

While it has been a positive step to include an environmental IDO, and it is appropriate that the IDO is phrased in a way to address general environmental impacts (on land, water, biodiversity etc. as well as climate), this formulation can be critiqued on various levels:

- A focus on impacts and benefits per unit of commodity could be seen as meaning that the program was unconcerned about the possibility of higher production and higher overall impacts, even with lower impacts per unit product
- The wording focusses on the mitigation of environmental impacts to the exclusion of adaptation of livestock and fish value chains to environmental trends, most notably climate change.

In any successor program the IDO or equivalent concerning environment and NRM should be redrafted to reflect these concerns. This task is now the responsibility of the FC rather than CRP management.

The management of environmental and NRM research within L&F is highly complex. In formal terms, environmental research is a sub-cluster of Cluster 1 "Conduct system component research and identify promising innovations" of the Systems Analysis for Sustainable Innovation (SASI) FP[19]. Each of the four participating Centers has a focal point for SASI. The ILRI focal point, an environmental scientist who is also ILRI's science lead for the CRP on Water, Land and Ecosystems, leads environmental activities within ILRI, and jointly with the SASI FP Leader, co-ordinates them across the four centers, with WorldFish environmental research being somewhat less closely co-ordinated with the other centers. Environmental work in CIAT is jointly managed by the SASI FP Leader and the SASI focal point, a more senior CIAT staff member. For ICARDA, the Ethiopia value chain co-ordinator also acts as SASI (and thus environmental) focal point. In addition to a complex structure of activities within L&F, there has also been collaboration with CCAFs and external research partners such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Stockholm Environment Institute (SEI). The fact that L&F environmental research is part of a nexus is one of its strengths but it also means that that work can "disappear" in the reporting process. The evaluation team considers that L&F should aim for a higher profile for the work including clearer attribution of published outputs to L&F.

4.1.3. Progress made

Seven main strands of environmental/NRM research were identified through lists of publications made available to the research team, in interviews and meeting during center visits, and in visits to country research hubs. This section gives an assessment of these strands of research, with an emphasis on particularly significant outputs and activities.

Global modelling studies

ILRI has a strong tradition of large-scale modelling of climate vulnerabilities and impacts, and global-level reviews of livestock, environment and climate interactions. The L&F period has seen several strong published outputs within this strand, taking the work into the areas of estimating GHG

[19] The sub-cluster also includes gender and human nutrition research

emissions through the construction of an underlying dataset of global biomass use and feed efficiencies[20] which incorporates better data on developing country livestock than any previous initiatives, and modelling the emission impacts of future changes in livestock systems and livestock-related land use change[21]. There is more detailed work on the difficulties of data collection and modelling for nitrogen flows in livestock systems[22]. While this strand of work is largely associated with L&F through the involvement of the previous ILRI Livestock Systems and Environment Program leader, it has resulted in very important and well-executed modelling exercises with very significant global policy implications, and overall progress should be adjudged excellent.[23]

Development of the CLEANED framework

With USD 600,000 from the Bill and Melinda Gates Foundation, ILRI together with SEI and other partners have been developing CLEANED, a comprehensive ex-ante environmental assessment tool for livestock value chains, encompassing impacts on water, soil, biodiversity and climate change. Development of CLEANED was founded in a comprehensive review of environmental impact assessment frameworks[24] and has been developed in collaboration with the Tanzania dairy research hub, and in response to needs expressed by them. The framework is succinctly set out in an L&F publication[25] and appears to be a useful and practical tool, well-rooted in current thinking on both environmental impacts and on value chain approaches, which can be adapted to livestock value chains in various settings. One of the workshop reports produced in the development process[26] also contains a fine example of the use of Participatory geographical information system (GIS). Overall progress should be adjudged good.

Environmental research by WorldFish

WorldFish work on environmental issues has proceeded on a largely separate course from that led by ILRI, but has resulted in some impressive outputs. A Working Paper of the World Resources Institute with WorldFish collaboration[27] is an excellent review and critical assessment of the major challenges around the sustainability of aquaculture, with a preliminary three-way (social, economic and environmental) assessment of aquaculture of six major species groups, scenario construction for future aquaculture development, and use of case studies on past improvements in environmental impact. It embodies some original research, and is accessible to a variety of audiences. WorldFish have also produced Life Cycle Assessments of aquaculture in both their L&F focus countries and more generally for Asian aquaculture systems[28]. The report on Egyptian tilapia production[29] is a clear exposition of Life Cycle Assessment methods, with an appropriately broad delineation of the lifecycle of Egyptian aquaculture mapping well on to the value chain, relevant comparisons to other tilapia-

[20] Herrero *et al*. 2013
[21] Havlik *et al*. 2014
[22] Rufino *et al*. 2014
[23] Declaration of interest: the author of this section of the evaluation and Dr Herrero are both co-authors of a journal paper under review, though the lead authors and initiators have no close connection with L&F.
[24] Ran *et al*. 2015
[25] Notenbaert *et al*. 2014
[26] Morris et al. 2014
[27] Waite et al. (2014),
[28] Henriksson *et al*. 2014
[29] Henriksson *et al*. in draft

producing countries and policy-relevant conclusions. An additional report investigates a potential positive environmental impact of aquaculture in Bangladesh.[30] Overall progress should be adjudged excellent.

WorldFish work on the potential climate change impacts on aquaculture has been funded under CCAFS and has taken place in non-L&F countries, so is not reviewed here.

Tropical forages and GHG mitigation

CIAT's longstanding mandate as lead CGIAR center, and now lead within L&F, on tropical forages, has increasingly involved work on environmental impacts, specifically GHG emissions and strategies to mitigate them – this has been part-funded under SASI. A L&F publication[31] gives a wide ranging review of these issues incorporating some original research, and a very promising and well-publicised line of research on breeding *Brachiaria*, a tropical grass, to enhance its capacity for biological nitrification inhibition (BNI), limiting emissions from the soil of nitrous oxide, a potent GHG, and enhance nitrogen availability for future annual crops. Overall progress should be adjudged good.

Climate-related research and development in Nicaragua

Relating to this work, the CIAT-led Nicaragua research hub has been the most active of all the hubs in incorporating climate change issues, both of adaptation and mitigation, into program design. The hub has been the only one to establish specific targets, for 2022, under IDO5 (see below), of:

- 60 percent of grassland covered by silvopastoral systems
- 20 percent of area in the field sites used for forest production
- 100 percent of water sources protected
- 50 percent of farmers benefitting from ecosystem services[32]

The program has included:

- Trials of a silvopastoral system including improved pastures and legume shrubs[33]
- Trials of Brachiaria humidicola (see above) for its BNI activity, involving investigation of farmer selection criteria
- A pilot "carbon insetting" program investigating the feasibility of private sector financing of combined climate change mitigation and adaptation activities.
- Quantifying enteric methane emissions from cattle grazing on improved forages (in collaboration with CCAFS)

Overall progress should be judged good.

[30] Haque et al. 2016 – sic. The team was not told of this output during the Bangladesh visit, and despite the funding acknowledgement to L&F it appears closer to the concerns of the AAS CRP
[31] Peters et al. 2012
[32] From a presentation to the evaluation team in Managua, July 2015. It is unclear whether these are national targets or for program areas, and how "farmers benefitting from ecosystem services" could be operationalised
[33] Van der Hoek et al. 2012

Livestock water consumption

A specific strand of research, centered on the work of a PhD student supervised at the Stockholm Resilience Center by an ILRI staff member, has investigated water use by different livestock systems in Uruguay. This work[34], based on global hydrological models as well as available literature on Uruguayan production systems, develops an original three way classification of livestock water use into "cropland green", "pasture green" and "blue". This work is now expanding to look in a similar way at trade-offs in global biomass and water use, distinguishing between human-edible and human-inedible, also looking at water-use per calorie, jointly funded under L&F and the CRP on WLE. It should also be noted that an ILRI scientist associated with this strand of research appears as a co-author on a major multi-authored contribution to the "planetary boundaries" debate[35]. Concurrently, scientists in ILRI and CIAT have reviewed global literature on livestock water requirements under various milk and meat production systems[36]. Up until now, work on water has been a minor strand within L&F, but within that strand progress has been good.

Laboratory research on cattle methane production

L&F (SASI) has co-funded, alongside CCAFS, Humidtropics and bilaterals, the Mazangira Center laboratory at ILRI Nairobi, which houses among other facilities, chambers to investigate GHG emissions form live animals. This has enabled investigation of emissions from developing country breeds of cattle, fed local feeds, and thus enabled fine-tuning of GHG emission estimates from cattle. This work has not yet seen publication, [37] so an overall judgement on progress is not made here.

Interactions between the environmental sub-cluster and value chain research hubs

There has been mixed success in establishing coherent links between Center-based and field-based work and in responding to needs identified in the field (note this topic is also discussed in chapter 6).

Positive examples include work on natural resource management and carbon insetting in Nicaragua shows a responsiveness to country hub environmental priorities. The development of CLEANED within the Tanzania program is certainly an example of confluence of interests between the country hub and the SASI FP. For the ILRI leader of SASI, the best example of interaction with a country hub is from the pig value chain in Uganda, where the identification of a pig manure problem led to the investment of ILRI staff time in the detailed development of a proposal for bilateral funding by IFAD.

However there are also negative examples. For example, in Viet Nam, environmental pollution from pigs has been identified as an issue in yet no bilateral finding has been obtained for environmental research and the evaluation team did not see or hear of any such research taking place. In Bangladesh, where improved fish strains may pose a risk to biodiversity of wild fish species, the evaluation team

[34] Ran *et al*. 2012
[35] Steffen *et al*. 2015
[36] Blummel *et al.* 2014
[37] However, one researcher with an ILRI affiliation is author and co-author of articles based on measurement of methane by the use of Portable Accumulation Chambers in Australia (Goopy et al. 2015, Robinson et al. 2015)

considers that WorldFish, in the absence of effective government regulation, should consider developing its own risk management policy on germplasm introduction.[38]

4.1.4. Conclusions on impact and effectiveness

The environmental and NRM activities of L&F have included some very high-quality science. Using the issues set out in 4.1.1 above, the global-level environmental impacts of livestock and fish value chains have been the subjects of significant research within L&F, the country- or region-specific issues much less so. For vulnerabilities of livestock and fish value chains to environmental shocks and trends the situation is somewhat reversed, as these have been addressed in local forms heighted by the value chain research, rather than at the global level.

Work has been of particularly high quality around global-level modelling, collating evidence on the environmental impacts of aquaculture, and breeding of *Brachiaria* for BNI. There is a clear possibility that the first two could have impacts on policy, though extra steps of policy engagement by the program will be needed. The *Brachiaria* work also will require several further well-planned steps before it can contribute to GHG emission reductions at scale. At the level of local landscapes or farms the work in Nicaragua show the greatest indications of future impact – it is working on a problem identified with local partners, towards locally-established partners, in close co-operation with farmers, and has produced promising early results.

The research that has been done is very important for the essential tasks of managing livestock-related environmental (including climate impacts) and impacts of environmental (including climate) trends on livestock value chains. It has been even more important as work on these themes, and especially on climate adaptation for livestock systems under CCAFS has apparently been very limited.[39] However, under L&F, the position of environment/NRM research as a sub-cluster under SASI, in other words two organizational levels below a FP, has limited its effectiveness and ability to respond to environmental priorities identified within the country hubs. Given the importance of the topic, the evaluation considers that it should be given a higher profile in future plans.

4.2 Gender

It is well recognized with the international development community, and CGIAR has made it mandatory, that gender issues must be addressed, and this is reflected in the L&F portfolio. Gender has always been an integral component in L&F, initially as one of three components in a "targeting gender and impact" theme and more recently component as a cross-cutting subject with a "home" in the SASI FP.

The evaluation addressed four aspects of L&F's gender program:

- The positioning of gender within the L&F structure. Gender has been a component within a theme, a separately identified theme, and most recently a component of the SASI FP. The evaluation assessed whether this repositioning has affected performance.
- The extent to which gender has been operationally mainstreamed within L&F.

[38] We acknowledge that earlier World Fish work in Africa (Lind *et al*. 2012) demonstrates significant reflection on mechanisms to avoid damage to wild fish biodiversity.

[39] Simon Anderson, team leader for the Independent Evaluation of CCAFS, pers.comm.

- Delivery of outputs and outcomes.
- The strength of the gender team relative to the work to be done.

4.2.1 Positioning of gender within the L&F portfolio

Gender has always been integral to the L&F portfolio. The initial program structure had three Themes with a total of nine components – gender was specifically mentioned in two themes. In 2012, L&F streamlined its structure, reducing the original three Themes (with nine components in total) to a new structure of six Themes (not divided into components), one of which was "gender and learning". Up to the end of 2014 L&F reported against the 6 themes. For the extension period 2015-2016, L&F was again restructured, gender removed as a separate theme and incorporated as a cross-cutting issue across all FPs, with technical leadership coming from the SASI FP.

In the opinion of the evaluation the removal of gender as a separate theme has not affected the importance placed on it or the way the researchers approach gender mainstreaming. The program still works to the gender strategy that was conceived under the old structure. The key to performance seems to have been the strength of the gender team and gender strategy rather than the precise position of gender in the program structure.

4.2.2 Progress in mainstreaming

The evaluation team defines mainstreaming as bringing a gender perspective to all aspects of the strategy and programs L&F and has looked for evidence that L&F had conceived and implemented a gender strategy that could deliver mainstreaming. The original L&F proposal consisted of having three elements: approaches and tools; capacity-building; and finding opportunities to enhance participation of women and men in value chains. As originally conceived, therefore, the program's design provides scope for gender mainstreaming.

In June 2013 L&F developed a gender strategy document that has underpinned all subsequent work on gender. It was confirmed during the evaluation visit to ILRI that this strategy is still considered valid by the gender researchers although in their words "it needs a little updating" to deal with anticipated future demands. In the opinion of the evaluation team the strategy document is well conceived and well written. The gender strategy addresses four types of gender output and takes on the ambitious but important goal of attempting to incorporate (or at least exploring the possibility to incorporate) gender transformative approaches (i.e. approaches to gender mainstreaming or equity that seek to change the gender norms in communities and institutions that create inequity). Gender transformative work, or indeed any kind of transformational change, relies on long term engagement, strong partnerships with development stakeholders at all levels, and work on policy and institutions. The strategy begins to define gender indicators for L&F, with the aim of generating a demand for gender work across the CRP and providing a structure against which to monitor progress. It distinguishes between accommodative and transformative approaches and thereby opens up an important question about what livestock research should be trying to achieve in terms of gender equity. It also identifies the types of capacity that will need to be built and some necessary activities.

Gender questions have been incorporated into most of the basic assessment tools of L&F. Research into gender issues is taking place in all of the FPs although the level of integration is very varied across FPs and some important questions are still not being asked. Equally important, the L&F gender team is beginning to evaluate the tools it is using for VC assessment to assess whether they are fit for purpose.

There has been some capacity building within the CGIAR and in partner organizations through a mentoring program implemented by the Royal Tropical Institute, Netherlands (KIT), and gender capacity development of partners done by Transition International with the ILRI gender team, as well as some "learning by doing" with development partners and national research partners.

It has been easiest to make progress with mainstreaming in the field programs. On the whole, value chain teams have been receptive to the concept of gender mainstreaming in their research and can see the value of considering gender issues, although they need considerable practical help in implementing the concept. For example, in Nicaragua, the value chain team includes a full-time gender person; the Ethiopia value chain has been assisted in survey design, data collection and a reanalysis of data when the initial report neglected gender issues; Tanzania has also received considerable attention from the gender team in Nairobi; Viet Nam has received some distance help in questionnaire design. Comments made to the team indicated that where support has been provided from the CRP gender team it has been appreciated. A value chain researcher responding to the researcher survey commented: "The gender partners are an asset to my work and working with them is worth the investment." The gender team has considered the extent to which it can or should attempt gender transformative work. It has concluded that many of the L&F research lines have the potential to be gender- or socially-transformative in some way. The training work done in the Bangladesh value chain is a positive example of a gender-transformative approach by developing husband-wife family teams that raise income in poor families. The gender program is now beginning to work with social media, partnering with a Kenya-based company with experience of promoting agriculture to young people. The evaluation considers that the senior members of the gender team have a realistic appreciation of what they can achieve.

Within the discovery FPs, the evaluation team would not expect every research activity to incorporate gender research but each FP should have an appreciation of areas where gender questions are needed and be trying to address them. The gender team has attempted to work with the discovery FPs but with varying results. Some progress has been made with the animal genetics FP – this was ascertained from interviews with both the gender team and animal genetics researchers – but it is evident that not all scientists see the need to consider gender issues. The feeds and forages FP is reported by the gender team to have shown interest in gender issues related to the technologies they deliver, but the evaluation visit to CIAT in Cali revealed that much of the Center-based work there is gender-blind and does not include gender questions that could be asked at quite an early stage of forage development. It has been quite challenging to incorporate gender into the Animal Health FP, which shows limited evidence of work done other than one study in Kenya related to Contagious Bovine Pleuropneumonia. Of the researchers interviewed, those who have strong field experience are receptive to the notion that there may be value in considering gender issues when designing vaccines and diagnostic tools, while those who are entirely laboratory based tend not to consider social science.

Assured core funding has been important to the mainstreaming effort. Each participating Center is expected to demonstrate that 10 percent of its overall budget is allocated to gender research in order for the CRP meets the 10 percent target set by the CO. Within ILRI, the budget for gender mainstreaming comes from a "tax" (the word given by some L&F scientists) at approximately 10 percent of total W1/W2 budget. This ensures that there has always been some core funding. In the sudden funding cut applied across all CRPs in April 2015, the gender budget was protected to some extent. There has been no bilateral funding purely for work on gender, although many of the field projects explicitly incorporate or allow for work on gender. The evaluation team considers that assured core funding has been important and should be continued, although it is evident from comments made in the researcher survey that not all scientists share this view and some consider that too much attention and budget has been devoted to gender.

