## List of specific PhD Research Topics/Areas for 2011 ILRI DAAD Fellows

| Project Ref Number | Research program/title for which application is invited | Possible project location |
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| **Research area:** Investigating the potential for climate change mitigation through management of carbon fluxes in African rangelands | | |
| 1 | Studying the possibilities among pastoralists for mitigating climate through sequestration and avoidance of emissions of carbon in the in the Borana rangelands of southern Ethiopia (see Annex No 1). | Addis Ababa, Ethiopia |
| 2 | Studying the impact of current and alternative land use on the carbon cycle and assess the potential of carbon based climate change mitigation for livelihood diversification in Burkina Faso (see Annex No 2). | Nairobi, Kenya |
| **Research area:** Exploring the intersection of feed quality of key crops in collaboration with national and international research and seed sector partners | | |
| 3 | Exploring farmer preferences for cultivar types, demand domains for improved dual purpose cultivars, exploitable variations in dual purpose food-feed traits, the mode of gene action on inheritance of fodder traits, and identification of appropriate breeding approaches for further genetic enhancement (see Annex No 3). | Addis Ababa, Ethiopia |
| **Research area:** Strengthening sustainably the genetic characteristics of endemic livestock, increasing its productivity and marketing in an enabling physical and institutional environment. | | |
| 4 | Exploring the implementation of breeding programs within smallholder livestock production systems. Specifically, optimizing the structure of 3-tier breeding programs using impact modeling software which incorporate gene-flow (see Annex No 4). | Nairobi, Kenya |
| **Research area:** Understanding of the role of livestock in livelihoods of the poor, especially poor women. Increasing knowledge about where and how livestock R4D can reduce poverty and empower women. Developing more systematic and innovative measurement, analysis, and communication of research outcomes and impacts | | |
| 5 | Conduct an ex-post economic evaluation of alternative interventions involving technical and institutional innovations in small holder dairy systems in Uganda. This will include supporting a household survey and analyzing changes since the baseline in variables such as milk production, dairy income and assets among participants and non participants (see Annex No 5). | Kampala, Uganda |
| **Research area:** Development of genomics resources for biotechnology improvement of an African orphan cereal crop Tef (Erogratis tef) | | |
| 6 | Developing of transcriptome data and conducting its analysis focusing on the two major traits: yield and nutrition (see Annex No | Nairobi, Kenya |

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| **Research area:** The Markets' opportunity research spans the livestock supply chain from production, procurement, distribution, processing to sale in national, regional and world export markets. The team works to provide appropriate technical, policy and institutional options that will enable the poor, especially women and other marginalized groups, to participate more effectively in remunerative livestock markets | | |
| 7 | A network-based design for Business Development Services as a pro-poor livestock market development instrument | Urban locations in Uganda and Tanzania |
| 8 | Identification of factors affecting value of export beef carcases in Botswana | Botswana |
| 9 | Comparison of empirical measures of performance in selected African livestock value chains | Uganda (pigs); Tanzania (dairy); Ethiopia or Mali (small ruminants) |
| 10 | A One-Health approach to assessing the risks to human and animal health from animal source foods. | Uganda (pigs); Tanzania (dairy); Ethiopia or Mali (small ruminants) |
| 11 | Epidemiology of cysticercosis in Uganda / brucellosis in Ethiopia / hydatid disease in sheep in Ethiopia/ (3 separate topics) | Uganda (pigs); Ethiopia |
| 12 | Evaluation of innovations for improving food safety in animal source value chains – pork supply chains in Uganda | Uganda |
| 13 | Assessing animal health constraints to pro-poor development of livestock value chains: an application of epidemiological and livelihoods analysis | Uganda (pigs); Tanzania (dairy); Ethiopia or Mali (small ruminants) |
| 14 | Competitiveness of Small Ruminant Value Chains in the Ethiopian Highlands: Implications for Organization and Coordination of Chain actors | Ethiopia |
| 15 | Identifying determinants of uptake of improved livestock production technology and impacts on productivity and household welfare | Uganda (pigs); Tanzania (dairy); Ethiopia or Mali (small ruminants) |
| 16 | Analysis of the effect of consumption-pull factors in the development of milk sheds in Ethiopia: Implications for enhancing commercialization of smallholder dairy (see Annex No 7) | Ethiopia |
| 17 | Improving household income through commercialization of the butter system in Ethiopia: role of collective action, private sector and public services (see Annex No 8) | Ethiopia |

