CGIAR Research Program 3.7

More meat, milk, and fish for and by the poor

Response to ISPC and FC comments

ILRI, WorldFish, ICARDA and CIAT

28 June 2011

We thank the ISPC and members of the Fund Council for a generally positive review of the CRP and particularly for constructive comments that, having been incorporated, will sharpen and strengthen the CRPs strategy, implementation and outcomes. Rather than address them all in detail, we have below responded to those that appear to present the most significant challenges to, and so opportunities for improvement for the CRP. We also respond to some of the specific comments received from FC members. This is followed by a brief listing of and acknowledgement to address during the operational planning the other issues highlighted in the comments.

1. Placing CRP 3.7 in the wider context of animal agriculture in the CGIAR Research Portfolio

While most of the focus has been on developing individual CGIAR Research Program (CRP) proposals in the past year, it is important to look at how the different CRPs fit together in the overall CGIAR portfolio for key sectors. CRP3.7 adopts a commodity approach to increase productivity by promoting commercial orientation and specialization within selected livestock and fish systems and implying increasing reliance on external inputs. At the same time, small-scale animal agriculture will continue to be an integral component of smallholder agricultural systems, drawing from and contributing to essential natural resources and ecosystem services locally. We make this point not to respond to specific comments from the ISPC, but rather to present the context in which environmental services, prioritization of value chains, etc. are addressed. In short we would like **to stress that while CRP3.7 will comprise an important part of the animal agriculture investment in the CGIAR, it is by no means intended to address the full range of animal agriculture issues**.

Some existing components of the CGIAR agenda (e.g. rice, wheat and maize) are largely internalized in individual CRPs. For the animal agriculture sectors, livestock and fish, their contributions have been included in a number of CRPs. This reflects the perspective that livestock needs to integrate with other agricultural activities in achieving the system level objectives. A more detailed analysis of the contributions and linkages between the different animal research contributions to the overall portfolio is presented in annex, and summarized in Annex Table 1. These contributions are quite diverse, reflecting the manifold roles of animals in developing country agricultural and food systems.

2. Livestock and the environment

We appreciate the ISPC and WB's concerns about addressing potential adverse environmental impacts associated with intensification of livestock systems and coordinating related efforts across the CGIAR to ensure the needed IPGs are generated. This had been a constant concern for all of the partners right from the very beginning and we had agreed that while environmental considerations would certainly be a dimension integrated into all aspects of our work, we would need to recognize the relevant capacity in other CRPs and avoid duplicating such capacity within CRP3.7. As detailed below, however, and consistent with our stated strategy of focusing on direct threats of livestock and fish production systems and value chains to natural resources and environmental services, we propose to strengthen existing plans for various types of trade-off analyses to now include systematic environmental impact assessment and monitoring, primarily related to threats to soil, water and vegetation. Additionally, we will strengthen and clarify our plan, where environmental threats were identified, to link to other CRPs that have more central emphasis on environment to look for ways to mitigate risks, and would incorporate those in VC piloting activities.

Therefore, as we move forward to prepare an operational plan, we commit to preparing an explicit environmental impact strategy (similar in spirit to our Gender and Equity Strategy) that will more clearly and explicitly describe how such value chain impacts are assessed at the local, national, regional and global scales, how these assessments will inform technology and value chain development strategies, and how impacts and progress in their mitigation will subsequently be monitored. This strategy will consolidate the elements already present in the proposal into a systematic framework, and address any remaining gaps. One such gap, for example, may be the need for environmental impact assessment tools, exploring simplified versions of life cycle analysis for practitioners, as an essential component of the value chain assessment toolkit. These tools will evaluate potential threats to key environmental indicators and metrics that will then also be reflected in value chain performance analysis and program M&E. At the value chain level, this framework will include a straightforward environmental monitoring plan that takes account of:

- Potential direct environmental impacts attributable to programme interventions (such as better use of water and land by increasing crop residue use and utilization of improved forages – as described in the feed technology component).
- Possible cumulative long-term environmental impacts that may arise as a result of programme activities in specific value chains, potentially arising as a result of the combined programme interventions.
- Impact of the environment on the programme activities. This may include considering for example the potential of climate change to impact on the crops grown and therefore the residues available for animal feed. Or it could relate to changes in upstream management of water resources that would impact on downstream animal producers.