According to the evaluation progress in mainstreaming has been reasonably good, underpinned by a strong strategy document, but there is more to do, particularly with respect to discovery FPs.

4.2.3 Delivery of research outputs and outcomes

The gender strategy defined four categories of outputs:

- Gender capabilities across systems actors [capacity]
- Gender and value chains [participation]
- Gender and society [access to markets, control of resources, technologies, labour, power, benefits]
- Gender and consumption [animal source foods consumption in poor households]

Work has focused mainly on output 1 and 2. Gender questions are gradually being included in surveys that will contribute to output 3 and possibly 4 but the speed at which this can be done is limited by the number of researchers in L&F with experience in gender research.

The most visible outputs to date have been methodological. These include the integration of gender in assessment of research needs, and review of the tools used for integrating gender to see whether they are fit for purpose. A small number of good reports and an even smaller number of high-quality publications in journals are emerging that relate to the outputs on gender capabilities and gender in society – for example, work has been published that explores the nuances of livestock asset ownership.

By early 2014 work was lagging behind. KIT[40] was recruited as an implementing partner to run a coaching and mentoring program. This has had two positive effects: capacity building was put onto a more systematic footing, and the CGIAR gender scientists had more time for analysis of data backlogs. A comment from the researcher survey: "the contact and work with the KIT Gender team has been a fantastic input to lift the gender work".

The assessment of the evaluation is that delivery of research outputs was initially disappointing but has speeded up thanks to remedial efforts made by L&F.

Outcomes

L&F's gender strategy can be mapped directly to IDO4 (through the gender strategy objective "Poor women, men and marginalized groups have improved and more equitable access to affordable animal source foods through gender equitable interventions") and indirectly to other IDOs where program activities result in increased gender capacity within CGIAR centers or partner organizations, or contribute to work done within FPs and value chain research hubs.

As yet there is no evidence on which to assess progress towards IDO4. The activities taking place particularly in the value chains and the SASI FP are addressing to some extent all four of the outputs of the gender strategy but (as in other parts of the CRP) there has been no attempt to map activities or outputs delivered to outcomes.

As the program progresses the strategy will need to be reviewed. For example:

[40] An organization from the Netherlands with considerable expertise in gender and development

- The L&F gender team is trying to anticipate the long-term impact of increased buy-in to gender. Having provided basic orientation and training, back-up support will be needed, and the CRP needs to assess what it can provide. Current coaching and tools will promote the inclusion of gender questions in studies, but another level of skills is needed to analyse and interpret the data.
- Research will need to evolve beyond the early emphasis on basic assessments of tools and value chains to expand the synthesis work that has begun to be published on livestock ownership, empowerment and transformative approaches. SASI has started working on broad-based databases and data analysis tools such as a GIS-based "gender map" for around 30 countries and reviewing the potential of the USAID Demographic and Health Surveys datasets and tools
- The gender team has also recognized the need to have impact at policy level, but feels it will need to recruit additional skills to do this work, or find a way to collaborate with a systems CRP that has those skills.

The evaluation's assessment is that the gender team leaders are aware of what needs to be done in the above areas to make progress towards outcomes but have not yet planned how to implement the necessary program evolution.

4.2.4 Capacity of the gender team

The team has two functions: a) research and b) capacity building within the CRP. Both are time-consuming, and there are costs involved in having to work in all of the FPs and all VC sites.

The team has only seven staff (5.5 person-equivalent in terms of time) who are gender specialists officially mapped to L&F, in addition to the program leader (who is currently part time and "wearing several hats". Two of the staff are at ILRI Nairobi. Several of L&F's field-based researchers in other disciplines are aware of gender issues, used to including them in field assessments, and can ask relevant questions from checklists, but do not necessarily have the expertise to design, analyse or interpret gender questions in surveys. The assessment of the evaluation team is that the gender component/team has sufficient human resource to do the basic work that has so far been attempting but will need further highly-skilled human resource to take research to the next stage. It is worth noting that two of the key synthesis papers produced to date, on transformative approaches and empowerment, had strong inputs from people who are neither current core team members nor research partners.

Lack of leadership is likely to become a problem. There has been a recurrent problem in finding senior gender scientists. The strategy document was developed under the leadership of ILRI's former senior gender scientist, who has now left. The next program leader was recruited in 2013 and left after a year. The evaluators were told that although ILRI is searching diligently it has not been possible to find someone with the appropriate combination of research expertise and leadership and management experience. In the interim, leadership is split between the Interim Program Leader, Livelihoods, Gender, Impact and Innovation at ILRI (an agricultural economist with good gender experience), who oversees the gender work at ILRI, and a senior researcher at KIT, who manages the coaching program and co-ordinates work across the participating Centers.

The evaluation considers that currently the lack of a dedicated gender specialist leader is not a problem as the team is cohesive and working towards a strategy. It is likely to become a problem in the near future when:

I. the strategy is overhauled

II. someone is needed to advocate within ILRI not only for gender work to be continued in the future (since this is expected to happen automatically) but for the right kind of gender work to be done with the right level of resourcing

4.2.5 Conclusions on gender mainstreaming and impact

The evaluation concludes that:

- Re-positioning of gender within the CRP structure has not so far affected its ability to deliver. A strong strategy and team are more important than the precise position.
- There has been good progress in mainstreaming within VCTS. Progress has been slower in the other FPs and mostly limited to scientists with strong field interests and experience. The gender team needs to build momentum in working with the technology FPs and would see the greatest impact from working with selected research groups that have already shown interest, to build positive examples of good practice.
- Delivery of outputs has been slow but has speeded up after engaging a strong partner. The evaluation considers that the engagement of KIT has been positive. Progress towards outcomes will require the gender team to expand the scope of its work and is hard to assess at present.
- The capacity of the gender team has been sufficient for the work it has needed to until now, but will have to be expanded in number and skills to deal with future needs. This could be done through core staff recruitment or international research partners. Lack of a senior gender scientist to lead the team is a concern and likely to be a constraint to future development.

5. Science Quality

5.1 Quality of outputs

The assessment of outputs centered on a database of publications provided to the evaluation team by L&F. The database included a wide range of published outputs, including those published externally and peer-reviewed, those published internally and subject to varying degrees of peer review, and a number that had somewhat limited science content. This section progresses from an overview of all published outputs to an assessment of the quality of those with scientific content. In addition, the evaluators assembled a list of non-published research outputs during visits to Centers and value chain research hubs. A discussion of their quality is also provided.

5.1.1 Quantity and scope of publications

According to the database of publications, 995 published outputs were produced between 2012 and 2015, the period during which L&F has been operational. (Table 5-1). Of these, 17 percent were journal articles, books, book chapters or theses and therefore externally peer-reviewed. A further 58 percent were scientific or training outputs that were subject to internal review but assumed not to be externally reviewed. Twenty-two percent were material of lower scientific content, intended to inform a general audience about the CRP. The remaining 4 percent were written for an internal CGIAR audience. The total number of publications and the number of scientific outputs increased between 2012 and 2014 but fell in 2014. This can partly be attributed to a surge in output from legacy projects followed by a lag while new research develops. However there is also a backlog of data waiting for analysis, particularly at value chain research hubs. Answers to the researcher survey suggested that specific time is not allocated in work plans for publication – it is assumed that this will be done but in practice it often becomes the last thing on a long to-do list. It was also reported that confusion of responsibilities within the SASI FP had delayed analysis and publication of some data. The evaluators consider the number of peer-reviewed outputs to be rather low, but were encouraged to learn that a number of publications have been submitted or accepted for publication during 2015 (not shown in the table, which includes only published material).

Table 5-1: Outputs produced by L&F

OUTPUT TYPE	2012	2013	2014	Mid 2015	TOTAL	PERCENT
Journal article	19	61	43	19	142	
Book and book chapter	6	5	4	1	16	
Thesis		1	6	2	9	
Subtotal					167	17%
Report and working paper	62	73	63	37	235	
Conference	4	17	8	11	40	
Presentation	61	109	65	43	278	
Equation	1	1	8	1	11	
Training Material		3	2	5	10	
Subtotal					574	58%
Audio, Video, Poster, Blog, News	4	75	54	26	159	
Briefs, brochures, extension material	8	17	24	8	57	
Subtotal					216	22%
Internal and wiki	4	24	9	1	38	4%
TOTAL	169	386	286	154	995	100%

Source: Evaluation team, based on information from L&F repository. The Equation refers to various models of a Near-InfraRed Spectroscopy equation.

Published outputs were spread across all discipline areas. When the output database was screened to remove brochures, internal reports and some posters, presentations and wiki items that were announcements of intent rather than actual outputs, this left 829 publications. Based on the primary discipline area of the output (some were multidisciplinary but one discipline or approach), 44 percent were from social science of all kinds, 26 percent from feed and forages, 13 percent from livestock health, 9 percent livestock genetics, 5 percent aquaculture (genetics and health) and 4 percent environment. The high percentage from social science has been influenced by the emphasis on value chain assessments taking place in nine countries where value chain research hubs were established. While these studies are multidisciplinary, the tools originate from the SASI FP and their development has been led by social scientists.

5.1.2 Quality of publications

Peer reviewed and non-peer reviewed outputs were assessed separately because each is important for a different reason. Non-peer reviewed publications can be produced more quickly, and can be used to show interim results and/or disseminate findings to a broad audience. Peer reviewed publications are important to create impact in the scientific community and to ensure that the quality of research is externally scrutinized.

Peer reviewed outputs

Among the 142 journal articles subjected to bibliometric analysis, citations have generally been low Table 5-2). Most citations were in the 1-5 category (69 publications) with 42 scoring 0. Only 9 publications had citations of over 27. These numbers suggest limited visibility and use of L&F peer-reviewed outputs. Possible reasons are subject matter and choice of journal (explored further below). The evaluation team does not find it surprising that many articles had citation rates of 18 or less, since L&F publishes on a wide range of subjects, some of which are of interest only to a specialist audience,

but the large number with no citations suggests that L&F should review its choice of journals. This issue is explored further below.

Table 5-2: Citation of journal articles produced by L&F

	Number of journal articles published				
Citations since publication	2012	2013	2014	2015	TOTAL
0	1	14	12	15	42
1 to 5	8	32	26	3	69
6 to 10	3	6	3	0	12
11 to 18	6	3	1	0	10
27 to 43	1	5	1	0	7
129	0	0	0	1	1
188	0	1	0	0	1
TOTAL	19	61	43	19	142

Source: Evaluation team

The journals most commonly chosen for publication are shown in Table 5-3. They include journals that are well respected in their field for crop, animal health and aquaculture basic and applied research. Those with the highest impact factor (IF) in which L&F has published are shown in Table 5-4. Publications in the highest quality journals (those journals well-respected in their research area and/or with high impact factor), account for around 45 percent of the 142 articles. Approximately 20 percent of articles were published in journals with an IF of zero, and this is a concern. The evaluation team considers that L&F should aim to publish a higher proportion of peer-reviewed outputs in journals of high quality and reduce the number published in zero-impact journals.

Table 5-3: Journals with highest number of published articles

JOURNAL	No of publications	Impact Factor
Field Crops Research	12	2.976
Tropical Grasslands-Forrajes Tropicales	11	0.224
Tropical Animal Health and Production	7	0.817
Livestock Research for Rural Development	6	n/a
Preventive Veterinary Medicine	5	2.167
Aquaculture Research	5	1.376
PNAS	4	9.674
Aquaculture	4	1.878
Animal	4	1.841

Source: Evaluation team. Note: The two aquaculture journals and Animal are well respected internationally in their respective research areas although their impact factor is below 2.

Table 5-4: Journals with highest impact factor

JOURNAL	No of journal articles	Impact Factor
Science	3	33.611
Proceedings of the National Academy of Sciences of the United States of America (PNAS)	4	9.674
PLoS Neglected Tropical Diseases	1	4.446
BMC Genomics	1	3.986
Reviews in Aquaculture	2	3.923
Advances in Agronomy	1	3.893
Genetics Selection Evolution	1	3.821
Annals of Botany	1	3.654
Parasites & Vectors	2	3.43
PLOS ONE	3	3.234
Plant Disease	2	3.02

Source: Evaluation team

The ten most cited articles are listed in Table 5-5. They cover a wide range of subjects, some related to L&F's objective and some to specific research areas. The most highly cited paper made no reference to ILRI and the ILRI staff on the author list are not core L&F researchers. Some of the other more highly cited papers are attributed principally to partner research organizations and include L&F author e.g. in Europe, thus indicating good international collaboration. Journals include Science, PNAS and Advances in Agronomy, all with Ifs higher than 3 and Animal, a well-respected journal in its research area.

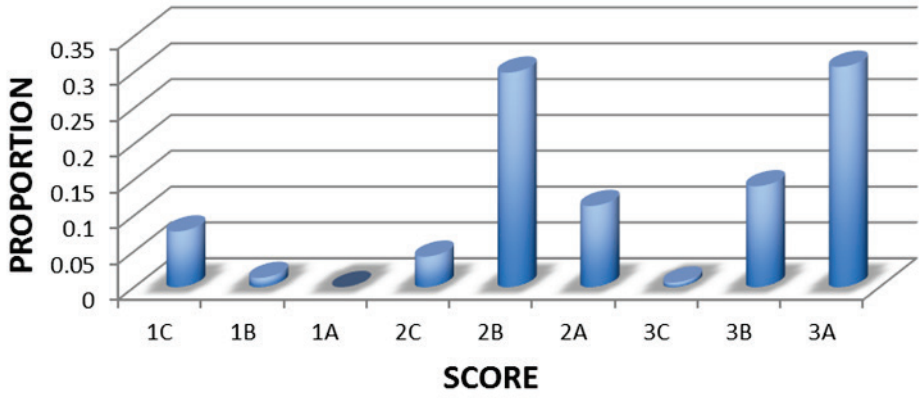
Table 5-5: The ten most cited journal articles

YEAR	CITATION	No of CITATIONS
2013	Garnett T, Appleby MC, Balmford A, Bateman IJ, Benton TG, Bloomer P, Burlingame B, Dawkins M, Dolan L, Fraser D, Herrero M, Hoffmann I, Smith P, Thornton PK, Toulmin C, Vermeulen SJ, Godfray HCJ. 2013. Sustainable intensification in agriculture: premises and policies. Science 341(6141): 33-34.	188
2015	Steffen, W., Richardson, K., Rockström, J., Cornell, S.E., Fetzer, I., Bennett, E.M. ,Biggs, R., Carpenter, S.R., Vries, W. de, Wit, C.A. de, Folke, C., Gerten, D. , Heinke, J., Mace, G.M., Persson, L.M., Ramanathan, V., Reyers, B. and Sörlin, S. 2015. Planetary boundaries: Guiding human development on a changing planet. Science 347:6219.	129
2014	Havlík, P., Valin, H., Herrero, M., Obersteiner, M., Schmid, E., Rufino, M.C., Mosnier, A., Thornton, P.K., Böttcher, H., Conant, R.T., Frank, S., Fritz, S., Fuss, S., Kraxner, F. and Notenbaert, A. 2014. Climate change mitigation through livestock system transitions. PNAS 111(10): 3709 – 3714	43
2013	Smith, J.W., Sones, K., Grace, D., MacMillan, S., Tarawali, S. and Herrero, M. 2013. Beyond milk, meat, and eggs: Role of livestock in food and nutrition security. Animal Frontiers 3(1): 6-13	42
2013	Kilelu, C.W., Klerkx, L. and Leeuwis, C. 2013. Unravelling the role of innovation platforms in supporting co-evolution of innovation: Contributions and tensions in a smallholder dairy development program. Agricultural Systems 118: 65-77	37
2012	Subbarao, G.V., Sahrawat, K.L., Nakahara, K., Ishikawa, T., Kudo, N., Kishii, M., Rao, I.M., Hash, C.T., George, T.S., Rao, P.S., Nardi, P., Bonnett, D., Berry, W., Suenaga, K. and Lata, J.C. 2012. Biological nitrification inhibition (BNI) - A novel strategy to regulate nitrification in agricultural systems. Advances in Agronomy 114: 249-302.	35
2013	Herrero, M., Grace, D., Njuki, J., Johnson, N., Enahoro, D., Silvestri, S. and Rufino, M.C. 2013. The roles of livestock in developing countries. Animal 7(Supplement s1): 3-18.	30
2013	Herrero, M. and Thornton, P.K. 2013. Livestock and global change: Emerging issues for sustainable food systems. PNAS 110(52):20878-20881	29
2013	Bush, S.R., Belton, B., Hall, D., Vandergeest, P., Murray, F.J., Ponte, S., Oosterveer, P., Islam, M.S., Mol, A.P.J., Hatanaka, M., Kruijssen, F., Ha, T.T.T., Little, D.C., Kusumawati, R. 2013. Certify sustainable aquaculture? Science 341(6150): 1067-1068	27
2011	Noyes, H.A., et al. 2011. Genetic and expression analysis of cattle identifies candidate genes in pathways responding to Trypanosoma congolense infection. Proceedings of the National Academy of Sciences	18

Source: Evaluation team. Number of citations based on google scholar.