## Annex – details on some of the research areas/topics

1. **PhD in Ethiopia**:

**ILRI Project**: ILRI is implementing a BMZ funded project that aims to investigate the potential for climate change mitigation through management of carbon fluxes in African rangelands, comparing sites in Burkina Faso and Ethiopia. For the research in Ethiopia ILRI and its partner institute Hawassa University are seeking proposals to study the possibilities among pastoralists for mitigating climate through sequestration and avoidance of emissions of carbon.
**Description**: The proposed research will be carried out in the Borana rangelands of southern Ethiopia, once one of the best grazing lands in East Africa, but in a degraded state at present. This degradation is one of the major reasons that rangelands hold a potential for carbon sequestration, because soil carbon levels are likely to be below saturation level making this region particularly interesting to consider in this context. The PhD study will aim to understand the impact of traditional and alternative land uses on the carbon cycle and assess their potential for livelihood diversification. The research will make use of existing grazing exclosures and fire experiments in the southern Borana plateau to investigate the effects on the carbon cycle of traditional rangeland resource management, including wood and charcoal off-take, and the role of fire and other bush control methods in range management. An important component of the research is to explore, through action research with pastoral communities, the options for alternative range management, and assess options for combining income from livestock with revenue from carbon management.

2. **PhD in Burkina Faso**:

**ILRI Project:** ILRI is implementing a BMZ funded project that aims to investigate the potential for climate change mitigation through management of carbon fluxes in African rangelands, comparing sites in Burkina Faso and Ethiopia. For the research in Burkina Faso ILRI and its partner institute INERA are seeking proposals to study the possibilities among pastoralists for mitigating climate through sequestration and avoidance of emissions of carbon.
**Description**: The proposed research will be carried out in the Northern Soudan zone of Burkina Faso, where pastoral herdsmen compete increasingly for grazing resources with sedentary agriculture. Current land management is thought to be leading to depletion of above and below ground carbon stocks. This degradation is one of the major reasons while rangelands hold potential for carbon sequestration, as soil carbon levels are likely to be below saturation level. The PhD study will aim to understand the impact of current and alternative land use on the carbon cycle and assess the potential of carbon based climate change mitigation for livelihood diversification. The research, which will be executed with INERA, will make use of existing grazing exclosures and fire experiments in Burkina Faso to investigate the effects on the carbon cycle of current livestock and rangeland resource management, including wood and charcoal off-take, and the role of fire and other bush control methods. An important component of the research is to explore, through action research with pastoral communities, the options for alternative range management, and assess options for combining income from livestock with revenue from carbon management.

3. **PhD in East/Southern Africa (most likely based in Ethiopia)**

**ILRI project:** The proposed work relates to ILRI's work on food-feed crops for East and Southern Africa, where we anticipate new funding to explore the intersection of feed quality of key crops in collaboration with national and international research and seed sector partners including other CG centres such as CIMMYT and ICRISAT.
**Description:** Stover from maize and sorghum are becoming increasingly important as dual-purpose crops that provide not only food for humans but also crucial fodder resources for the livestock. Drivers of these demands include increasing population and demand for livestock products accompanied by decreasing water availability. Our hypothesis is that quantity and fodder quality of stover can be improved through multidimensional crop improvement strategies where grain **and** stover traits are concomitantly enhanced. The PhD research will focus at the interface of livestock nutrition and crop improvement and will explore: 1) farmer preferences for cultivar types in mixed small holder crop livestock systems, 2) demand domains for improved dual purpose cultivars, 3) exploitable variations in dual purpose food-feed traits in existing germplasm including possible trade-offs between grain and fodder traits, 3) mode of gene action on inheritance of fodder traits; 4) identification of appropriate breeding approaches for further genetic enhancement towards dual purpose traits.