For each of these aspects, mitigation options will be identified, where appropriate, in collaboration with other CRPs that may be co-located; information about our planned sites is currently being shared with CRP1.1 and 1.2 as they identify their sites. In the first instance, this would include working with CRP1.2 for pig value chains in Uganda and Vietnam and with CRP1.1 in Mali and Ethiopia for small ruminants (many of which are likely to be sourced from pastoral systems) and dairy in India. Mitigation options will be based on both technical approaches and incentive structures, the latter point aimed at increasing likelihood of uptake and sustainability in a value chain framework. For example, the water footprint of livestock systems has recently been explored (Mekonnen and Hoekstra, 2010) and ILRI and IWMI have developed spreadsheet models for water productivity in crop-livestock systems (Descheemaeker et al., 2010) which will be further refined in the context of CRP5 and the CPWF projects in the Nile basin. We would expect to interact with CRP5

on this work, having it contribute to and benefit CRP3.7 Component 3.1 (Spatial, systems and households analysis and targeting), adapting tools for assessing water resource use in value chains, and informing the need for water-efficient feeds. It remains difficult to identify specific opportunities and mechanisms for collaboration as the proposals or operational plans for the various CRPs are still under development, but we would expect to be able to clarify these links as we move forward to develop the CRP3.7 operational plan.

The ISPC suggests that CRP3.7 play a broader role, coordinating and consolidating all such cross-cutting animal research across the CRPs. This is certainly part of the foresight role envisaged for Component 3.1 as it evaluates the pro-poor growth potential for livestock and fish value chains, including the threats they face. We will also actively explore whether a broader coordination role of the overall livestock and fish sector globally is best addressed through expected links to the foresight work proposed under CRP2.

3. Animal health and technology platforms

There are two related issues here that we would like to respond to a) the specific comments around the rationale for continued investment by the CGIAR in animal health given a mixed track record in the past and b) the wider but closely linked issue of developing technology platforms that support IPGs more broadly.

On the rationale for continued investment in animal health, we believe that the central argument for this is the **fact that animal health research investments will now be integrated in a value chain context, such that the research will directly address the needs identified in the value chain analysis**. In essence, the development of the research agenda will be governed by the identification of those animal health constraints to increased productivity where the application, adaptation or further development of current technologies will have a high likelihood of relieving such constraints. Using a value chain framework will help to focus and improve decision-making around priorities and clients for technology investments. We accept that previous animal health research was not closely enough aligned with the demands of actors in value chains and their needs for adapted technologies that can be easily delivered and in which health, breeding and feeding inputs need to be bundled together. The relative importance and combinations of the animal health research investments inputs is likely to vary depending on the demands coming from the specific CRP3.7 value chains and the opportunities for potential spillovers for broader international public goods.

Research on animal health technology options will be along two closely interrelated lines of effort. The first relies on addressing immediate needs and constraints identified for value chain development. This will require adaptive research to improve existing technology, improve farming practices, link to agri-business and combine different technology inputs by service providers, to be done in close collaboration with civil society, NGOs and the private sector as part of upgrading value chains. For currently available but under-used vaccines, an analysis of the reasons for lack of uptake is expected to lead to a combination of technology adaptation and improved delivery options to enhance uptake. Two clear examples are thermostabilization of the existing live viral vaccine for *peste de petits ruminants* (PPR) in small ruminants and testing of various delivery channels, and quality control/assurance improvements in manufacture and deployment of the current live parasite based vaccine against East Coast fever (ECF) in dairy cattle. Technologies and methods for zoonoses control and food safety will be addressed with CRP4.

The second line of effort focuses on more advanced “platform” research with broader application to develop new or more sustainable options as needed. There are opportunities in health (diagnostics and vaccines) as in breeding (reproductive technologies and genomics) and feeding that will rely on

rapidly evolving biosciences. No vaccine currently exists for the control of African swine fever (ASF), a disease threat of global significance to the pig industry and a major barrier for smallholder intensification of pig production in countries with strongly growing demand for pig products. Thus, bio-security measures represent the front line options for prevention of ASF, which will depend on improved diagnostics, epidemiological data and animal husbandry, while the need for higher-risk and longer-term research on the feasibility of developing a vaccine is evaluated with partners. It is recognized that, due to the longer term nature of this research coupled with the frequency with which current technologies can be superseded by better ones, constant monitoring is required to ensure that the most rapid progress towards the delivery of solutions is being made. While the needs for adaptive research on technologies within value chains are more easily determined with partners, there will be much more effort put into reviewing investments and linking research processes to applications for longer-term research. Ex-ante priority setting methods will focus on what the CGIAR should do and what others such as the private sector (e.g. Pfizer, Merial, Intervet, GALVmed, PANVAC, Indian and Chinese companies) will do. They will also include aspects of technology foresight, economic analysis and business model planning. As part of the operation plan we will build in consultations with private and public sector experts on initial priorities and processes for on-going decision making.