Results from the evaluation team's scoring of 79 peer-reviewed outputs, (49 percent of the total, mostly journal articles) are presented in summary form in Figure 5-1. The y axis describes the proportion of papers with each score. The greatest proportion of publications scored 3A, the highest possible score combination. This indicates that these papers were of excellent scientific quality (3=excellent; 1=poor) and had, or were anticipated to have high impact (A=high impact; C=low impact) within relevant scientific communities. Approximately half of the proportion of those scoring 3A scored 3B, indicating excellent quality but perhaps a reduced impact or potential impact internationally. Almost the same proportion of papers scored 2B indicating good quality and impact. Only a relatively low proportion of peer reviewed publications were considered to be poor quality and with low potential impact, and these were scored 1C. The result of the scoring exercise adds nuance to the citation count. Although L&F journal articles are not being widely cited, this is not because they are poorly written or of low potential interest. Choice of journal, short time since publication or specialist subject matter may all be contributing to low citations.

Figure 5-1: Results of scoring of peer reviewed outputs across all discipline areas



Source: Evaluation team. Note: scores 1-3 denote quality with 3 the highest. C-A denote potential impact with A the highest. Thus, 1C is the worst possible score and 3A the best.

There was a fairly even spread of scores across subject areas. Social sciences had a higher proportion of papers with higher scores but also produced relatively few submissions. Social scientists have been much involved in supporting multi-disciplinary value chain assessments, the results of which are published as non-peer reviewed outputs. The papers with the lowest scores came from the discipline areas of livestock and fish genetics and feeds and forages.

The conclusion of the evaluation is that, with a very few exceptions, the quality of peer-reviewed published output has been of the standard that would be expected from the CGIAR. No individual subject area or FP stands out as being exceptionally good or poor, although the team would encourage fish genetics to scrutinise published outputs more closely prior to submission as some of the papers had flaws that the reviewers did not understand. Overall, the CRP should aim to publish more and to publish a larger proportion of its output in internationally relevant and high-impact journals.

Non-Peer Reviewed Outputs

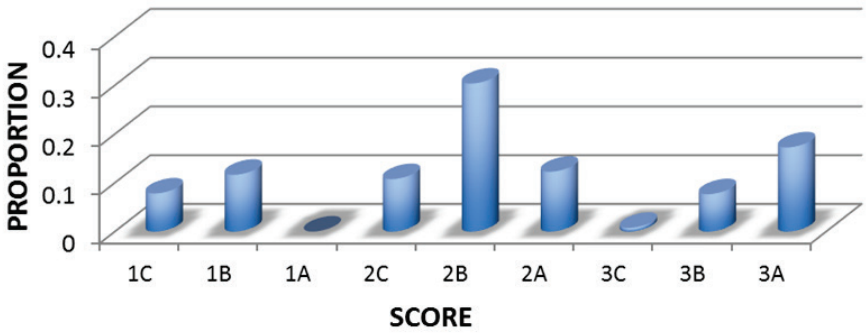
A large proportion of L&F's scientific output is not externally peer-reviewed, although some of it is subjected to careful internal review. For much of L&F's target audience a well-written report or brief can be as valuable as a journal article – and is likely to be produced in a more timely fashion. Publications that are not externally peer-reviewed may be communicating science results or making policy recommendations based on science results and they should be of high quality.

Therefore the evaluation team paid considerable attention to non-peer reviewed outputs and subjected 144 published outputs to a scoring process equivalent to that of the peer-reviewed material. For future reference, it would have been helpful to request L&F to include in the publication database information on the peer review process to which each publication had been submitted.

Of those scored, the greatest proportion were awarded 2B (Figure 5-2), indicating good novelty and usefulness to target audiences (which could include the scientific community or development audiences, depending on the publication). The next greatest proportion scored the highest score of 3A, indicating excellent novelty and usefulness to a wide variety of potential end-users of the information. Some of the outputs did however attract low scores of 1C or 1B. These outputs were

thought to contain little or no new information, scoring B or C respectively; and were not thought to have been useful or to have the potential to be useful, thus scoring 1.

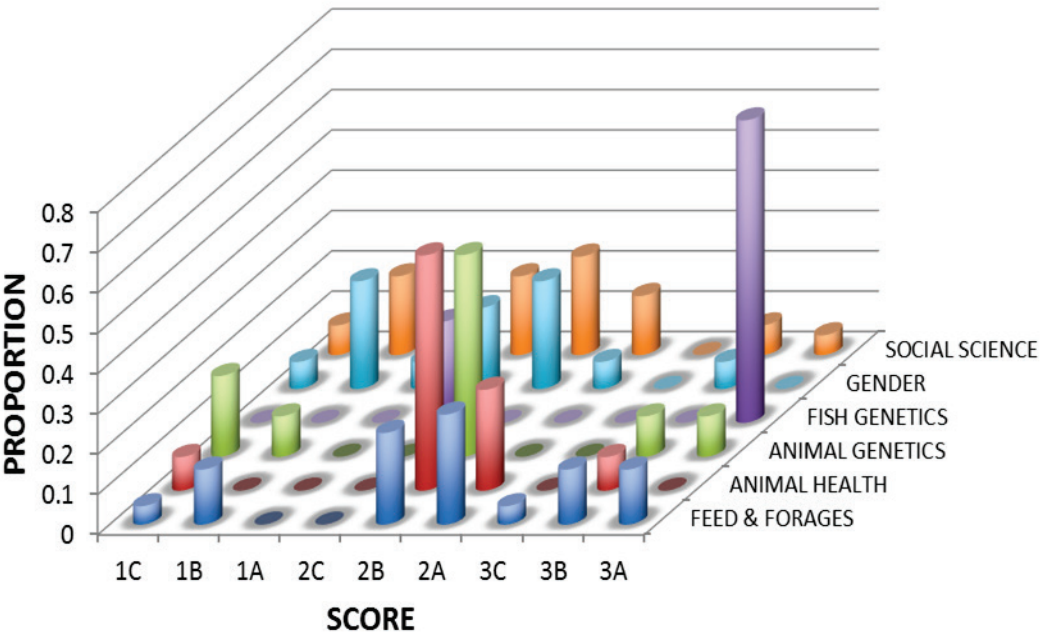
Figure 5-2: Results of output scoring of non-peer reviewed outputs across all discipline areas



Source: Evaluation team. Note: scores 1-3 denote novelty (equivalent to "quality" for a peer reviewed paper) with 3 the highest. C-A denote potential usefulness to target audience (equivalent to "impact" for a peer reviewed paper with A the highest. Thus, 1C is the worst possible score and 3A the best.

Figure 5-3 shows the results divided into discipline areas. It indicates a fairly even spread of scores across the areas, with the exception of fish genetics which had a very high proportion (over 50 percent) of outputs considered to be of excellent novelty and usefulness, and of current or future potential. Animal health had the greatest proportion of outputs scoring 2B or 2A, indicating the outputs were of good novelty and usefulness. Similarly, many of the animal genetics scored 2B, but this discipline area also had the greatest proportion of outputs scoring the lowest score combination of 1C.

Figure 5-3: Results of scoring of non-peer reviewed outputs by discipline area



Source: Evaluation team.

The conclusion of the evaluation is that the quality of the non-peer reviewed material was generally of the standard that would be expected from the CGIAR. It was lower than that of peer-reviewed

outputs but that is hardly surprising. There is considerable value in publishing non-peer reviewed material of high quality as it is more quickly and easily accessible to L&F's target audience than journal articles and can include a broader range of information. It is normal and expected that this type of material will be published in greater volumes than journal articles, and the evaluation would encourage L&F to continue putting effort into non-peer reviewed material. The evaluators are concerned that quite a large number of the non-peer reviewed outputs are repetitions of very similar material in PowerPoints and briefs that are apparently all aimed at the same audience – in other words there is quite a high level of "recycling" rather than new ideas. It is important that L&F produces outputs for a range of audiences but it may not be necessary to produce so many versions of the same message for the same audience. The evaluation team would advise L&F to focus on producing fewer but high-quality outputs that are thoroughly peer reviewed internally. Many of these will later be the foundation for peer-reviewed publications.

Outputs from Flagship Projects vs value chain research hubs

Additional information on output quality, beyond that obtained from bibliometric analysis and scoring, was derived from the seven FP case studies[41] covering three of the four discovery FPs. Most of the case studies focused on research areas that were considered substantial in terms of staffing and funding allocation, in some cases extending over many years. The outputs from these were numerous, and although not all were scored specifically, many were considered to be good or excellent with respect to both peer and non-peer reviewed publications. The case studies based on smaller research areas, some of which had only recently been the focus of the L&F program scientists, had produced fewer outputs but again these were considered to be good or excellent generally. There was one exception, the case study on Feed Conservation and Processing, where few outputs were available from which to draw conclusions.

The research done in the value chain research hubs has generally been applied research and therefore of a practical nature. The value chain teams had good (in some cases) or modest (in most cases) links with the Centers and the relevant FPs in terms of collaboration and therefore outputs. Staffing in all the value chain research hubs is at a low level, hindering progress in quality of science – discussed further in 5.2. This is clearly indicated by the general paucity of research outputs, particularly peer reviewed publications. Published outputs from the VCTS FP are limited and mostly non peer-reviewed and therefore it is hard to comment on the quality of science that will eventually emerge. This is particularly so in areas of biological science where they are not clearly linked to the FPs. VCTS has quite a strong social science research component covering agricultural economics, gender, and institutional issues. Opportunities to publish about on-farm learning and institutional learning may be lost because they are not being systematically recorded. This is disappointing as L&F is missing a very useful mechanism to publish valuable information that might be of great interest to a wide range of end-users. More attention to institutional factors affecting the governance of value chains would also provide L&F with the opportunity to develop an innovative value chain research agenda that moves beyond the somewhat descriptive nature of the work done to date.

[41] Listed in 1.4.4

Non-publication outputs from L&F

It is recognised that a considerable number of the most important outputs from L&F did not take the form of publications but were tangible products/processes/plans that were evident and were being used by multiple stakeholders and end-users. Examples assessed by the evaluation include:

- The Dairy Development Forum (DDF) in Tanzania (an institution by which stakeholders influence dairy sector strategy and projects) was set up by L&F and is now run by national stakeholders.
- Germplasm and a dissemination system for genetically improved tilapia in Bangladesh.
- A women's fish marketing cooperative in Egypt.
- A tool for feed resource assessment (FEAST)
- The infection and treatment method (ITM) (ECF) vaccine and its distribution
- Tools/equations for phenotyping for feed and fodder quality for ruminant, monogastrics and fish
- The Animal Feed Analysis Web Application (AFAWA), a web-based tool for managing lab analyses of feeds and dissemination of results
- The Data Recording and Management System (DREMS) for sheep and goat breeding program
- The Azizi biorepository, a biorepository of biological samples of livestock linked to various information, serving as research resource

It would not have been appropriate to score this type of non-publication output and this was not done; instead they were considered in the context of their target audience. All of the outputs in the above list are of good to excellent quality. For example, the DDF is a well-designed forum that has been successful in bringing together stakeholders in the Tanzanian dairy sector and is appreciated by them. The FEAST tool has been widely applied on L&F research sites and is appreciated by researchers. Other non-publication outputs including vaccines, diagnostic tests and designs for breeding programs, may emerge in the future, although it is too soon to assess the potential impact of these longer-term lines of research.

5.1.3 Legacy and new work

Many of the outputs across almost all of the discipline areas have originated from legacy projects. There are a small number of exceptions, such as work in Fish Genetics and the community based breeding program in Ethiopia, where there is clear evidence of work having been initiated at the start of the current funding period and resulting in tangible outputs including selective breeding and distribution networks. Peer reviewed publications were beginning to appear in international journals within two years of the start of L&F.

New work in social science (value chain assessment and economics) and gender have also started to produce a limited number of publications with a high proportion considered to be high quality. In contrast, animal health, livestock genetics and feeds and forages had well established and internationally recognised programs of work that have continued to develop into the current funding period. In some cases, the subject matter of outputs had not changed e.g., ECF vaccination, however the technological approaches and methods had changed to reflect the need for ongoing development and improvements.

The evaluators consider that the balance between legacy and new work has been appropriate.

5.1.4 Conclusions and opportunities for improvement

The overall conclusion is that the evaluators have no serious concerns about the quality of scientific output. It is clear that L&F has the ability to produce outputs of high quality and indeed is doing so. However the following offer opportunities for improvement and were considered when formulating the recommendations in chapter 8:

- Clearing the backlog of data analysis and publication that has contributed to a low volume of output.
- An increased focus on targeting publications towards internationally recognised journals, especially those with high impact factors and these well recognised within specific discipline areas. It is recognised that some outputs should be targeted at national journals but scientists should be ambitious about publishing in the best possible journals to increase awareness of their work.
- An increased focus on producing excellent/good (rather than merely acceptable) "grey" literature such as reports and briefs (i.e. outputs classified here as non-peer reviewed) and in ensuring that they are consistently peer reviewed internally
- Greater attention to planning and study design in some of the aquaculture projects.
- Greater use of cutting-edge technology in animal genetics projects to investigate and seek genes and genomic regions controlling relevant traits (e.g. adaptive and production traits) in the unique local genetic resources in the countries where L&F works.

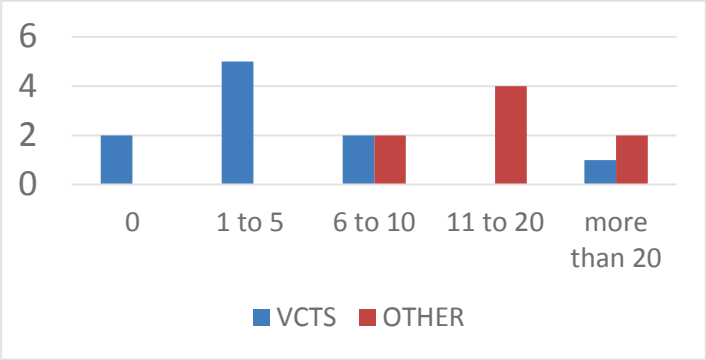
5.2 Quality of inputs

This section addresses the environment that L&F provides for delivering high quality research and the actions taken within L&F to address research quality.

5.2.1 The experience of research leaders and competence of research teams

All team leaders and focal points are competent research leaders, based on interviews, observation and interaction with the teams. The evaluation also reviewed the H indices of FP leaders, VCCs, Center representatives and the CRP Director (see Figure 5-4). The scientists within the VCTS generally had low H indices, although their citations may have been under-represented by using Scopus rather than Google Scholar. In any case, their role is very different from that of a typical research leader, requiring them to have skills in co-ordination of applied research, liaison with development partners and fundraising as well as research. However it is important that strong links are made between the VCTS and the discovery FPs to ensure that the VCCs have access to scientific advice across a range of disciplines, and as chapter 6 will discuss, this has not always been the case. The other research leaders, those who are Center-based, had higher H indices, between 8 and 35, which the evaluation team considers to be sufficient to lead the basic and applied research done by L&F.

Figure 5-4: H index of L&F FP and value chain team leaders according to Scopus



Source: Evaluation team, based on data from Scopus.

A research team's ability to produce outputs is affected by the number of qualified scientists available. The evaluators reviewed both the number of scientists and their qualifications.

The number of scientist Full Time Equivalents (FTE) mapped to L&F in each Center and FP was estimated from a staffing list provided by L&F[42]. These include internationally and nationally recruited staff (IRS and NRS). The distribution of L&F researchers in FTE per Center and FP (Figure 5-5) shows a dominance of ILRI and and WorldFish which have 84 percent of the total FTE mapped to L&F. Animal Health researchers were mainly found at ILRI and Animal Genetics researchers were mainly located at WorldFish. Researchers mapped to SASI were mainly found in ILRI and WorldFish and VCTS researchers in ILRI. Two discovery FPs (Animal Genetics and SASI) have a concentration of scientists in both ILRI and WorldFish. It might have been expected that this would provide opportunities for synergy between livestock and aquaculture, resulting in innovative outputs, but as mentioned in Chapter 3 there is limited evidence of this effect.

Judging from interviews at the Centers, the general scientific competence of the teams was good with the possible exception of the WorldFish team where some improvement in performance could be gained by the scientists in fish genetics by increased mentoring and training from the senior scientists and more interaction with scientists both outside WorldFish and outside the CG system. Note that this is also an area in which the evaluation had some concerns about published outputs.

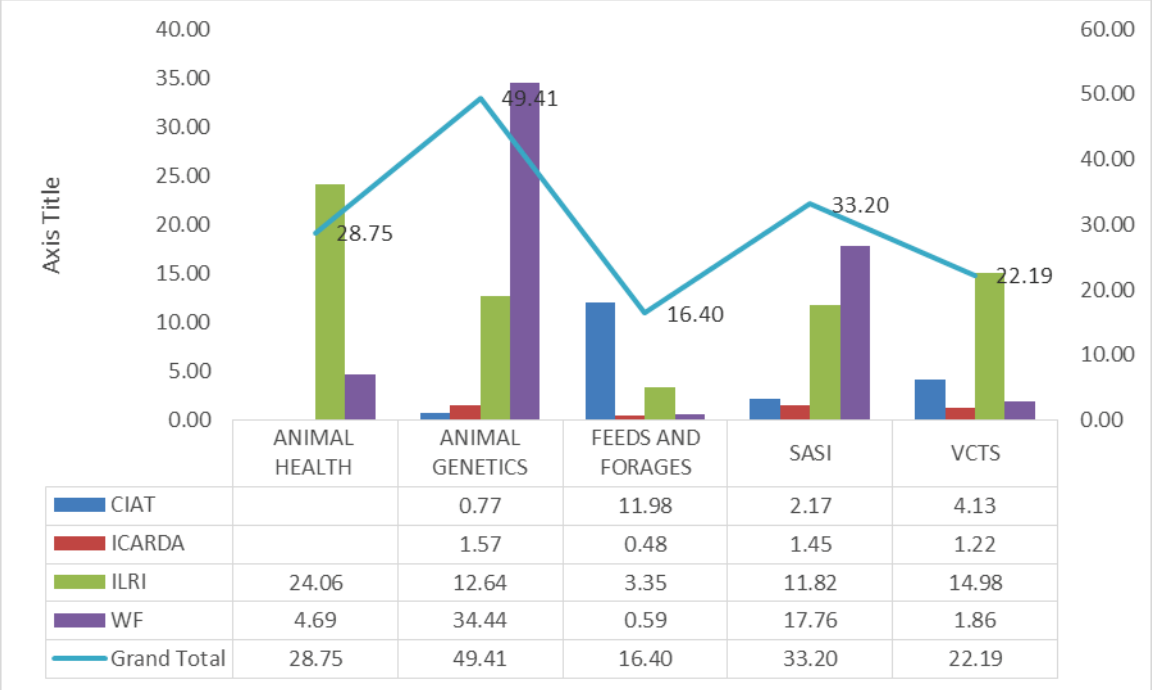
The educational levels of L&F researchers in each FP are shown in Figure 5-6. The total number of researchers and also PhDs is lowest for feeds and forages and highest for animal genetics. Animal Genetics has many more FTEs than e.g. Animal Health but the PhD FTEs in each program are almost the same. The proportion of B.Sc. and 'Other' is highest for Animal Health and SASI with Feed & forages somewhat lower. Until now there has not been a clear association between the percentage of graduates in each FP and the ability to publish – there has not been a sufficiently large number of publications to draw conclusions. However, scrutiny of L&F publications reveals that the highest-cited peer-reviewed outputs and the highest-quality non-peer reviewed outputs are, unsurprisingly, associated with scientists who have graduate qualifications and several years of experience.

The evaluation has concerns about the critical mass of core researchers – it is low in most value chain teams and the VCTS FP overall and in some discipline areas, notably social sciences (which cover a

[42] As mentioned in Chapter 3, there are inconsistencies in the data provided to the evaluation team on staff whose time is mapped to L&F. Therefore any figures presented here can be considered to be reasonable approximations rather than precise figures.

broad range of subjects and work across the entire CRP). When this is combined with a fairly low percentage of postgraduates it must limit the ability to publish.

Figure 5-5: Distribution of L&F researchers in Full Time Equivalents per center and FP



	ANIMAL HEALTH	ANIMAL GENETICS	FEEDS AND FORAGES	SASI	VCTS
CIAT		0.77	11.98	2.17	4.13
ICARDA		1.57	0.48	1.45	1.22
ILRI	24.06	12.64	3.35	11.82	14.98
WF	4.69	34.44	0.59	17.76	1.86
Grand Total	28.75	49.41	16.40	33.20	22.19

Source: Evaluation team.

Figure 5-6: Educational profile and total Full Time Equivalents per FP of L&F researchers.

	ANIMAL HEALTH	ANIMAL GENETICS	FEEDS AND FORAGES	SASI	VCTS
Ph.D.	13.53	14.95	7.38	11.28	8.66
M.Sc.	3.13	22.61	2.62	6.84	7.98
B.Sc	6.00	5.35	6.40	4.79	4.99
Other (certificates, diploma, etc)	6.09	6.50		10.29	0.55
TOTAL	28.75	49.41	16.40	33.20	22.19
BSc&Other as% of total	42%	24%	39%	45%	25%

Source: Evaluation team.

The overall assessment of the evaluation is that leadership qualities among team leaders and focal points are high and the scientific qualities of these persons are appropriate for the tasks at hand, with the caveat that a strong link is needed between the value chain research hubs and the discovery FPs. Quality of the teams also appears to be generally high. However the total allocation of scientist time is small to cover the wide range of subject on which L&F works.

5.2.2 Research design

Research design within Animal Health (livestock) was found to be of a very high standard with use of appropriate study design, statistical analysis, and the use of modern epidemiological, genomic, proteomic and molecular methods. Similar standards were met in both laboratory and field based studies.

Fish genetics research designs and innovativeness were good but in transition and could improve further. Choice of traits in fish research designs could be more appropriate, and greater attention to maintenance and utilization of genetic controls are needed.

Livestock genetics studies were also well designed and in some cases innovative in strategy – for example the combination of classic quantitative genetics and animal breeding approaches with the involvement of smallholder in Ethiopia. However the use of innovative technologies has lagged behind, since the use of new high-throughput tools to investigate the genome of local genetic resources have started only recently. More innovative use could be made of genomic technologies to investigate adaptation of livestock. Technologies are available and L&F has access to animal genetic resources with unique adaptive traits. It would also be possible to explore alternative/complementary strategies to integrate crossbreeding with the conservation of local genetic resources and adaptive traits e.g. informed crossbreeding, and to make increased use of methods and models to transfer genetic livestock resources, improved by modern technologies, including reproductive biotechnologies, to the field. This approach could be integrated in or complement community based breeding programs.

Feeds & Forages research designs appear to be generally highly appropriate, judging from published papers. A great asset to research in these areas seem to have been the existence of gene banks at CIAT, ILRI and food crop CRP Centers enabling testing of multiple varieties. Innovativeness, from a scientific point of view, was high in research on breeding for multiple resistance in Brachiaria and by taking advantage of apomixes in breeding.

In SASI, gender research designs were generally adequate and there has been an internal review of the appropriateness of tools where they were found not to be producing needed results. Modelling exercises on livestock-environment interactions, including livestock related greenhouse gas (GHG) emissions under different scenarios, which are partially attributable to L&F work, were world-leading in their design. Publications on water consumption by livestock were highly innovative in their designs and their proposed categorization of livestock water use. The evaluators also noted a very promising use of participatory GIS for environmental/NRM research in one non-peer reviewed output.

In the VCTS FP, research designs for essentially descriptive analyses of particular value chains were fully adequate, except for a tendency in some early value chain work not to incorporate gender disaggregation and gender analytical approaches. WorldFish has also benefitted from the presence of international staff with expertise in research on value chains and on human consumption surveys. A lack of expertise within the CRP as a whole in agribusiness and value chain research has limited the scope of research design on value chain performance and governance. While L&F has acknowledged the recommendation of the CCEE of the value chain approach to “develop innovations on strategic knowledge partners to support innovation on value chain development approaches”, it has not yet developed new research collaborations with research partners expert in value chain research.

5.2.3 Quality management processes

L&F does not have specific quality management processes but follows the policies and strategies of Centers.

Data collection and management

All participating Centers have a policy of open-access publishing as far as possible. The evaluation team found that a large proportion of outputs were easily accessible – however those in high-impact journals were not all accessible, although it would be possible for L&F to arrange and pay for open access. CIAT makes an additional effort to publish open-access by maintaining the CIAT journal "Tropical Grasslands – Forrajes Tropicales". This is an old journal that has recently been revived. It currently has a low IF but this is expected to improve.

ILRI and CIAT have data management units to ensure that data are preserved and that there is some consistency in storage. At WorldFish, data management is mostly an individual decision by the scientist, although a common data management plan is being developed. Currently, datasets are mostly stored on laptop hard drives that are backed up automatically to a server. However no protocols of formats for metadata have been developed. Some attempts have been made to standardize household and farm-level data collection in Bangladesh as a pilot initiative.

At CIAT the development of the online tool (SoFT) jointly with CSIRO Sustainable Ecosystems, Department of Primary Industries & Fisheries and ILRI for the selection of tropical forages has resulted in the data base being used by FAO in Feedipedia. The evaluation team could not assess the quality of the data, but management appeared to be adequate. Funding was in the pipeline and a continued updating of the system was anticipated. An Animal Feed Analysis Web Application (AFAWA) for managing lab analyses of feeds and dissemination of results has been developed at ICARDA.

Scrutiny of research through peer review, research meetings and mentoring

Peer review processes differ among Centers. WorldFish has a quality assurance program that requires all papers and outputs to go through a review process. ILRI uses a review tool for managing internal peer reviews. At CIAT headquarters (HQ), there appears to be no formal review requirement for papers submitted to journals, although it is common practice for manuscripts to be circulated for comment. L&F reports are reviewed by the team leader and by L&F management at ILRI. The evaluation considers that there would be value in having a more consistent and systematic review process across the CRP with a record of the review conducted on each published output. To avoid duplication of existing Center processes, L&F could review each partner's processes and agree on a minimum requirement for peer review, helping the less rigorous partners to strengthen their processes. It could also, in the database kept of CRP outputs, indicate the peer-review process that has been applied to each publication.

The evaluation team was told that research meetings at ILRI HQ are frequently convened at institutional and program levels and are usually quite robust in science content. Project level meetings also take place but these usually mix both science and administrative discussions. Besides seminars where scientists share and seek feedback on their work, there are also those patronized by visiting scientists. Information communications technology, such as WebEx, is increasingly providing opportunities for out-posted staff to participate. At CIAT HQ, it was reported that the forage researchers meet frequently, on average at least once a month. Staff at different levels (including scientist, postdocs, research assistants and BSc, MSc and PhD students) have opportunities to share both their investigations and their results. WorldFish meetings were said to include research, research

design and management issues. The management (and admin) related meetings were reported by the scientists to have taken up disproportionate amounts of time in the early stages of the CRP.

Mentoring of young scientists is variable throughout L&F. Those within research team at Centers are generally well-mentored, based on observations at CIAT and ILRI. One ILRI informant stated that training and mentoring of young scientists was perhaps one of the areas ILRI can be most proud about, citing as an example the structured mentoring program operated by African Women in Agricultural Research and Development (AWARD) Program. The gender team, which is based in ILRI but has individuals posted in a number of countries, appears to have established a community of practice that communicates well on an informal basis. However there are also less good examples. The evaluation team observed that mentoring of staff based at value chain research hubs is highly variable – where a suitable mentor is not available within the value chain team, considerable motivation and persistence are required from the mentee to seek advice from a busy research leader working at a distance. At WorldFish mentoring appeared to be a weak point because of senior scientist overload with administrative duties.

Incentives for researchers

All participating Centers have some process by which researchers are rewarded for performance. CIAT has an internal classification system that allows promotion of staff according to publications and fund raising. A revised performance appraisal system has been implemented in for the past 3 years and a monetary incentive is given to the researchers with outstanding scientific performance throughout the year. At ILRI, researcher assessments are linked to promotions. At WorldFish a minimum annual performance standard is expected and evaluated and merit also increases based on performance.

The CRP does not have its own separate system of incentives. There may be value in developing modest CRP-specific incentives, provided they do not duplicate existing Center mechanisms. Researchers responding to the evaluation survey suggested a variety of possibilities that would incentivise them to produce quality research, including:

- Peer recognition (internal peer review and feedback; praise). This could be implemented through CRP research groups and COP.
- Co-ordination across the CRP (research planning and integration among Centers)
- Clear targeting (measurement of research outputs in terms of peer reviewed publications; inter-Center competition). This could be linked to CRP targets.
- Funding of innovative work (use of W1/2 funds for additional competitive grants, to test new and innovative ideas, or as a reward - this idea was expressed by several people in different ways)
- Opportunities for scientific exchange (exchange with high level scientists to learn new methodologies and livestock research findings; exchange of experience with researchers from different regions working on the same subjects; cross-team learning).
- Promotion linked to scientific performance (although this may not be feasible through the CRP mechanism as employment contracts are with Centers).
- Reduction in reporting that has little value

Ethics

According to the L&F monitoring, evaluation and learning framework 2014: "Research originating at ILRI will be vetted by the Institutional Research Ethics Committee (IREC); research originating outside of ILRI will also be vetted by the IREC, or a similar, qualified ethics review board". Participating Centers have their own ethics policies for humans and animals. ILRI has a policy on the management of intellectual assets and the IREC for protection of human subjects in research. ILRI also has an Institutional Animal Care and Use Committee which complies with the UK's Animals (Scientific Procedures) Act of 1986. It contains guidelines and codes of practice for the housing and care of animals used in scientific procedures. WorldFish also has a strong ethics policy regarding partners, human subjects, treatment of others, etc. International and national treaties and regulations are complied with. WorldFish policies relate to research conduct including child protection; intellectual property rights and management of aquatic genetic resources; engagement in technology transfer activities; animal care and welfare; and gender research; as well as guidelines relating to photography and video, and social media.

The conclusion of the evaluation team is that quality management processes are reasonable but could be improved. All Centers appear to have appropriate incentive schemes to encourage research output. Data management may need to be further formalized and some good examples of open data in the form of tools and applications were noted. Numerous meetings were evident within the Centers but also complaints of too much focus on administrative issues. Mentoring could be improved in WorldFish, should probably be formalized at all Centers, and should be strengthened for young scientists posted to value chain research hubs. It is important to note that scientists consider themselves motivated to perform by a wide range of factors, not all of which are Center-driven. Peer-review and exchange across L&F and the use of W1/W2 funds for grants linked to previous scientific performance are all within the scope of the CRP.

5.2.4 The contribution of research partnerships to quality of science

This section considers partnerships between L&F Centers and their national and international research partners. It also considers partnerships with other CRPs. It does not discuss partnerships between L&F research teams although these are also important.

Animal Health and Animal Genetics are the FPs that seem to have benefitted most from research partnerships. In animal health, there is evidence of many research partnerships, the majority of which are longstanding. These include academic links with universities, research organizations and other partners across the world, mainly in the USA and the EU, but also in other regions of Africa and countries in Asia and elsewhere in the southern hemisphere. These partnerships have delivered in scientific terms and in attracting substantial sums of external research income that would have been unlikely should L&F or Center scientists have applied for these in isolation.

In livestock genetics, important contributions from international partnerships are made in terms of ideas and publications. The best published papers are almost all in collaboration with international partners. National research partners have also been of fundamental importance – field work in Ethiopia would have been impossible without them. WorldFish has good research partnerships that contribute to the quality of science in fish genetics.

Feeds & Forages also benefit from partnerships but the strength of the CIAT Tropical Forage team in their research on Brachiaria spp. may somewhat reduce the need for collaboration with international research partners. However, research on crop residues has greatly benefitted from collaboration with commodity CRP's.

SASI appears to have focused on capacity building and development partnerships more than research partnerships, although it has benefitted from cross-CRP partnership with the CRP on Policies Institutions and Markets. The choice of KIT as a strong partner for capacity building in gender mainstreaming is allowing L&F researchers to spend more time on analysis and publication. KIT has the capacity to become more engaged in research should this be needed.

The role of national partners has been prominent in the VCTS FP. They are very important in ensuring that fieldwork is carried out and outputs are relevant and useful for end users, although until now, with few exceptions, their impact on the quality of published outputs has been marginal (this may change in the future as capacity increases). There is a notable gap in capacity in agri-business research within VCTS that was pointed out by the internal evaluation – L&F researchers acknowledge the problem but have not been able to rectify it.

The general and unsurprising conclusion is that quality of science is benefitting from research partnerships. More could be done to think strategically about the use of research partnerships to fill skill gaps that currently exist (e.g. agribusiness/value chain analysis) and others that are likely to emerge as the program develops. The evaluation recognizes that this may take time as bilateral funding may need to be raised to enable new partners to collaborate.

5.2.5 Technological infrastructure and support

L&F draws heavily on the technological infrastructure of participating Centers. Available infrastructure includes:

- Laboratories for various specialized purposes at CIAT HQ and ILRI Nairobi, Addis Ababa and India, that are used for research on feeds & forages
- Crop, livestock and fish gene bank, including seed banks at CIAT HQ (recently refurbished), and ILRI Nairobi and Addis Ababa, and ILRI's Azizi biorepository offering long term storage platform for biological materials being collected by different projects..
- A unique resource for animal health research at ILRI Nairobi, including specialized laboratories and animal accommodation, equipped to handle safely pathogens of various biological containment levels, and to use these pathogens in controlled experimental trials in multiple animal species. Most of the laboratory accommodation visited met international standards. Some of the animal accommodation was showing signs of ageing and a number of areas were undergoing refurbishment. The facilities at ILRI not only provide a regional resource, but are only one of two principal research organizations in the African continent, the other being the Onderstepoort Veterinary Institute (OVI), Pretoria.
- An expansive array of experimental fish ponds in Egypt. WorldFish has no ponds or laboratory facilities in Bangladesh, where it is dependent upon on the government, NGOs and commercial partners to conduct research. A great opportunity could exist if a strong relationship could be built with Bangladesh Fisheries Research Institute, which has extensive, but under-utilized pond facilities because of a loss of the majority of their best scientists. In Malaysia, the headquarters, research ponds are provided by the Malaysian government. Current wet and dry laboratory renovations currently underway will significantly increase research capacity.
- The technological support and infrastructure available to L&F in participating centers or through collaborative arrangements are sufficient for the program's needs. Regular investment is needed to maintain it to the standard required for research of international quality, and it is a concern that the CRP funding arrangements provide very limited funding for investment in capacity.