4. Specific Value Chain issues, plus some cross-cutting Value Chain issues

There have been a number of specific comments on the individual value chains targeted by the CRP, and we welcome the opportunity to clarify our rationale and strategy towards those. We also acknowledge other comments that challenge the VC approach more generally in terms of the evolution of target VCs, monitoring of progress and performance, etc.

Specific value chains comments

The ISPC queried the inclusion on the **smallholder dairy value chain in India** in this proposal given the 'considerable research effort (and success) already achieved with that value chain'. Justification for its inclusion was given in the proposal, but perhaps insufficient clarity was given regarding the rationale for targeting particular geographic regions. India is a huge and heterogeneous country. While it is true that there has been considerable success in dairy development such as in the cooperative sector, the success of the cooperative sector has been limited to a small number of states, e.g. Gujarat, Punjab, Haryana, Karnataka, parts of Maharashtra, Andhra Pradesh and Uttar Pradesh. Dairy development has lagged in most of the eastern states and in many dryland areas. Further, across most of these states (with growing exception of Punjab and Harayana), individual dairy cow productivity remains very low and far below potential. With rapidly increasing demand and a failure of the supply to match this demand, milk prices are rising rapidly (about 20% per annum), inhibiting the ability of the poor to buy milk and dairy products, but offering great opportunities for poor smallholder and landless producers. It is estimated that India will need to produce annually about 180 million tons of milk by 2021, from the current level of production of 110 million tons. Much of this increase in production will need to come from the eastern states and dryland areas, where the agro-ecology and socio-economic and institutional environments (e.g. smaller farm sizes, weak or non-existent coops, poorer infrastructure) differ from the traditional high potential dairy areas, resulting in a varying set of research and development challenges. We therefore propose to focus activities in three, complementary but contrasting states: Bihar, Assam and Andhra Pradesh. There is strong support from Government of India (Department of Animal Husbandry, Dairying and Fisheries; Indian Council of Agricultural Research) for inclusion of India in this CRP. The Indian Council of Agricultural Research has been involved in discussions on the programme design. Importantly, in the context of IPGs, experiences and learning from India will offer good learning platforms for other regions in South Asia and Sub-Saharan Africa.

The ISPC asks for more clarification on the **researchable constraints for the sheep value chain in Mali and dairying in Tanzania**. In Mali, our efforts will be focused primarily on goats, but will not ignore sheep to enable lesson-learning with the sheep value chain in Ethiopia. Researchable constraints are essentially the same across the two countries to address the productivity drivers related to health, feed and genetics, as well as improving marketing systems. Health issues centre on understanding the diseases and risk factors responsible for high pre-weaning mortality constraining flock growth (30 to 50 % of animals die before the age of one year), and addressing the major epidemic risk from *peste des petits ruminants* (PPR). Developing a thermostable PPR vaccine offers a particular immediate opportunity to reduce such risk. At the same time, strategies for strengthening animal health delivery systems are needed if new technologies are to have impact, and this will require a combination of technical and institutional research. The availability of quality feed across seasons remains a major problem, so strategies adapted to the Malian context to produce more feed of better quality, to make better use of existing feed resources and to process feed resources will be needed. Breeding strategies will be required to disseminate existing high performing breeds with targeted production and fitness traits into different production systems in response to growing market demands for meat and Tabaski (Eid) sheep, in addition to improving the uptake and sustainability of conventional sheep and goat straight breeding and crossbreeding programs. With respect to dairying in Tanzania, we agree that the summary of researchable constraints provided in Tables 4.15 and 4.16 is insufficient. It does not reflect adequately the extensive detail provided in the text on pages 172-174 preceding those tables and which should answer the reviewers' concerns.