5.2.6 Conclusions and opportunities for improvement

The conclusion of the evaluation is that, while there are no serious concerns about L&F's ability to produce high-quality research outputs, it has not yet produced them at the scale expected. The experienced scientists who lead teams throughout the program, and the highly committed researchers, are L&F's greatest asset. In most FPs and particularly VCTS there is a need for more human capacity at postgraduate level, to provide a critical mass and/or fill gaps in specific expertise. There is a need to improve and perhaps formalize certain processes within the CRP in order to make best use of scientific capacity. The following are specific areas for improvement that were considered when formulating the recommendations in chapter 8:

- Making better use of opportunities for cross discipline projects e.g. animal health and animal genetics; fish and animal health; feed and forages and social science. Many of these provide opportunities to attract external funding for multi-disciplinary research.
- Strategic exploitation of international collaboration with the intention of filling skill gaps and increasing the critical mass of researchers and resources in areas where they are lacking.
- Increased use of postgraduate students in research and data analysis (with the caveat that appropriate mentoring arrangements must be in place with research collaborators).
- An expanded mentoring system across the CRP to ensure that good practices are used more uniformly – this might involve more formalized mentoring processes or dissemination through a community of practice of the kind apparent in the gender team.
- An expansion of the portfolio of techniques and technologies within animal genetics, e.g.: in genomic technologies, exploration of alternative/complementary strategies to integrate crossbreeding with the conservation of local genetic resources and adaptive traits, increased use of methods and models to transfer genetic livestock resources.
- Expansion of the gender portfolio beyond provision of tools and into a wider range of research topics and analyses including analysis of policy issues (this will increase publication potential in peer reviewed journals and broaden the impact of non-peer reviewed outputs). Note this would only be possible with an expansion of the numbers and skill-set in the gender team.
- Reformulation of the profile of the VCTS FP leader to emphasise building a community of practice across the value chain research hubs, ensuring that each hub has sufficient capacity to operate effectively, and synthesizing the findings of the VCTS to produce more "game changing" results (also see Chapter 5). In response to the CCEE on the value chain approach, CRP management proposes to reformulate the terms of reference of the VCTS leader, convert this position to full time and establish a Research Methods specialist position. The evaluation considers this to be an appropriate response.
- Incentives for outputs were apparent at the Centers but not at L&F program level. This view was clear from comments made in the staff survey. The evaluation does not have specific process to recommend but would suggest that L&F explore possibilities e.g. "prize" research grants from W1/2 funding to support innovative research that are linked to previous performance; opportunities for exchange linked to performance.

6. The value chain approach

The "value chain transformation and scaling" approach is an innovative feature of L&F from the perspective of CGIAR work on livestock (in particular) and fish since it represents a shift towards a) working along the whole value chain, rather than focusing on producers and b) a direct and dynamic communication between problem identification in the field and station/laboratory/computer-based research at Centers. It seeks to increase the potential for impact by implementing applied research in close collaboration with national research partners and development partners. L&F has nine value chain research hubs, each based in a single country. Three research hubs work with cattle, two with small ruminants, two with pigs and two with aquaculture. Five are led by ILRI, two by WorldFish, one by CIAT and one by ICARDA. Each is expected to have impact in the country and value chains where it works as well as providing broader lessons that may be applicable elsewhere. Value chain locations were chosen based on five selection criteria that cover research needs, opportunities for smallholder participation and the potential for scaling out. In the opinion of the evaluators the criteria are congruent with L&F objectives and the value chain approach.

It is worth noting that value chain approaches have benefits and drawbacks. A value chain approach is a form of systems approach since it draws boundaries around a system (the value chain) and analyses the actors within it, the relationships between them, and the relationships between the value chain and the outside environment. A drawback of a value chain approach when applied to smallholder farmers is that is does not explicitly consider the multiple enterprises within the farming system and may therefore fail to acknowledge the everyday reality of the farmer. A strength of the value chain approach is that it explicitly considers the food system from farm to fork, something that other systems approaches may not do. It also analyses the influence of value chain actors outside the farm that affect the livelihoods of farmers. By deciding to use a value chain approach, L&F has acknowledged and is attempting to remedy a former weakness of CGIAR livestock research – that it often did not consider actors and influences outside the farm. The evaluation considers this to be a valid choice.

As previously suggested by Figure 1-1 section 1.4, it was intended that there would be a close interaction between the Value Chain Transformation and Scaling (VCTS) FP and the other four FPs. The VCTS FP was designed as the delivery vehicle for the value chain approach, while the other "discovery" FPs were expected to contribute to it by providing tools and technical expertise. Discovery FPs were also expected to learn from the experience of working on value chains and adjust their priorities accordingly.

This chapter addresses the overarching question "does L&F have sufficient capacity (in all senses) to deliver on the promise of a value chain approach to enhancing the roles of livestock and fish?" by examining four aspects of L&F's value chain approach, each of which is discussed in one of the following sections. The analysis drew strongly on the detailed case studies prepared for five value chain research hubs, and used Skype and in-person interviews and literature review to gain an understanding of the work done in the remaining four chains.

6.1 Investment and institutional relationships

A country-based research hub cannot expect to achieve impact unless it is well embedded in the institutions of the country where it is located. In the five value chain research hubs visited by the

evaluation team and two others visited by a CRP-commissioned external evaluation team[43] it was evident that there has been considerable effort to invest in institutional relationships and processes (Box 6-1) and that this has been effective. The experience, professional credibility and country knowledge of team leaders, senior researchers and CGIAR Centers have been an important factor in building an institutional base.

Box 6-1: Examples of L&F institutional approaches

Country	A sample of L&F institutional relationships
Bangladesh	Works with an array of public and private sector partners
Egypt	An "innovation platform" has been developed through collaboration between WorldFish and the Ministry of Agriculture and Land Reclamation
Ethiopia	Works closely with government's Livestock Marketing Department and the Livestock Traders Association
Nicaragua	Works closely with dairy co-operatives
Tanzania	Worked with national partners to build a Dairy Development Forum, initially led by L&F but now taken over by national stakeholders
Uganda	Supports the Ugandan Pig Stakeholders Platform
Viet Nam	A longstanding ILRI relationship with national policy research partners has continued and strengthened. A more recent partnership has been developed with the Ministry of Agriculture and provincial Department of Agriculture.

Source: Evaluation team

The evaluators believe the investment in developing a solid institutional base has been important and justified. However it has come at a cost. The investment in relationship-building activities has occupied much of the time of value chain team leaders and researchers. For example, in Tanzania institutions have been built at three levels: locally (dairy hubs); regionally (innovation platforms); and national (DDF). While these institutions have roots in the former East African Dairy Development Project, in which ILRI was a partner, and in ILRI's experiences elsewhere, it has taken the first three years of L&F to develop them to the point where they are "owned" by national partners and can be a solid base for conducting research and delivering research findings. With the ten-year timeline originally envisaged for L&F this was not unreasonable, but it has diverted attention from producing research outputs – there have been few published outputs. Slow delivery of results was reported to be a concern by bilateral donors interviewed, who need evidence of outputs to report to their governments. As previously noted in Chapter 5, there has been a fairly low level of published outputs from the VCTS FP, other than results of value chain assessments.

Time devoted to institution-building is not the sole cause of delay in producing research outputs. A more serious problem is the generally low level of core (W1/2) funding for each value chain research hub. This has resulted in sub-optimal core staffing, since core staff are funded primarily through W1/2[44]. Few if any senior researchers are fully committed to L&F, as they may contribute to more than one CRP and to their Centers' research programs. Value chain team leaders have made personal choices to focus on institutional relationships, research or fundraising as they have insufficient time to

[43] Baker, D., Speedy, A. & Hambrey, J. 2014 Report of the CGIAR Research Program on Livestock and Fish CRP Commissioned External Evaluation of the Program's Value Chain Approach

[44] Note the earlier CRP-commissioned review also concluded that the value chain teams were "under-staffed and under-funded" (p x).

do all three effectively. While teams are multi-disciplinary, they do not include the full range of skills to ensure that all researchable issues in each value chain are identified and addressed. For example, the Nicaragua team has a strong gender and communications skill base that has been vital for mainstreaming gender, but has largely ignored animal health issues (lack of research into animal health delivery is a common theme within VCTS but may be remedied by the appointment of a field-based animal health FP leader). Small team sizes have also resulted in delays in data analysis and publication.

The abrupt funding cut in 2015 and concern about the future of L&F in the second phase of the CRPs have created uncertainty about future CGIAR commitment to the value chain research hubs. Short term investment would reduce credibility with national partners, who expect the CGIAR to demonstrate that it can follow up on promises. As previously mentioned in section 2.1, in India a delay in implementing research activities following planning exercises led to concern among local partners that research might not be implemented as planned. In addition, the evaluation team is concerned that if funding horizons change from long-term to short-term, this may skew research towards what is quick and easy and discourage future investment in important longer-term initiatives.

6.2 Research into development outcomes

The chosen species and value chain are all relevant to the needs of the countries in which they are located, important to food production and income generation and aligned with government priorities. They are not the only possible choices, but they are all justifiable choices. Alignment with national interests increases the potential to have impact in country. The evaluation notes and commends the move away from ILRI's previous focus on cattle, as well as ICARDA's flexibility in responding to the Ethiopian government's request to include goats in what was planned as a sheep research hub.

Some of the value chains (e.g. Bangladesh, Ethiopia) have built on legacy research to move towards development outcomes, but there has also been progress in new areas (e.g. pigs in Uganda; exploratory work on marketing of indigenous pigs in Viet Nam). In all cases it is evident that the value chain research teams are focused on development outcomes. Although the value chain teams do not routinely use the language of impact pathways and Theory of Change, it is clear that they are committed to delivering impact by working closely with partners. There may even be disadvantages in using Theory of Change "jargon" with partners who do not use it in other parts of their work.

Mixed-discipline value chain teams with a strong presence of applied and social scientists, together with some strengthening of the skill base in qualitative social science, have been important in advancing the research-into-development agenda. This agenda is a notable departure from the image of the CGIAR, held by some in the development world and spontaneously expressed by several peer interviewees in this evaluation, as an organization that concentrates on peer reviewed publication at the expense of "solving problems on the ground". Bilateral donors have responded to L&F's expressed commitment to bringing research into use by funding an encouraging array of projects in which research and development partners work together.

There has been considerable added value through research-development partnerships created in all of the value chain research hubs (partnerships are also discussed in Chapter 6). These include partnerships with government agencies (e.g. ILRI- Department of Agriculture and Rural Development in Viet Nam), international NGOs (e.g. ILRI-Heifer International in Tanzania, CIAT-Solidaridad in Nicaragua) and national NGOS (e.g.Faida MaLi, established and based in Tanzania although now working internationally)). Key partners interviewed during this evaluation were clear that they see the partnership with the CGIAR as strategic rather than opportunistic, and appreciate the opportunity for mutual learning.

Through the development partnerships in particular[45] there is potential for close engagement on the ground and for more rapid testing and adoption of new ideas and technologies. There is some evidence that this potential is being realised, but to date this has mostly been on a very small scale – an exception being the widespread delivery of improved tilapia germplasm in Bangladesh and Egypt. The institutional relationships discussed previously should provide suitable vehicles for wider dissemination of research outputs in most of the value chain research countries, but this will undoubtedly take time. It is a concern to the evaluation team, particularly in the current funding climate and with a pending second round of CRPs that the VCTS may be abandoned prematurely because it has not yet delivered sufficient development impacts.

To date there are few signs of scaling of either technologies or methods beyond the countries in which research is taking place. Scaling beyond value chain countries is likely to require one or more of three conditions:

i) An international development partner is able to translate learning within L&F to other countries. Within L&F, one example of scaling of methods is the use of "hubs" as a research-development concept. It is likely that Heifer Tanzania will take lessons learned about working with dairy hubs back to the parent NGO Heifer International and thus disseminate new ideas into other countries beyond L&F. IrishAid has chosen to fund a MoreMilk project in Tanzania and a MorePork project in Uganda, each based on a "hub" concept.

ii) A substantive published output from an L&F value chain research hub, or a synthesis of work across several hubs, attracts wide attention and influenced future development projects. There have been almost no substantive outputs of this kind from L&F's value chain work until now, and none that appear to be influencing others. As previously mentioned in chapter 5, there has been a missed opportunity for scaling of methods by pursuing "action research" in a rigorous fashion and provide methodological guidance for use beyond L&F value chain countries. The evaluation recognizes that there may be challenges in obtaining funding for this type of research. However the results would be of great value to the donor as well as the research community. This type of research could be included within proposals made to development donors, particularly if linked to the development and delivery of specific technologies. There has also been a missed opportunity to carry out research on the best strategies for upscaling, by making systematic comparisons and evaluations of the upscaling strategies. This could have been done within some hubs – e.g. focussing on different levels of subsidy within different bilateral projects in Bangladesh - or across hubs.

iii) A technology such as a vaccine or grass seed is tested within value chain countries but suitable for and sold into many countries. L&F is working on several technologies of this kind (fish germplasm, grass and other forage cultivars, livestock vaccines and diagnostics) but only one (tilapia germplasm) has originated directly from the needs of a value chain country and there has been very little testing or adoption of others within value chain sites.

To deliver outputs at scale and beyond individual value chain countries, more attention will need to be paid to fulfilling the above conditions.

[45] In theory there should also be potential for national scaling by working with NARS; however most NARS lack the capacity and resources for dissemination of research and rely on the same partnerships as L&F

6.3 Coherence of the CRP portfolio

Chapter 3 reviewed the portfolio of L&F and concluded that it needed to be more focused and coherently designed. This section further develops the argument with specific reference to the value chain approach.

To deliver on the value chain approach promised by L&F program proposals, VCTS must include a comprehensive portfolio that addresses the needs of the whole value chain.

Livestock research in the CGIAR has traditionally been strongly focused on producers, with the notable exceptions of ILRI's work on milk markets in East Africa and on pig sector modelling in Viet Nam. The value chain approach of L&F was intended to ensure that the needs of the whole value chain would be considered and to this end needs assessments were carried out by all of the value chain research hubs within the first year and a half.

The portfolio of work carried out by the value chain research hubs does reflect the results of the value chain assessments and the objectives of L&F, but it also appears to have been influenced by the expertise and previous experience of the value chain teams, and particularly their leaders, as well as the interests of bilateral donors.

The CRP-commissioned evaluation of the value chain work commented that "there would appear to be some degree of serendipity in the pattern of outcomes and subsequent impact pathways [in the value chain TOCs], probably stemming more from the orientations and strengths of program staff in the countries than sound analysis of alternative pathways and program outcomes". The same report noted that the impact pathway and outcomes developed retrospectively for the Egypt value chain corresponded very closely to the deliverables of the Swiss Agency for Development and Cooperation project that funded the work. The present evaluation observed that a strong focus on institutional development in Tanzania is a natural progression from work previously done by the Value Chain Coordinator under the East African Dairy Development Project. The breeding and genetics focus in Ethiopia draws on the previous skills and experience of the value chain team leader there. The emphasis on economic modelling and farm-level economic analysis in the Viet Nam portfolio reflects the expertise of the VCC in a previous ILRI project, while work on animal health has only emerged with the introduction of a new project mapped to the CRP on Agriculture for Nutrition and Health (A4NH). In Nicaragua, where CIAT leads the value chain work, there is an emphasis on adaptation of forages to biotic and abiotic stresses, an area in which CIAT has considerable expertise.

As mentioned in 3.2.2, there is still a concentration at the producer end of the chain[46] but there are also examples of work on marketing and market links (e.g. in Bangladesh; work is planned in Viet Nam), food safety (e.g. Uganda, a recent initiative in partnership with Vets without Borders) and input provision (e.g. Tanzania).

From all the above, the evaluation team concluded that L&F does not yet have a sufficiently comprehensive portfolio along the value chain, but is progressing in the right direction. However, in every country visited the evaluators identified research questions that L&F could or should address but does not, often because a particular skill set is lacking to identify the questions or design a proposal for bilateral funding to support the work.

[46] The research portfolios of five value chains are described in the value chain case studies in Annex F

Gaps in the portfolios of the value chain research hubs could be filled by any of the following, and ideally a combination of all of them:

i) Closer collaboration between VCTS and other FPs to develop new research activities where they are most needed. This is the obvious option to pursue, since the L&F program in its entirety includes a broad set of skills and experience and it was part of the original plan that the FPs would work together. However the observation of the evaluators is that the implementation of L&F is not particularly coherent. Value chain sites are testing (and in some cases using and appreciating) tools developed centrally. Initiatives have been put in place to monitor on-farm impacts of some technologies and institutional changes, either formally through household surveys or informally through farmer evaluations. Yet there is little evidence that field-level findings are influencing the content of any of the discovery FPs except SASI. In addition, value chain research hubs find it hard to get attention from FP scientists, particularly those based at distant Centers that they do not know personally.

ii) Closer collaboration across the VC research hubs that work on the same species or commodity. For example, the two research hubs in Africa (Ethiopia and Burkina Faso) dealing with small ruminants are managed to as separate sites, each with a small core research team and distinct outputs. An alternative approach would be to provide the core scientific resource to both sites in the form of a joint small-ruminant value chain team, covering several disciplines, and with the mandate and budget to travel between sites. This could potentially provide a broader core scientific team to both sites, allowing flexibility for future developments in each country, as well as promoting synthesis and learning between them in an unforced way.

iii) Collaboration between L&F and other CRPs. L&F has collaborated with A4NH (in several countries), AAS (In Bangladesh), CCAFS (in Nicaragua), WLE (in Egypt), PIM (in Nicaragua and Viet Nam), Humidtropics (in Uganda and Viet Nam), Dryland Systems (in Ethiopia) and Roots, Tubers and Bananas (in Uganda). Collaboration with A4NH is particularly strong and is enabling L&F to bring a food safety dimension to value chains. A4NH does not have a similar field-based program and benefits from access to field sites through the collaboration. The evaluators see the cross-CRP as generally positive, although it means that the input of value chain co-ordinators is diluted, since they are often the in-country focal point for all of the collaborating CRPs. A possible exception has been the collaboration with PIM – researchers in both CRPs shared concerns about insufficiently clear delineation of responsibilities while PIM was criticised by some L&F scientists for not sharing data and being slow to complete analyses.

iv) Collaboration between L&F and research partners, particularly international research partners. The capacity for research at a value chain hub can be greatly increased through bilaterally funded projects in collaboration with international research partners. However it is important that they are clearly mapped to and congruent with the aims of L&F. For example, the REVALTER project in Viet Nam, funded by the French government and managed by the French Agricultural Research Center for International Development (CIRAD), is mapped to L&F because of work on feed market development, but has a broader remit than L&F and its own clearly stated agenda. It will be the responsibility of the L&F VCC rather than the CIRAD project leader to ensure that outputs from REVALTER contribute to L&F's objectives.