The ISPC questions the **potential for upgrading the smallholder pig value chain in Uganda** given the lack of incentives in the very low-input systems found there. While the majority of pig-keeping households appear to practice such low-input free-range or tethering systems, preliminary joint scoping missions and a stakeholder consultation by ILRI and CIAT held on 14 June 2011 have confirmed an emerging set of semi-commercial systems in both rural and peri-urban areas responding to the rapidly growing--and as of yet unsatisfied--local and urban demand for pork. A few medium-scale industrial farms have also been established in recent years, but reportedly face difficulties competing successfully. The stakeholder consultation endorsed the clear opportunities that exist for quick gains in improving productivity and efficiency in these semi-commercial production systems and associated market chains.

We appreciate the continuing concern about the **absence of poultry from among the selected value chains**. The review highlights the need to address poor competitiveness of commercial poultry in Africa, drawing from experience in Asia. As noted in the box on page 16 of the CRP3.7 proposal, we will certainly be continuing to evaluate poultry as a candidate value chain. As of now, however, the objective of increasing the supply of poultry products appears to be best addressed through continued reliance on industrial systems using private-sector technologies to optimize economies of scale and conform to biosecurity requirements (also now important in light of the recent avian influenza outbreaks) (FAO 2009 State of Food and Agriculture Report). The issue is not whether poultry systems are in many cases important for the rural poor, but rather whether significant knowledge gaps requiring research exist, or whether working development models are inadequate. Only where commercial industrial systems suffer a clear fundamental comparative disadvantage and the private sector does not offer an intermediate solution, could CRP3.7 possibly explore strengthening the role of smallholder and informal value chains. Having said that, in the area of feed supply the CRP will actively look for synergies between poultry, pigs and fish production where there may be opportunities to capture economies of scale in production of quality alternative feeds for multiple species.

Monitoring performance of value chain research and evolution of value chain selections

The ISPC review is correct in pointing out the lack of clarity about how evaluation of research progress will be used to reorient priorities as the program and its context evolve. Detailed development of criteria for evaluating progress in specific value chains will be carried out during the CRP Operational Plan development, building on the existing set of selection criteria outlined in the CPR proposal. A limited number of simple and clear indicators will be developed around each of the criteria covering research performance, outcomes, impact, sustainability, and scalability/contribution to IPGs, and will be incorporated into the M&E process (Component 3.3).

CRP component 3.1 'Spatial, systems and household analysis and targeting' will generate the information and horizon-scanning at various scales (global, regional, national, value chain) as the basis for evaluating and regularly updating the trajectories for selected and candidate value chains so that program priorities target those with the highest potential for future impact and out-scaling. We will add these as explicit research questions under Component 3.1. The Program Planning and Management Committee will be responsible for evaluating findings emerging from these activities under Component 3.1, and comparing them with the lessons being learned under the M&E component (Component 3.3) to decide if and when reorientation of value chain priorities is appropriate.

The ISPC has also commented appropriately on the risks inherent in driving value chain innovations of "slipping into direct development work" and echoed in the WB comments on the need to generate IPGs. We recognize this risk and the CRP has clear strategies for managing it. The first relies on close collaboration with major development partners (particularly NGOs and governmental development agencies). These partners will be expected to lead the actual development activities that will provide the main action learning platform for the CRP for understanding and updating technology and strategy performance, outcomes and impact, as processes for scaling up. This approach mirrors some existing projects in which the CRP Centers are currently involved, including the East African Dairy Development Project, PROGEBE, imGoats, C-FISH project, etc., in which development partners play the lead roles in implementation of development activities. These experiences have honed our understanding of and the approaches to the types of roles that international research centers can play in development projects, including targeting for impact, baselines, M&E, analysis of innovation processes, impact assessment, and importantly, strategic learning that essentially represent a critical mass of research on how translate local value chain experience into IPGs.

Further, the potential for seemingly local value chain innovations to generate significant IPGs should not be underestimated. The work by ILRI with partners in Kenya to develop an innovative training and certification program for upgrading informal milk markets has not only generated impacts in Kenya (estimated gains of over $30M annually – Kaitibie et al., 2008), but is now being adapted and tested in India in similar circumstances, in the largest milk market in the world and one of the largest (by value) domestic food markets of any kind in developing countries. Our view is that the application of relevant learning tools in locally-oriented piloting of interventions and innovations will always create good opportunities for strategic lesson generation and IPGs.

5. Funding and governance

We acknowledge and accept comments by the ISPC and the FC members to the effect that there are shortcomings in the description of the resource mobilization strategy in the CRP, as well as lack of clarity in some respects as to functions and relationships within the governance and management structure. A clear resource management strategy has not been detailed and will be an important part of the operational planning process. Given the need to establish the value chain learning

platforms, **the priority will be to first secure resources to develop those value chains currently most in need** of launch resources, and then to find additional resources for the technology and cross cutting platforms, the latter process then having the advantage of being able to point to the clear opportunity of demonstrating relevance and grounded learning through the value chain platforms already resourced. Indeed the process of prioritizing the value chains targets by greatest need for resources to be launched has already begun. The CRP partner consultation process identified dairy in Tanzania, pigs and fish in Uganda, and small ruminants in Mali as being the value chains currently in most need of resources to be properly established. Significant resource mobilization addressing these have already begun and been fruitful, so for example nearly $2M in new resources is expected in the next few months specifically addressing core production technology and risk issues in Ugandan smallholder pig systems and in aquaculture value chains, the former involving both ILRI and CIAT, the latter WorldFish, and built solidly around the CRP framework. More broadly, all new resource mobilization efforts are now being challenged to support the priorities of this CRP as well as others the partners are committed to. Operationally, once management structures are in place, the Development Manager is expected to play a lead role in resource mobilization, jointly with development partners, for the value chains, while the scientific leaders of the learning platforms will take the lead for their areas of research.

We welcome the recognition by the ISCP of the **potential need for greater resources than we could initially request** under the ground rules provided to us, and look for FC member support in that regard.

During the operation planning, details will be developed on make-up and criteria for selection of members of the Science and Partnership Advisory Committee, and procedure and criteria for operating and targeting the competitive grant scheme, drawing from existing successful models.

Additional specific comments that we accept and will address during the operational planning:

- Re-consideration of the priorities for forages and feed research in order to focus on those most applicable to the value chains.

- Global, strategic analysis of trends in markets and production systems (to be addressed in component 3.1 and through collaboration with CRP2)

- The multifunctionality of livestock and its asset value.

- Targets for outcome and impacts in each value chain.

- Specifying the sequence of research proposed over time and the timeframes for addressing major specific research problems within the overall CRP agenda. (Note that there was confusion about there being major interventions planned in only 3 value chains during the initial 5-year planning period; in fact, this should be interpreted as 3 interventions initiated in each year of Years 2-4, for a total of nine value chains.)

Specific FC comments

In addition to the ISPC review, FC members have contributed several comments.

We welcome the vote of confidence voiced by Australia. They also raise the following issues that highlight challenges faced by CRP3.7.

Value chain development benefits will be captured by 'middle people' rather than poor consumers and producers. Many of the value chains targeted by CRP 3.7 involve short market channels operating largely within the informal sector and so create employment and income for significant numbers of low-income actors. The large numbers of raw milk vendors who distribute supplies locally by bicycle in Kenya are a case in point. Further, the analysis by Kaitibie et al. (2008) showed that gains through improved performance by small traders were actually accrued among farmers and consumers through more favorable prices, rather than among the traders themselves. That said, we will certainly not exclude the possibility of creating business opportunities for commercial enterprises to support strategically pro-poor development and thereby deepen sustainability of the system.

Is CRP3.7 simply an agri-business consultancy. This issue is partly addressed already in the response to the ISPC concern about 'slipping into direct development work', i.e., how CRP3.7 positions itself as the research partner to development actors. Importantly, though, as noted later in the Australian comments, the work in selected value chains is in fact designed to generate key IPG research outputs in the form of new value chain tools and new approaches to value chain innovation. The apparently 'overly ambitious' culture of continuous learning and communication noted by the reviewer also reflects our concern to ensure that the emphasis of CRP3.7 remains appropriately on research.

Governance is top-heavy. As evidenced by the low budget allocation, we have kept the governance structure to a minimum consistent with the Consortium guidelines. There is an error on p. 71 in the proposal which still mentions a Program Governance Committee that had been proposed in earlier versions, but which should no longer appear in this final version, as reflected in the organogram.