6.4 Management of a multi-site program

In theory, the nine value chain research hubs should communicate laterally and learn from each other, making a whole that is greater than the sum of the parts. In practice they operate for the most part as nine separate programs with limited lateral communication. The lack of lateral communication was noted by the CRP-commissioned external evaluation and also observed by the present evaluation. CRP management's proposal to include a specific section in each FP strategic implementation plan and POWB, a response to the CCEE of the value chain approach, is a positive step to overcome this problem but has not yet been implemented.

The diversity and geographic spread of locations and species has resulted in a wide range of experience, with several "pockets of excellence" from which much can be learned. Positive lessons from the countries visited by the evaluators include:

- Bangladesh: successful outscaling of the use of genetically improved fish.
- Ethiopia: management of community-based breeding programs; a realistic aspiration to integrate poor producers into value chains for urban/export markets.
- Nicaragua: gender mainstreaming; partnership with farmer co-operatives
- Tanzania: institutional grounding through DDF; strong partnership with Heifer International.
- Viet Nam: economic outputs influencing policy; capacity building in local research partners

However, the lack of internal coherence in the flagship means that it is not achieving economies of scope (i.e. reaping full benefit from the variety of research activities pursued) or economies of scale:

- Tools and techniques are being introduced across most value chain sites but value chain sites mostly operate as separate entities and rarely compare experiences. There are exceptions – for example a paper has been published synthesising findings on gender mainstreaming in three countries – but they are rare.
- There is no community of practice among VCCs or scientists (other than gender researchers) to encourage scientists to compare findings or their experience of using methods and tools. There was no evidence of collective reflection and learning by the flagship, although some individual value chain teams have engaged in and reported on reflection and learning exercises.[47]
- In seeking assistance from discovery flagships, whether financial, physical, mentoring, value chain research hubs act as individual "price takers". The evaluators found no sense of strategic planning or collective bargaining from the VCTS FP as a whole, and when questioned, VCCs confirmed that they operate as individual units.[48]

In addition, and outwith the direct control of VCTS:

- Discovery FPs have often been slow in responding to requests for collaboration and assistance.

[47] Note the CRP-commissioned review found that "only 14 percent of staff agreed that there had been effective cross-site learning" (p32)

[48] Note the CRP-commissioned review recommended that the VCTS should "effectively mobilise expertise from other knowledge partners and leverage support from the discovery flagships" (p xix)

- The allocation of W1/2 funding process is opaque (also see Chapter 2). VCCs say that it is "small" but most cannot quote annual amounts and none have control over what is allocated. By comparison, most VCCs know very clearly the amounts of bilateral funding they receive.

6.5 Areas that offer the greatest opportunities for improvement

The conclusion of the evaluation is that the value chain approach is a valuable concept and the approach or its functional equivalent should be continued. It should be acknowledged that delivery will take time. However, the program needs to be managed much more effectively to deliver on its promise. The CRP management's response to the CRP-commissioned review includes useful proposals, but most were expected to be actioned in late 2015 or 2016 and had not been implemented by the time of the present evaluation.

The following barriers must be acknowledged:

- There may be a short remaining timeframe to deliver proof of concept on an approach that was relatively new in CGIAR research, and has required transformative change in the relationship between the CGIAR Centers and their partners to allow it to be implemented.
- In order to manage VCTS effectively and coherently, it will be necessary to cut through the complex organizational structure of the CRP. CRP management has limited power to make changes to management processes and will need support from Center management.
- L&F has a legacy of a Center-based (on-station, laboratory or modelling, as opposed to field-based) approach to research, where much of the L&F funding is still concentrated.
- There is very limited expertise within the CRP of managing a geographically dispersed program with a strong applied research element.

Notwithstanding the challenges, the following offer concrete opportunities for improvement and were taken into account in formulating the recommendations in chapter 8:

- Boosting funding to provide sufficient core capacity at each hub. This would require: i) not increasing the number of research hubs and possibly closing one of them – or moving to a two-tier system of primary and secondary research hubs; ii) a concerted effort from CRP management to seek bilateral funding for all research hubs that are below capacity and iii) serious thought should be given to moving funding from discovery FPs to VCTS so that value chain research hubs can "commission" research from discovery FPs.
- Reformulating the terms of reference of the VCTS co-ordinator to emphasise co-ordination, development of a community of practice among the value chain teams, time spent in each country, and synthesis of results and lessons learned. Appointing or recruiting someone with the necessary skills. The evaluation notes that a positive step has been made in this direction In response to recommendation made by the CRP-commissioned evaluation of the value chain approach. CRP management proposes to convert the VCTS Flagship Leader from a part-time to a full-time assignment and establish a Research Methods specialist position within VCTS to support the FP leader.
- Separating the roles of running the research program and each value chain and managing the administration.

- Identifying successful outcomes and providing opportunities to analyse and learn from them, at annual L&F meetings or in webinars.
- Boosting the technical content and breadth of research through a more strategic engagement of the VCTS FP with the discovery FPs. For example, increasing the technical content of animal health by bringing together a corps of veterinary epidemiologists and veterinarians with field experience.
- Using the opportunity offered by L&F's presence in nine countries to pursue the development of action research tools, and to research the best strategies for scaling.

7. Effectiveness and impact

This chapter addresses L&F's effectiveness in delivery and the operational constraints to effectiveness. It also touches on factors that will affect sustainability beyond L&F's lifetime, in particular the experience of working with research and development partners. The evaluation assessed actual and potential progress against short and longer-term targets and identified factors contributing to progress. It also separately reviewed L&F's partnership strategy and tactics, since partnership is a critical element of the CRP's design that contributes to both effectiveness and sustainability.

7.1 Progress against targets

7.1.1 Means to measure progress

L&F has targets with respect to completion of activities, delivery of outputs and progress towards outcomes, and the evaluation considered all of them.

For the donors who fund L&F, through W1/2 and W3/bilateral programs, outcome targets expressed by the IDOs and the TOC are very important.They are also the most difficult targets against which to assess L&F's progress. In addition to the usual problems of assessing potential outcomes part-way through the life of a program, L&F presents the following specific challenges:

- It has taken time to define indicators for each IDO. By August 2014 a manual defining a set of quantitative, semi-qualitative and (for IDO 6) qualitative indicators had been produced but this will need to be reviewed and possibly revised in line with the new CGIAR Strategy and Results Framework (SRF) approved in May 2015 by the FC. The narrative description of indicators is good but the actual targets set are very vague and mostly do not include the scale of improvement that would be considered acceptable – phrases like "more is better" are typical. L&F's work on the IDOs was suspended in 2014 when the decision was made to develop a common set of IDOs for all CRPs under the new SRF.
- There has not yet been any formal impact assessment, and, notwithstanding the extensive information contained in local and national-level situation analyses and value chain assessments, neither has there been a systematic baseline survey against which to make an assessment.
- As previously discussed in chapter 2, the TOC (including the impact pathways) has been a moving target and has never been available in a complete form. The changes made to the TOC and impact pathways were not simply the evolution that would be expected from an evolving and dynamic program, but have been major reformulations of ideas. Throughout the evaluation, different versions of the TOC were shown to the evaluation team by different L&F research leaders. The most recent version shown to the evaluation did not yet provide a framework against which to monitor medium to long-term progress, although there have been encouraging developments in the past six months. A pilot version tested in two countries explicitly links annual reporting to longer term monitoring of progress.

Progress towards outputs and completion of activities, as well as expenditure, should be easier to assess, as targets are set in annual and pluri-annual work plans, against which L&F reports every year. However the formal CRP reporting system is confusing to the outsider and does not facilitate assessment of progress. For example, the 2014 annual report provides a text description of activities carried out that contribute to outputs and outputs delivered that will contribute to outcomes, but does

not map any of these against concrete targets. Some quantitative and qualitative targets can be found in the POWB but for the VCTS FP the targets are aggregated and are very difficult to map against activities in countries. In addition, research leaders report separately to donors on progress made in bilateral projects.

In addition to reviewing POWB, annual reports and documents submitted to Science and Partnership Advisory Committee (SPAC), the evaluators also attended presentations made by FP and value chain leaders, interviewed research leaders during visits to Centers and value chain research hubs, reviewed selected documentation from bilateral projects and interviewed a small number of donor representatives. It took a great deal of time to understand what L&F was meant to be delivering, even before assessing what it had actually delivered. The assessment of progress against medium to long term targets relied heavily on interviews and expert assessment. The present reporting system is not helpful to monitoring progress, and it is not likely to improve while L&F is in transition to using the "One Corporate System" and operating with a reduced CRP management team (see chapter 2).

The evaluation considers L&F's lack of a monitoring and evaluation system to be a serious problem. CRP Management is aware of the problem, SPAC considers it as a weakness and it has forced this evaluation to rely less than had been anticipated on facts and figures and more on expert opinion and qualitative assessments. There are several reasons why a M&E system has not been established yet. These include: the complex multi-locational, multi-disciplinary and multi-institutional program; the inconsistency between the reporting requirements of L&F management, the Consortium Office, and bilateral donors; multiple changes to the TOC, which could otherwise have been an important monitoring reference; and a changing CRP structure with unclear reporting responsibilities. The evaluation is concerned that the CRP will not be able to develop a M&E system until the end of the current program, particularly because two persons dealing with M&E in the CRP management had to leave in the first half of 2015 due to the announced severe budget cuts.

7.1.2 Activities and outputs

The evaluation found that generally L&F has made reasonable progress in completing planned activities, and has delivered a number of outputs, ranging in scope from early assessments of value chains to dissemination of fish germplasm (also see chapter 4). The evaluation found areas of good progress and others where progress has been slow, in every FP and Center. As previously mentioned in chapter 5 there has been a backlog in data analysis and publication of results across all FPs and the evaluation encourages L&F to pay attention to clearing the backlog.

The more traditional discovery FPs (Animal Health, Animal Genetics and Feeds & Forages) have been more successful in completing planned activities and delivering outputs than the novel VCTS and SASI FPs. VCTS has been slow in developing research activities because of the time needed to make investments in institutional relationships and seek operational funding, the small size of core teams, and changes in the countries chosen – Burkina Faso was brought into the program very late to substitute for a program in Mali. The SASI flagship is a recent entity, assembled in 2014 from parts of previous Themes. As a flagship it has an incoherent structure and delivery is hard to assess. However, both VCTS and SASI have the potential to deliver well if their structural incoherence can be overcome. SASI is doing innovative work on gender and the environment and a recent partnership with KIT has increased the pace of delivery of gender activities (discussed in Chapter 8). VCTS has made good progress in some areas, and is likely to speed up the delivery of activities and outputs in the future. It would perform much better if more coherently managed and better resourced. Although each FP has been separately considered here it is also important to remember that each has a role to play in the CRP beyond the delivery of planned research outputs: Animal Health, Animal Genetic and Feeds&

Forages are expected to deliver basic research in their respective areas; SASI is intended to be the discovery "home" for cross-cutting research on gender and environment/NRM as well as other cross-cutting issues; and VCTS is the delivery vehicle for the value chain approach.

7.1.3 Impacts of legacy work

The following topics represent substantial legacy work from which to base an assessment of impact;

- East Coast Fever Immunisation and Treatment (ILRI). Research has been carried out over many years by several organizations including ILRI. The vaccine has been widely used in East and Southern Africa by smallholder dairy farmers. ILRI's role in producing the most recent batch of stabilate has been important in assuring a stopgap supply of vaccine until it could be produced by regional laboratories.
- Smallholder dairy markets (ILRI). ILRI's work on dairy policy and smallholder markets in Easy Africa is one of the few legacy projects that many people can cite as having influenced policymakers.
- *Brachiaria* grasses in South and Central America (CIAT). *Brachiara* grasses adapted to South American conditions have been widely marketed in South and Central America, particularly in Brazil, through commercial channels
- Tilapia genetics (WorldFish). As previously described in Box 7-1, improved tilapia germplasm has been widely distributed in Bangladesh, Egypt and elsewhere and has increased incomes for poor families

However, there are hardly any published assessments from which to make an objective assessment of impact. An impact assessment has also been published on development and dissemination of genetically improved farmed tilapia, and this was published in 2005 and relates to work done by the International Center for Living Aquatic Resources Management (ICLARM) before WorldFish took over the research. It cites a study by WorldFIsh that found an internal rate of return of 70 percent on ten years of investment in the Philippines and Thailand. Only one of the twelve ex-post impact assessments identified by the SPIA study mentioned in section 1.6 relates to substantive L&F legacy work. The report in question assessed the impact of ILRI's smallholder dairy program in Kenya between 1997 and 2003 and estimated a net present value of USD 230 million and an internal rate of return (IRR) of 55 percent from liberalization of the milk market. A further study from 1999 identified by the SPIA study found a net present value of USD 11.8 million and an IRR of 38 percent from development of fodder banks for pastoralists in West Africa, which has a tenuous link to work done on a very small scale in the Tanzania dairy value chain in developing Maasai traditional systems of grazing management.

The evaluation's conclusion from this very limited information base is that relevant L&F research done at sufficient scale (i.e. affecting national policies or applicable to more than one country) can potentially generate positive economic impacts and benefits for the poor. A more definite conclusion is that there is a strong need for impact assessment of L&F's key research areas to be planned carried out in a systematic fashion. This is echoed by the SPIA report's recommendation to use the opportunity provided by multi-Center CRPs to mainstream impact assessment of livestock research.

7.1.4 Progress towards outcomes

It is too soon to assess how well L&F will deliver on outcomes. It is making encouraging progress in some areas and much slower progress in others. It would be hard to predict an outcome delivery date for much of what L&F is working on. Boxes 5 and 6 describe examples of research with a long legacy that has already delivered development outcomes (tilapia genetic improvement), and more recent

research on an important topic where a delivery date for outcomes cannot be predicted (African Swine Fever epidemiology and diagnostics).The evaluation identified the following areas that would merit attention:

i. **Center-based research**: Some research outputs, although potentially of high impact, have very uncertain and potentially distant delivery dates – these include livestock vaccines and livestock germplasm. The evaluation team considers that it is important to include "high-risk/high-return" projects of potentially great value to developing countries in the portfolio. However L&F could be more explicit in about reviewing their progress in annual meetings and Annual Reports. It could also do more to explore the delivery pathways that will eventually be needed for these outputs – which might include connections with delivery partners, including those in the private sector. There are examples where this has already been done, such as CIAT's long-standing relationship with Dow Agrochemicals to deliver grass seed – however even with this successful example there has not been much explicit consideration of the route by which the seed might reach small-scale farmers.

ii. **Country-based research:** Development donors interviewed are concerned about the lag between research activities and development outcomes. Different donors express it differently: "not sufficiently focused on results"; "too focused on publications"; "need for us [the donor] to be accountable to government"; "need to show progress to stakeholders". It is inevitable that there will be some tension between research and development cultures, with respect to the rigour of investigation methods and the time taken to show results. One of the positive findings of the evaluation was the relationship that has developed between the L&F researchers and some of their development partners, with learning on both sides. However there is a need for L&F to be clearer in conceiving and communicating the path it is following towards development outcomes and for donors to be realistic about the time needed for meticulous research. The previously-mentioned pilot M&E system reporting against the TOC is a positive step in this regard and should provide a vehicle for clearer communication between L&F and donors.

There is a good chance that L&F will create local impact within the countries where it works and in most countries it is beginning to do this. There are only very few examples where a broader national impact has been created. National impact at scale is most likely to occur when L&F: produces policy outputs (as for example, In Viet Nam, resulting in a more pro-smallholder government stance); produces outputs that can be widely disseminated through market mechanisms (such as improved fish); works with development partners that also work in other locations (for example in Tanzania, L&F has partnered with a successful local NGO that has the potential to disseminate improved management training); or works at multiple locations (this has generally not been possible because of limited funding). The program can be expected to generate additional national inputs in the future but in most countries the process will be slow. It is also unclear how the research will be used on a regional or global scale, owing to the considerable diversity of value chain hubs and research activities and limited connections between them (genetic improvement in tilapia is an exception, as this has already been applied in both Egypt and Bangladesh). As previously discussed in chapters 3 and 5, L&F will need to pay attention to synthesis and coherence across the VCTS FP if it is to deliver IPGs.

In general. The point made in chapter 3 about the need for streamlining, focus and synthesis to generate game-changing outputs is reiterated here. For example, there has been interesting work in environmental analysis that has potential to contribute to IPGs. Some of this is reported within SASI and some from value chain hubs and only by reviewing the entire program is it possible to see the full

value of the research. It would be worthwhile putting effort into synthesizing cross-FP and cross-site findings. This should be the role of the recently-formed SASI FP.

Box 7-1: Progress towards outcomes: tilapia genetic enhancement

The tilapia genetic enhancement program is a legacy project dating back to 1987 (ICLARM, Philippines) that continues to be the centerpiece of WorldFish's contribution to the Animal Genetics flagship, and is the most visible component of their research program. This project is active at the Center in Malaysia as well as Bangladesh and Egypt. The outputs have been and are being applied globally. Tilapia genetic enhancement is highly relevant to the broader development agenda of L&F as it addresses production of food by and for the poor. WorldFish philosophy emphasizes middle income players or higher in the value chain to impact poverty and food for the poor. Family selection is being used to improve the growth and production of Nile tilapia, *Oreochromis niloticus*, a hardy, fast growing fish, widely consumed worldwide with a reasonable price. Samples provided to WorldFish by the Philippines government have been used to produce successive generations in Malaysia. Three releases have been made in Bangladesh and the name of the line has evolved over time. In Egypt, a selection program was initiated with local Egyptian Nile tilapia, resulting in another improved line that has only been released in Egypt.

Positive features

Germplasm from this genetic enhancement program has been released to poor farmers in Bangladesh and Egypt who then produce tilapia for poor consumers. As poor farmers gain economic traction, they prefer to begin raising fish of higher value that would be less accessible to the poor consumers. However the poor still benefit from the tilapia production from larger farmers and from employment opportunities at various positions in the value chain.

Contributory factors

The development outcome realised in L&F builds on a long period of legacy work. Bilateral funding in Bangladesh and Egypt has facilitated the process of transfer.

Concerns

Dissemination of improved germplasm may represent a threat to natural genetic resources and biodiversity. There are no government policies in place to mitigate the threat.

Dissemination has taken precedence over the development of the research program. The focus has been on a single, albeit important trait, body weight, although the evaluation team, during interviews with stakeholders and partners in identified several traits that were a close second to growth in importance or more important than growth to farmers, hatchery managers or consumers. These included problems with reproduction and rates of sexual maturity, fecundity, disease resistance, feed conversion efficiency, appearance of the meat alive or dressed, survivability and stress tolerance during transport to the market, size at marketing, price and taste.

Many more breeding programs could have been used or integrated with the family selection. Intraspecific crossbreeding and interspecific hybridization could have been used to take greater advantage of genetic resources. Modern genetics and biotechnology have largely been ignored in the program. Conservation genetics concerns could have been partially addressed with new technologies.

Source: Evaluation FP case study

Box 7-2: Progress towards outcomes: African swine fever research

African swine fever (ASF) research at ILRI originates from legacy work, but with a fairly short duration. ASF is considered the most serious infectious disease of pigs in Africa and an important constraint to development. It can cause up to 100 percent mortality in domestic pigs. There is no vaccine against the disease. Almost half of African countries (25 countries) reported the disease in 2012. As well as causing major economic losses, ASF also has a considerable social on people who depend on pig farming. Because of these features, the African Union's Interafrican Bureau for Animal Resources (AU-IBAR), FAO and ILRI have jointly developed a regional strategy for the control of ASF in Africa.

ASF research at ILRI began in 2005 in collaboration with Animal Health Research Center (CISA-INIA), Spain. The research mainly aimed at evaluating the epidemiological situation of ASF in Africa from a molecular and biological point of view and developing sensitive diagnostic techniques, including pen-side tests, for the existing field viruses. In 2012/13 (Biosciences eastern and central Africa) BecA-ILRI in partnership with CSIRO conducted studies in the border region of Kenya and Uganda to generate quantitative data on pig husbandry systems and associated production constraints, in particular relating to ASF. Published results recommend that farmers should be sensitized to adopt biosecurity practices and report suspected outbreaks to authorities. Research is underway into the genetics and field epidemiology of the disease while social science research is exploring the potential to use social networks to as a vehicle to develop practices through which smallholders manage ASF risks.

Positive features

The ASF research team has developed a TOC that maps the aims of their research to development outcomes: enabling farmers to better manage their pigs in order to reduced disease risk, and providing faster and more accurate information to veterinary services so that outbreaks can be controlled more quickly.

The Center-based research team is clearly aware of the need for multi-disciplinary work with development partners. ILRI is part of a network with AU-IBAR, African veterinary services and FAO

Concerns

Translating study findings into action by farmers and animal health providers will require transformative change that is not yet built into the research program and will require long-term funding and an expansion of the current coalition of research and development partners to include more that work directly with rural communities.

Source: Evaluation FP case study

7.2 Working with partners

Partnerships have been a very positive aspect of L&F's implementation, and working with partners was assessed very positively in the evaluation's survey of researchers. This is interesting because L&F does not have a clear partnership strategy or any CRP-wide mechanism for developing partnerships. The program proposal and any reports that mention partnership provide long lists of partners, and in some cases the rationale for identifying them, but make no mention of a deliberate strategy for building relationships with partners. A strategy document for partnering with development partners was developed[49] but has not been put into use and there is no such document for research partners. In spite of the lack of a formal strategy there have been some effective opportunistic approaches that will be discussed for each type of partner.

Research partners

L&F has made effective use of international research partnerships and it is notable that the most-cited published outputs listed in chapter 4 result from international collaborative efforts. These are the CGIAR's natural collaborators, including a long list of universities and a few other research institutes that are all internationally respected. Some of these relationships are of long standing and the partners work together apparently with little effort. Comments from the researcher survey indicated a strong appreciation for working with international partners.

[49] Worsley, 2014

The evaluation team interviewed some of L&F's international research partners and are professionally acquainted with others. There are differences of opinion, a limited level of rivalry and comments about the value or otherwise of formal arrangements like MOUs, but in general the working relationships are effective. The evaluation team's only comment is that L&F could have been more adventurous in seeking partnerships with institutions that have a different profile and skill-base to its own and could fill skill gaps in areas such as agribusiness.

L&F also works with research partners (universities and government research centers) in all value chain countries – the ability of the CGIAR to do this emerged as a comparative advantage in peer interviews. Many of these partners face limitations in human resource capacity or funding or both, but in spite of this it has been crucial for L&F to partner with them. The value chain teams tailor the collaborative work they do to the capacity of the national partners. For example in Viet Nam the value chain team leader has a longstanding collaborative relationship with a policy research group that now runs pig sector models to which L&F has contributed. L&F also has a more recent relationship with two universities that have been strongly involved in the value chain assessment work. In Tanzania L&F has partnered with a long-established university in a solid research collaboration with a university staff member as focal point, and also with the government's livestock research institute, which has limited capacity to do research but is an important partner for advocacy purposes. In Ethiopia the value chain team has invested considerable time and effort in building partnerships with several of the regional agricultural research institutes that have assumed most of the research mandate under Ethiopia's federal system. The evaluation considers L&F's pragmatic approach to be sensible and finds it to be working well.

Development partners

Working closely with development partners is a feature of CRPs in general and L&F's value chain approach in particular. L&F has established two types of development partnerships:

i. **Working partnerships in countries where value chain research hubs are situated**. The value chain case studies developed for the evaluation reveal that there has been a strong positive experience of working as partners with NGOs and extension agencies on joint projects. Several of the development partners have gained a stronger understanding of the value of research and what is required to do it well. At the same time the pragmatic approach of development partners and their connection to farmers and delivery systems has helped to "ground" research. The collaboration between the two has provided opportunities to have research outputs tested and adopted more quickly. It has also been possible to obtain bilateral funding from development agencies that would hesitate to fund a "purely" research project.

The evaluation has been impressed by the progress made in establishing working partnerships and would only caution that it is important to retain research rigour even when action research is done by the development partner. This means establishing a process for recording and reporting lessons learned.

ii. **Fledgling strategic partnerships with funding agencies**. Some flagships and value chains have been very successful in attracting bilateral funding, without which the program could not have continued at the present scale. Some bilateral donors interviewed either stated or implied that they consider the relationship with L&F to be a partnership, even when the donor, as the provider of funds might be considered to be the driver of the relationship. Positive impacts have included

becoming more knowledgeable about the interaction between research and development, and using research papers posted on the wiki to guide their thinking in other projects.

There is more to be done in developing partnerships with donors. Partly it relates to communication about expectations on both sides from bilaterally funded projects and clear communication about progress, to limit donor uncertainty and frustration. There is also work to be done at the level of L&F management in interacting more strategically as a CRP to communicate intentions and seek program-level funding, and in driving wider development agendas through membership of strategic alliances – this relates to the need to produce "game changing" outputs discussed in chapter 3.

The evaluation has noted the potential of a single bilateral project to drive an agenda – examples are the funding of aquaculture research and development in Egypt and the recent funding of work on poultry genetics. Strong influence from a donor can be positive or negative, but it is important for L&F to be intentional in mapping bilaterally funded projects to L&F outcomes.

7.3 Operational constraints to effectiveness

Effective operation and the delivery of outcomes requires sustainability of L&F's core funding and human resource together with the capability of research and development partners to respectively continue and take forward research outputs.

7.3.1 Funding

L&F was conceived as a 10-15 year program with sustainable core funding, allowing it to be innovative in design. However, as discussed in chapter 2 the expected sustainable core funding did not materialise – in 2012 and 2013 funding was as expected or higher, but in 2014 it was below the expected level and in 2015 a budget cut was announced at very short notice. The rules regarding carry-over of funding also changed in 2014. Although much of the research portfolio has been protected from the effects of funding cuts, which have been applied most strongly to program management, projections suggest that core funding will again be reduced in 2016 and 2017. The evaluation is concerned that this will compromise L&F's ability to provide the scientific expertise needed for delivery of outputs.

Bilateral funding has been very important to L&F as even the level of W1/2 funding originally expected would have been insufficient to sustain the planned research. L&F has been successful in attracting bilateral funding and the evaluation considers that bilateral funding has been valuable in supporting L&F, as it has encouraged Centers to be responsive to stakeholder needs, has brought in resources from sources that would not otherwise have funded the CGIAR, and has been used for some worthwhile projects. However bilateral funding should not become the dominant source of finance for L&F. It is important for L&F to have sufficient, consistent core funding to allow it to be a strong partner that can sustain medium to long term initiatives that will deliver IPGs, while collaborating with development partners whose funding cycles may be shorter term.

The evaluation considers that the instability of funding compromises the long-term effectiveness of L&F. It could undoubtedly become more resource-efficient by streamlining the portfolio and improving management and reporting systems, as suggested in chapters 2 and 3, but there are also areas in which funding needs to expand. If L&F is to implement changes in management systems, improve efforts to synthesis research findings and resource value chain resource hubs to an optimal level it will need stable core funding at a higher level than is currently projected. There is a related need to approach donors strategically and as a whole CRP rather than as individual Centers and research hubs, in order to ensure that W3 and bilateral funding is coherent with the goals of L&F.

7.3.2 L&F human resources

L&F depends on the quality of its researchers. As discussed in chapter 4 it has strong research leaders and senior scientists and generally good teams, although higher proportion of postgraduates would be beneficial. However it has experienced problems in recruiting senior team members in some positions – for example the value chain leader in Bangladesh and the leader of the gender team have both left and no suitable replacements have been found at the time of drafting this report. The ILRI DG shared with evaluators a concern that Nairobi is no longer seen as the most attractive destination for international staff owing to security concerns. Until now L&F has been able to maintain an effective research team but the sustainability of the human resource is a concern for the future.

7.3.3 Capacity of national partners

National research partners in developing countries are not well endowed with resources. L&F works with national universities, where the most innovative scientists tend to be found, as well as government research systems, which are important institutional partners, but neither are sustainably funded. L&F cannot build infrastructure and equipment capacity, it can only help to develop human capacity. Within the scope of a research program the most effective approach to developing sustainability is to build a long-term collaboration based on joint projects that deliver outputs while providing opportunities for national scientists to publish and also to pursue Masters and PhD degrees. There is inevitably an element of brain-drain from national systems to the CGIAR but this need not be a problem if engagement at country level is sustained. Experience of building capacity of national research partners has been varied – for example in Viet Nam and Nicaragua they have contributed strongly to value chain assessment and gained experience in the process, while in Tanzania there have been missed opportunities to expand applied research on forage. Researchers who responded to the evaluation's survey indicated that they were attempting to integrate capacity building into their work but had insufficient funding. The evaluation would encourage L&F to continue working in the countries where it has gained traction with national partners and also to review progress across VCTS and learn from successes. Even with the best efforts of L&F, it would be unrealistic to rely upon a CRP as the means of building sustainable national research capacity in the absence of substantial investment from other sources.

Sustainability achieved through development partners depends on their interest and ability to use and pass on the research outputs from the program. L&F's contribution is to choose the right partners, engage their interest and work with them to create outputs that can be delivered by them or others. Early signs are encouraging in some of L&F's projects. For example, in Bangladesh and Egypt it is likely that improved fish strains developed under L&F would continue to be delivered even in the absence of L&F, although progress in research would slow or stop. The model of dairy hubs in Tanzania is likely to be adopted by Heifer and used beyond L&F and beyond Tanzania. Community based breeding programs in Ethiopia would not be sustainable if L&F stopped working tomorrow but it is reasonable to expect that in the medium term they will become sustainable. If a new East Coast Fever vaccine can be developed it will be easier to deliver on a wide scale than the present vaccine and could potentially be delivered sustainably in many countries in eastern and southern Africa.

7.4 Conclusions and opportunities for improvement

In addition to comments made throughout this chapter, the evaluation team has identified the following key areas that, if addressed, would considerably improve L&F's effectiveness and impact. These have contributed to the formulation of recommendation in chapter 8:

- Establishing a systematic process of assessing impact of key research areas
- Reliability of core funding. This is outwith L&F's control but a serious concern.
- Establishing a M&E system that meets the requirements of a complex and decentralised program, and aligning it with a fully-developed TOC
- Developing a more strategic and concerted approach as an entire CRP to communicate with development partners (as opposed to Center-by-Center and country-by-country approaches).
- Streamlining the program in order to reallocate funding to areas that are important but under-resourced
- Paying more attention to opportunities for scaling of research outputs from local to national level and from national to international

8. Conclusions and recommendations

L&F was an ambitious concept. Like all CRPs it brought multiple Centers into coalition to execute a global program. It brought livestock and fish together with the explicit intention of creating new research synergies between Centers and research teams that previously had not collaborated closely. It also aimed to deliver research outputs and development outcomes at scale through a comprehensive field program based on selected livestock and aquaculture value chains.

The evaluation has been formative and summative, looking back through three and a half years of implementation and forward to the remaining one and a half years of L&F and the next phase of the CRPs, for which separate livestock and fish pre-proposals were submitted in August 2015. Although L&F has been running for two thirds of what will be a five year lifespan, the evaluation acknowledges that it was originally conceived and designed as a ten-year program. It has also been distracted during the past 18 months by requirements to submit an extension proposal and a second phase pre-proposal, to undergo evaluations of several program elements as well as the present evaluation, and to deal with staff cuts after an unexpected fall in core funding.

Overall the evaluation concludes that L&F has added value to CGIAR research in livestock and aquaculture and should continue to be funded, either as a joint CRP or as separate Livestock and Aquaculture CRPs. L&F is not yet fully delivering on its promise and in order to do so it will require streamlining of the research portfolio (with discussions beginning immediately and gradual implementation into the CRP 2 portfolio), greater coherence across the program (to be initiated during the present CRP and carried into phase 2) and a considerably more efficient management system (to be initiated during the present CRP and carried into phase 2).

Specific conclusions and recommendations are as follows:

There has been added value in a CRP rather than individual center programs, in spite of high transactions costs.

Traditionally, livestock research in the CGIAR has been dominated by ILRI and aquaculture research by WorldFish. The CRP has brought four Centers into a collaboration that is unlikely to have occurred without the demands of the CRP mechanism. The evaluation found a number of positive examples of value added. Some of these have resulted in concrete outputs while others are more recent and have not yet delivered a solid result.

- Collaboration between Centers: for example, WorldFish has expanded its research portfolio as a result of collaborating with ILRI. The CIAT tropical forages program, which has traditionally been strongly focused on Latin America, is bringing its considerable expertise to a new collaborative initiative with ILRI on forages in Africa. ICARDA has brought the expertise to deliver an effective field-based small ruminant genetics program.

- Collaboration between disciplines: particularly between social scientists and a range of biological scientists in the VCTS FP. There has been much less cross-discipline collaboration in the Center-based work, although scientists acknowledge that this would add value.

- Distribution of FP leadership: this has been reasonably egalitarian across Centers and in some cases innovative. For example, the leader of the SASI FP is a former ILRI scientist and now a CIAT staff member based in Nairobi. Scientists volunteered that this has helped to promote a seamless collaboration between CIAT and ILRI, at least in Africa. The leader of the Animal Genetics FP is a WorldFish staff member and this has facilitated dialogue between ILRI and WorldFish. Animal health research in the CGIAR has traditionally been led by ILRI from the Nairobi campus, and the original Animal Health FP leader was a laboratory scientist – however L&F has made the commendable decision to appoint a herd health specialist from the Addis Ababa campus as the next FP leader.

- Value chain research hubs have been focal points for collaboration between disciplines and Centers, with the caveat that leadership is dominated by ILRI and research hubs do not always get the inputs they seek from FPs.

There have also been problems and missed opportunities:

- The CRP has not yet capitalized on the potential of being a large program by developing a comprehensive proposal for bilateral funding – it approaches donors piecemeal for small projects in the same way that individual Centers have traditionally done.

- It is widely acknowledged, and this report has highlighted in several places, that inefficient management systems have greatly exacerbated the already high transactions costs of working in a complex and decentralised program. A transition period to developing more efficient management processes was to be expected, but the present inefficient management system has continued for too long and with no immediate prospect of improvement.

- In spite of its size and growing number of development partners, L&F has not yet made any significant impact on the development agenda. Many key development actors have no idea of the scope of what it is doing and cannot cite any research or policy outputs. Neither has it capitalized on the internal research capacity of the CRP to produce substantive published outputs with an L&F "stamp" – the notable publications to date are joint-authored with multiple external authors and barely recognizable as L&F products.