CRP3.7 should hasten slowly. In several of the selected value chains, the CGIAR Centers already have considerable experience and strong partnerships with both research and development partners, and so feel confident that our concerted effort can stimulate major interventions even as we refine the research priorities. In others, especially for pigs and fish in Uganda, the benefit of focusing our collective efforts is expected to generate momentum much more quickly than under the conventional approach. With support from the EC and IFAD, for example, ILRI and CIAT are already engaging with partners in Uganda to pilot and evaluate initial best-bet interventions for upgrading smallholder pig systems to prioritize our research efforts while generating the evidence needed to stimulate investment in larger-scale development interventions by Year 4. We are testing the hypothesis that such a program can be ambitious but achievable when efforts are focused in this manner.

We agree with FAO's concern about strengthening **links with development partners** and it was certainly our intention by highlighting in particular the expected role of FAO as a 'strategic program partner' participating actively in the CRP research program, helping to guide it, and leveraging or scaling out the outcomes as described in the partnership strategy (p. 74).

In relation particularly to fish, we acknowledge FAO's wide ranging program of work on fish production in Africa: SPADA, ANAF and TIVO (the latter an FAO-WorldFish project). It is envisaged that the fish components of CRP3.7, including the value chain work in Uganda and Egypt and the technology platforms, will seek to involve the FAO wherever there is opportunity and where we can draw on the organization's specific strengths. Already since the CRP3.7 proposal was submitted we have successfully worked together to secure EC funding to evaluate the contribution of aquaculture to reducing poverty and hunger in Uganda, one of six developing countries in which the study will be conducted. A research proposal made to ASARECA to look at public-private sector partnership to enhance the productivity and competitiveness of aquaculture in the ECA region explicitly mentions liaising with the FAO in terms of improving aquatic biosafety and biosecurity in the region. We very much agree with the FAO's viewpoint that '..**fish farming as a business is not for the poorest of the poor**': indeed, we have co-authored a high profile paper on this topic with the FAO (Brummett et al. 2008; see also Beveridge et al. 2010, Dey et al. 2010, Brummett and Jamu 2011). The FAO take issue with our statement about the '.. **unknown but likely undesirable consequences**' arising from escaped fish breeding with wild populations. Our work in genetics adopts a precautionary approach and is in line with the FAO's own position as set out in their Technical Guidelines (FAO 2008). We agree in part with the FAO's assertion that the central feed issue right now is about '.. **how to lower costs'**. However, we believe the issue to be wider than this, as elaborated in the specific fish value chains we will consider and in the technology platform research priorities. They also set out to address environmental concerns, concerns about aquaculture competing for feed material with poor consumers, and food safety issues (e.g. aflatoxins). Finally, the FAO raises the issue of why Uganda, saying that there are distinct **'.. bio-diversity, bio-conservation, bio-safety and bio-security**' risk issues. We agree, but believe that the risks are no greater here than in the other countries in the region that were considered as options for this value chain (Nigeria, Ghana). Indeed, the question was raised why Ghana was not chosen. There has been a long-term program of genetic improvement of Nile tilapia (the 'Akosombo' strain) implemented by the Water Research Center (Ghana), WorldFish, and, more recently, the FAO. The choice of sub-Saharan country was admittedly difficult but for reasons laid out in the proposal, Uganda was ultimately chosen. We are also continuing to support the program of genetic improvement in Ghana on the basis of the contributions it is making to the genetics technology platform.

WB's strong endorsement of the CRP3.7 proposal is very much appreciated. Several of their concerns are being addressed in other sections of this response (program management structure, environmental trade-offs, resource mobilization, ensuring global public goods, detailed outcome indicators), while others were addressed in the response to earlier Consortium Office comments (balance between upstream and downstream).

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Annex: Note on animal research across the CRPs