Recommendation 1: Capitalize on the benefits of being a CRP

It has been valuable to have a CRP that brings Centers together within one program and this should continue. However, L&F has failed to fully capitalize on the benefits of being a CRP. The following are recommended to CRP management. The strategic leadership of the CRP Director will be important in accomplishing these goals:

- a stronger emphasis on CRP-wide research initiatives that will produce game-changing outputs
- stronger engagement as a CRP in global public debates on livestock, poverty and development
- whole-CRP approaches to major donors.

L&F has not fully succeeded in managing the complexities of the CRP. Recommendations 4, 7 and 9 all deal with this issue

The concept of combining livestock and fish was a good one, but there is little concrete evidence of synergy or added value

Scientifically, livestock and fish have to a large extent remained separate programs. There has been some scientific collaboration that contributed to the expansion of the WorldFish portfolio. A number of Center-based scientists say that they can appreciate the potential for combining ideas from livestock and fish in genetics, health or feeds, but have not yet taken any concrete action to do so, because they are already working in other, more familiar collaborative arrangements. There are also no joint field activities although Bangladesh (fish) and Viet Nam (livestock) could offer opportunities for collaboration as aquaculture and livestock production exist side-by-side in both countries. The focus on a single-country/single-species perspective has discouraged scientists from seeking joint field projects. It would certainly require additional investment in national institutional relationships to expand from livestock into aquaculture or vice versa within a value chain hub.

Generally there has been goodwill at Center management level and an excellent collaboration in the Program Coordination and Management Committee, but an intended joint Board of Trustees meeting between ILRI and WorldFish, which could have brought a stronger integration, did not materialize, and there have disagreements about the allocation of funds. It must be acknowledged that the L&F proposal was written in a pragmatic way, and not as a fully strategic collaboration between Centers. It takes time for strategic partnerships to grow, and they often develop most effectively from collaboration on concrete projects. The evaluation has found only limited evidence that bringing livestock and fish together has added value, although there are indications that, with a more strategic partnership, this could happen.

There is potential in having livestock and fish in the same program that has not yet been realized. However the evaluation does not have a recommendation on the value or otherwise of retaining a joint program and considers that it will make very little difference to achievement of development outcomes whether livestock and fish remain together in one CRP or collaborate as separate CRPs.

Recommendation 2: Increase synergies between livestock and aquaculture

Regardless of whether livestock and aquaculture remain together in one program, stronger attempts should be made to capitalize on potential synergies between them, including the development of a larger portfolio of substantial projects that brings them together.

The L&F portfolio is broadly relevant but too diverse to achieve scalable impact

L&F works towards the program maxim of “more meat milk and fish, by and for the poor”, and six key Intermediate Development Outcomes (IDOs) that between them encompass international public goods and every major global development need to which research in livestock and aquaculture might be expected to contribute. The targets set for the IDOs have taken time to develop and are still vague. All of this gives the CRP scope to work on more topics than it could possibly manage, even with the capacity of four contributing Centers.

A widely-held belief among peer interviewees, shared by the evaluation, is that is that L&F has little comparative advantage scientifically other than in a few specialist areas, but it has the undeniable and very important comparative advantages of mandate to work for the poor and on IPGs, combined with a close partnership with national research systems, and an increasing presence on the ground.

The evaluation concluded that all of the discovery FP research activities currently conducted are broadly relevant, in that they fall within the scope of the IDOs and the remit of the CRP. Some are more obviously relevant than others but none are irrelevant. Likewise, all of the value chains under the VCTS FP are relevant to the needs of the countries in which they are located and the L&F IDOs.

L&F must not only work in relevant areas, it must also deliver outputs appropriate to a large, publicly funded research program. Peer reviewers from the development community expect the CGIAR to deliver:

- Substantial analyses synthesised across locations or over time from which others can learn and plan.
- Game-changing research outputs that lead to new ways of working or new lines of research for others.
- Outputs that will help to solve national problems and at the same time contribute to the wider discourse.

L&F has delivered few outputs so far that fall into any of these three categories or could be considered substantial progress towards the game-changing outputs that are required for provision of IPGs.

The evaluation acknowledges that the program is still young, and much of the work it is doing requires a long development time, or has required investment in institutional relationships prior to initiating research activities. However, two major shortcomings characterize the present portfolio:

- It is so broad and diverse that human and financial resources are spread very thinly. There are exceptions to this in a small number of projects that have delivered scalable outputs (e.g. improved fish germplasm in Bangladesh and Egypt) or may do so (e.g. new livestock vaccines, if they can be produced within the time available), but many discovery and value chain projects are under-funded.
- It lacks coherence. The lack of coherence between Center and field work and between FPs has been mentioned several times in this report. The portfolio is so dispersed, that opportunities to add value from synergy are missed. This is a structural weakness that can only partly be overcome by more collaborative implementation. FPs are designed as clusters of activities that should each add up to a substantial whole, but when the evaluators looked for case studies to analyse they found a bewildering array of projects and only a few research areas where a sufficient body of work had been done to provide a case study. The lack of coherence is also due to the fact that the CRP Director has deliberately emphasized coordination rather than strategic leadership. It has been important for L&F to have transparent and inclusive management; however, at times, SPAC and partners would like to see a stronger and more visionary leadership exerted.

Work on environment and NRM is showing promise. This is a globally important topic that merits more recognition in the L&F's future portfolio. The position of environment/NRM research as a sub-cluster under SASI, in other words two organizational levels below a FP, has limited its effectiveness and ability to respond to environmental priorities identified within the country hubs. Given the importance of the topic, the evaluation considers that it should be given a higher profile in future plans.

Recommendation 3. Streamline the portfolio

In order to deliver game-changing outputs in the future, and considering the resources that are available and the system complexity, the portfolio will need to be streamlined into areas of greatest

potential impact on IDOs taking into account scientific capacity. The streamlining should take place in the context of the TOC and should ensure a balance between short, medium and long term outputs, based on very clear decision criteria. A discussion on streamlining/prioritisation discussion should be started immediately but changes implemented gradually and realized fully under phase 2.The evaluation acknowledges that this is a substantial task that is likely to need outside assistance, since it has not been possible within the scope of the present detailed examination of the CRP to make specific recommendations on streamlining, and it is likely that L&F can achieve part of the desired result by implementing changes suggested under other recommendations.. In future proposals the evaluation would strongly recommend not increasing the number of FPs or value chain sites. CRP management will also need at times to use a more strategic leadership style to guide the development and delivery of a more streamlined portfolio.

Recommendation 4: A higher profile for environment/NRM

A higher profile for work on environment and natural resource management is recommended. In Phase 2 this could take the form of a flagship program on the topic. In Phase 2 this could take the form of a flagship program on the topic, which would allow a) more space to develop objectives and workplans that covered a range of livestock-environment interactions, b) more visibility for environment in reporting and M&E and c) clearer lines of accountability through a flagship leader compared to the current complex leadership arrangements.

L&F is making progress in delivering outputs, but with insufficient thought to research outcomes.

It is evident from the POWB, the review of published outputs, the CRP commissioned external evaluation and visits to research sites that L&F is making progress in delivering outputs and some progress towards outcomes – although the reporting system does not allow judging progress against plans and so the present conclusions rely strongly on qualitative assessment rather than quantitative measures. There are areas of good progress but progress has been slow in completing research activities or analysing data. The evaluation was concerned by the fairly small number of published quality outputs, and donor agencies would prefer to see greater evidence of development outcomes.

The overall conclusion is that L&F is making reasonable progress although it is hard to predict a delivery date for much of what it is working on.

The following have been lacking:

- Published information on the impact of legacy work. Hardly any published impact assessments could be found relating to L&F's work, even for substantial legacy work.
- Clarity about anticipated impact. To the consortium, progress is not reported against planned activities and outputs but as achievement against a unified format for all CRPs; an impact timeline for the program is missing. The program's Theory of Change, including the impact pathways, have been a moving target since it started. Only very recently has a pilot project been initiated to report progress against impact pathways, with an accompanying discussion of assumptions and the change process. Early results look promising, and if extended across the program this initiative offers the possibility of clearly aligning research progress to development impact.
- A realistic assessment of what is required to progress along impact pathways from research to development outcomes, particularly with respect to delivery of technology from discovery FPs. At value chain sites there has been considerable investment in relationships with development

partners, both government and NGOs, who are in a position to deliver training, advice and policy change. Less thought has been given to the relationship with partners, including those in the private sector, who will deliver vaccines, diagnostics and germplasm. There are obvious exceptions, such as CIAT's relationship with Dow Agrochemicals to deliver grass seed, but even with existing partnerships more thought could be given to choice of delivery partner and the likely impact on the poor. A good start has been made by WorldFish, which has developed policy papers on technology transfer.

Recommendation 5: Establish a M&E system based on the TOC

L&F should complete the development of the TOC (including impact pathways) and ensure that a M&E system is established in line with the TOC, building on the pilot initiatives carried out during 2015. It should also ensure that baseline studies are carried out that will facilitate impact assessment of key research areas.

Recommendation 6: Build private sector partnerships for technology delivery

Build carefully-chosen partnerships with commercial companies, including partners in developing countries and multinationals with expertise in developing country markets, in order to deliver the pipeline from technology research to application. Potential commercial links/partnerships could be established to allow research to follow commercial requirements for registration/target product profiles. These should be seen as strategic public-private partnerships linking the national governments, the CGIAR and private companies. At the same time it is important to continue building and strengthening strategic relationships with development partners.

Governance arrangements are fit for purpose, the management system is transparent but inefficient and not sustainable.

L&F has taken a pragmatic approach to governance that after some initial adjustments appears to be working well. Processes for financial oversight (by the ILRI BoT), science and partnership oversight (through the SPAC), stakeholder participation in science oversight (through institutional relationship in value chain countries) and risk management are in place and fulfil requirements of legitimacy, accountability, transparency, equity, effectiveness, efficiency and independence. To date the governance system has not been tested by any serious conflict regarding science strategy, finance or personnel conflicts.

Some of the difficulties faced by L&F stem from a lack of consistency at Fund Council and Consortium level, including uncertain fund flows and changing guidelines on carry-over of funds from one year to the next. Many of these issues are beyond the control of the CRP. The fact that a recent review of L&F by the Internal Audit Unit of the CGIAR addressed nine recommendations to the CRP but 24 recommendations to the Consortium office speaks for itself

The evaluation has identified a number of problems with systems for managing research, reporting, staff and finance. The size and complexity of the CRP require management systems beyond those of an individual Center. The CGIAR One Corporate System should have met the requirements for CRP management but has not been installed in all CG Centers and is only in 2015 being introduced in ILRI, the lead Center for L&F. L&F has installed a stop-gap system based on manual entry and spreadsheets for research reporting and financial management. It has enabled L&F to satisfy main reporting

requirements but needs considerable work to update; there is a high and risky dependency on one person.

L&F management has been inclusive, transparent and serviceable; program staff in particular appreciate the management style. The system of internal and external communication of L&F is timely, comprehensive and open-access; it builds on the effective communication system of ILRI. The evaluation commends the transparency and inclusiveness of L&F's management but considers that the complexity of the CRP and the need to focus and make choices at times require a management style that is strategic rather than coordinative.

In L&F about 50 percent of the funding came from central Window 1/Window 2 sources; for the other 50 percent bilateral projects are mapped against the CRP. Window 1/Window 2 funds contribute to leveraging bilateral funding. Overheads generated by bilateral projects are insufficient to cover all the maintenance and capital costs of a large Center rich in labs like ILRI; its long-term sustainability is threatened.

Recommendation 7: Maintain the governance arrangements but with some adjustments

a) associate the Director General of ILRI more with SPAC deliberations in order to align ILRI and CRP programs (by more extended participation in SPAC meetings).
b) establish a periodic interaction between the SPAC chair and ILRI Board program committee chair (an annual physical meeting is suggested).
c) provide the SPAC regularly with summarized (gross) financial and administrative information so that it is aware of the financial constraints of the CRP.

Recommendation 8: Modernize the financial management system

It is recommended that, as a matter of urgency, the systems of financial management are modernized to fit the requirements of a complex, multi-site program. In particular reporting relationships and products need to be simplified in order to reduce the administrative burden particularly on middle level managers. A move should also be made from present reliance on spreadsheets to adoption of a joined-up financial database. As OCS is just being introduced in two of the Centers it will not bring the expected efficiency gains for some time to come. Instead L&F should urgently explore the possibility to introduce its own project management system, drawing from the experience of other CRPs, such as CCAFS and WLE to more effectively and efficiently collect information from participating Centers. Ideally, structures of the participating Centers and L&F should be harmonized.

The value chain approach has added value although the CRP has by no means realized the potential of the approach.

The value chain transformation and scaling approach has been a keystone of L&F and one of its most appreciated features. It was initiated with the aim of making L&F's work more relevant to field problems and to help it deliver research outputs more directly and rapidly to potential end users. By working through nine country-based value chain research hubs, each focusing on a single species or commodity, it has achieved sufficient diversity to provide a broad spectrum of experiences from which to draw lessons.

The evaluation was impressed by the investment that has been made in institutional settings and relationships and development partnerships, providing a solid foundation for applied research. The CGIAR Centers have reached far beyond their traditional NARS partners to work with government extension agencies, producer co-operatives and NGOs. Several of the development partners interviewed were clear that they see the relationship with the CGIAR as a strategic one with long term potential. They also talked of the value of having a closer relationship with the CGIAR and the mutual learning that has taken place. Donors who have provided bilateral funding to value chain research hubs were also broadly positive about their experience of working with L&F and some have funded more than one project.

There are already some visible outputs (e.g. in Bangladesh, Egypt and Ethiopia). Applied research involving national partners is taking place in seven value chains and planning and assessments have been conducted in the remaining two.

Research is still concentrated at the producer end of the value chains, the "comfort zone" for the CGAR, but has been spreading along the chains, with some work on inputs and recent collaborations with A4NH on food safety. There has been strong collaboration between social and biological scientists.

L&F can function effectively in a field setting and with a more development-oriented approach than would have been possible in earlier CGIAR programs. However, L&F has only very partially delivered on the potential of the value chain approach, for the following reasons:

- The resourcing of value chain research hubs has been sub-optimal. The core teams are too small to carry out all of their necessary work in managing/conducting research, publishing, fund-raising and reporting to multiple stakeholders. While it is inevitable that they should need to prioritize what they work on, the funding deficit has resulted in a generally low level of published outputs as well as incomplete research portfolios where questions of potential importance to local stakeholders are not considered because the team does not include the skill-set to address them.
- The abrupt funding cut in 2015 has seriously hampered research in some value chains (e.g. India) and has created uncertainty about L&F in the second phase and future CGIAR commitment to the value chain research hubs.
- Field testing and delivery has mostly been on a very small scale although there are indications it could expand nationally or internationally through development partnerships and local institutions. This may lead donors or the CGIAR to abandon the work prematurely.
- Substantive published outputs from individual value chain research hub, or a synthesis of work across several hubs, would be excellent vehicles for wider delivery of research outputs. However very few such publications have yet emerged or appear to be in the pipeline. In addition, L&F has not capitalized on the opportunity offered by the CRP's field presence in nine countries to pursue the development of action research tools, or to research the best strategies for scaling, both of which would be noteworthy IPGs.
- Apart from the introduction of a few useful tools and techniques, the program is not being managed in a coherent fashion to create economies of scope and scale. Within the VCTS flagship the research hubs largely operate as separate entities, with no systematic approach to developing a community of practice, sharing scientific findings or collective reflection and learning. Each research hub operates independently to seek assistance from discovery flagships.

Recommendation 9. Maintain the value chain approach but manage it much more effectively

The evaluation recommends that the VC approach or its functional equivalent is continued but that considerable changes are made to increase the value added by the approach: a) every value chain hub should be properly resourced, at a higher level than is currently the case – even if this means working in a smaller number of countries or establishing a 2-tier system of value chains ; b) the roles of the VCTS flagship, the country research hubs and SASI should be clarified with respect to producing knowledge to transform and scale up value chains; c) the role of the leader of the VCTS should be reformulated with a strong emphasis on communication and learning across VC and a mandate to interact with every value chain; d) there should be a much stronger emphasis on synthesis of results in published papers.

Quality of outputs is generally good, but there should be more

The evaluators have no serious concerns about science quality. It is clear that L&F has the capacity to produce outputs of high quality and indeed is doing so. There have been a few excellent or very good reports and peer-reviewed publications, mostly from legacy work. Every flagship has produced useful published material as have most value chain research hubs.

A few areas for improvement were noted, of which the main ones were:

- A generally low level of publications in high quality journals
- A backlog of data awaiting analysis, reported from every FP and value chain research hub.
- A need for consistently high attention to planning and study design in field projects
- Some missed opportunities for cross discipline projects or greater use of cutting-edge technology and techniques.
- Missed opportunities to increase human resources and fill skill gaps by strategic exploitation of international collaboration and use of international graduate students
- An inconsistent scientific mentoring system for younger scientists across the CRP

Recommendation 10: Generate more high-quality published outputs

While the evaluation has no serious concerns about quality of science, the following recommendations are made. L&F should:

a) clear the backlog and increase effort on producing high-quality peer-reviewed publications aiming for internationally recognized journals (where appropriate in collaboration with outside scientists)

b) continue to produce non externally peer reviewed high-quality outputs but thoroughly and systematically peer reviewed internally that can be disseminated broadly and quickly– but with more focus on syntheses and big-picture analyses

c) increase the number of publications that are interdisciplinary (e.g. genetics and feeds; animal health and social science; animal genetics and animal health);

d) increase and systematize mentoring for young scientists

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