In the overall CGIAR portfolio, most animal investment (approximately 70%) has gone into supporting poor people along value chains and in agricultural systems. Within agricultural systems, the multi-functional role of livestock combines with other agricultural inputs in supporting greater benefits from more productive mixed agricultural systems. WorldFish leads the CRP1.3 on coastal and aquatic systems, which focuses on how to address the interlinked issues of income and asset poverty, marginalization and vulnerability. It adopts a gender-centric perspective, which it sees as central to effectively addressing the problems of the poor and vulnerable in aquatic agriculture systems. Important research roles for livestock have been included in the CRPs on drylands (1.1) and humid tropics (1.2). In CRP1.1, the focus of livestock research is on options for increasing resilience and reducing vulnerability of people, animals and the environment, and sustainable intensification in drylands. In CRP1.2, the focus is on the role of livestock in sustainable intensification of smallholder farming systems. Tropical feed and forage production in CRP1.2 does not only affect livestock production directly but also indirectly sustainable crop production via maintaining soil fertility and resource use efficiency. In response to the booming demand for animal products in developing countries and the need to ensure accessibility by the poor, a major focus has also been placed on value chains for animal products (CRP3.7). This research focuses on system level outputs for food security and poverty alleviation, by linking the poor, as producers, input suppliers and actors along production and marketing chains. Given the high nutritional value of animal products, there is also an important component on animal products in enhancing nutrition in value chains (close collaboration between CRP3.7 and CRP4). Two important interfaces between crop and animal research across the CRPs will be in the tradeoffs for plant biomass use in agricultural systems (feed, biofuels, conservation agriculture) and in feeds research between CRP3.7 and the different crop production CRPs (wheat, maize, rice, roots and tubers, dryland cereals and legumes).

While there are enormous positive benefits from animal agriculture in developing countries, there are also health risks and negative environmental consequences that need to be managed (approximately 30% of CGIAR investments in livestock research). Animal agriculture research features strongly in CRP4 in the components of agriculture-associated diseases by looking at food safety, zoonotic diseases and health risks in agro-ecosystems. Research focusing on sustainable animal agriculture features in the agricultural systems CRPs (1.1, 1.2 and 1.3), as well as in CRP5 focusing on water, land and ecosystem management and in CRP7 on adaptation and mitigation of climate change. In CRP7, animal agriculture research focuses on the role of animals in helping people adapt to climate change as well as mitigating the contributions of animal agriculture to climate change. As feed production through planted forages, crop residues and crop by-products is the major agricultural land use on about 70% of agricultural land, capturing the potential of tropical forages and improved crop-livestock systems to reduce greenhouse gas emissions and sequester carbon is a major climate mitigation strategy.

Annex Table 1. Contribution of animal agriculture in proposed CGIAR Research Programs (as of June 2011)

Consortium research program (abbreviated title)	**Animal Agriculture – role and contributions in different CRPs**
Agricultural Systems for the Poor and Vulnerable	
1.1 Drylands	Livestock feature in all components, contributing to strategies for enhancing resilience in very dry areas and increasing productivity and improving livelihoods in integrated crop-livestock systems in semi-arid area and in assessing tradeoffs in biomass use.
1.2 Humid Tropics	Livestock feature in increasing productivity and improving livelihoods in integrated crop-livestock systems in sub-humid and humid systems and in assessing tradeoffs in biomass use. CIAT is contributing with improved forages to enhance eco-efficiency of crop-livestock systems, realizing social, economic and environmental benefits.
1.3 Coastal and aquatic	World Fish leads this CRP, which focuses on aquatic agriculture systems. Non-crop opportunities, including not only animal agriculture but also off-farm opportunities, are especially important. It is impossible, however, to tease out specific animal agriculture components, which will be very much location-specific.
2. Policies, institutions and markets	Small contributions from ILRI in all 3 research components to ensure coordination with animal research in other CRPs
Enhancing Food Security through Staple Foods	
3.7 Livestock and fish	Focus is value chain improvement in specific animal value chains Technology platform (feeds and forages, breeds, health). ILRI is the Lead Center with contributions from World Fish towards genetics and disease, ICARDA in small ruminant systems, and CIAT on feeds and forages. Links on feeds with other crop production CRPs will be further developed building on previous work from the System-wide livestock program.
4. Agriculture for improved nutrition and health	Strong links between CRP3.7 value chains and CRP4 component of enhancing nutrition in value chains. ILRI leads the component on agriculture-associated diseases and links to nutritional improvements in value chains.
5. Water, land and ecosystems	Livestock-water research in rainfed and pastoral systems research, primarily in the Nile and Volta Basins. Role for animal genetic resources needs to be determined (either CRP5 or CRP3.7).
7. Climate change, agriculture and food security	ILRI conducts research in all 4 components looking at livestock's role in adaptation and mitigation. In addition, ILRI coordinates activities under aprt of 'Integration for Decision Making ' (component 4) and for the eastern Africa region. CIAT contributes mainly in assessing the climate change mitigation potential of improved tropical forages, in addition to identifying forage options that adapt to climate change.