4. **PhD – Analyzing breeding systems of 4 West Africa Countries**

**ILRI Project:** ILRI is a partner to a project termed the "Sustainable Management of Globally Significant Endemic Ruminant Livestock in West Africa (PROGEBE, see http://www.progebe.net/)", which is largely funded by the African Development Bank and Global Environmental Fund. This project was initiated with the aim of improving the livelihoods of cattle, sheep and goat keepers of 4 West African countries (The Gambia, Mali, Senegal, and Guinea) through a range of livestock related interventions. One of the interventions under consideration is within-breed improvement programs.
**Description:** The proposed PhD is within the field of animal breeding / quantitative genetics and would explore a number of issues around the implementation of breeding programs within smallholder livestock production systems, in relation to the project described above. Specific areas of research include (but are not limited to): optimizing the structure of 3-tier (nucleus/ multiplier/ commercial) breeding programs within small-holder systems using impact modeling software incorporating gene-flow; quantifying the expected impacts of breeding activities to smallholders in terms of income and livelihood benefits; and assessing the cost / benefit of implementing breeding programs in comparison to alternate interventions (such as improved health-care or feed). As a starting point the research would make use of baseline survey data already collected in each of the four project countries and which characterizes the livestock production systems. The candidate would be based at the ILRI headquarters in Nairobi, Kenya, working within the animal-breeding team but also interacting with ILRI scientists from other disciplines (economists, poverty experts etc.). It is also expected that the candidate would spend time with project partners at field sites within the West African countries.

5. **PhD in Uganda**:

An ex-post economic evaluation of alternative interventions involving technical and institutional innovations in small holder dairy systems in Uganda. The student would support the collection of a the second round of a household survey and conduct the analysis by comparing changes since the baseline in variables such as milk production, dairy income and assets among participants and non participants. Impacts would be disaggregated by gender. The student should have a background in agricultural economics, development economics, or economics, with experience with data analysis and statistics, a good knowledge of agriculture (including livestock) and markets, and experience working in the field in Uganda.

6. **PhD in Biotech related area**

**Project title:** Development of genomics resources for biotechnology improvement of an African orphan cereal crop Tef (Erogratis tef).
The BecA Hub at ILRI has developed a Tef genomics component as part of the genomics-based Tef improvement program. The Tef improvement program is a collaborative program funded by the Syngenta Foundation for Sustainable Agriculture. Key collaborators are the University of Bern, the Ethiopian Institute for Agricultural Research (EIAR), the BecA Hub at ILRI and Cornell University. The overall aim of the program is to develop genomics resources and use them to identify markers for Tef improvement.
**Description**: Boosting agricultural productivity remains critical in ensuring food security in Africa. In addition to current efforts on increasing productivity of major staple crops such as maize, millet and sorghum there is a real need to focus research and development efforts on boosting the productivity of orphan crops as well. Orphan crops include and may not be limited to Tef, finger millet, Fonio and cowpea. Tef (Eragrostis tef) is grown on over 2.5 million hectares of land mainly in Ethiopia. The plant is tolerant to abiotic stresses especially to poorly drained soils in which other crops such as maize and wheat do not perform well and that will become even more important with global climate changes. In addition, the seeds of Tef produce healthy food because they do not contain gluten for which many people are allergic. There is however a need for a better understanding of the genetic control of agronomic traits for its improvement. Genomics data such as complete genome sequence and transcriptome can provide better resources for the development of tools for the improvement of Tef. Such improvement strategies should focus on developing markers for better breeding program focusing on yield, nutritional value and other important traits. We, therefore, propose to supplement the current genome sequencing effort with a comprehensive dataset of expressed gene for use in various activities. Furthermore we propose to engage tef breeders for training on genomics, data mining, leveraging genomics resources to accelerate of development of molecular markers for use in various tef breeding programs. The PhD fellow will focus on the development of transcriptome data and conduct its analysis focusing on the two major traits: yield and nutrition. It is anticipated that markers linked to this traits will be developed and used in collaboration with breeders to contribute to ongoing Tef breeding efforts.

7. **PhD in Market systems**

**Project title:** Analysis of the effect of consumption-pull factors in the development of milk sheds in Ethiopia: Implications for enhancing commercialization of smallholder dairy

**Description:** Dairy consumption research in Ethiopia is limited. This research is based on the premise that consumption pull is an important factor of the development of dairy value chains. If constraints at the consumption end (such as processing/value addition, food safety, distribution, and marketing) are alleviated the effect of consumption pull will be stronger and help trigger supply response through galvanizing input supply and services provision to the dairy sector. The input supply/ and services provision are themselves derived demand. There are some experiences already in this regard in areas such as Eastern Shoa zone, Shashemene/Hawassa/Yirgalem milk shed, and other LIVES sites. The research will involve demand analysis, market analysis, and issues related to input supply and services provision.

8. **PhD in Market systems**

**Project title:** Improving household income through commercialization of the butter system in Ethiopia: role of collective action, private sector and public services

**Description:** The Ethiopian dairy system can be classified generally into the fluid milk system (around cities and towns) and the butter system (farther away from road infrastructure and urban population). It is expected that, with the development of infrastructure and further urbanization, farmers may not specialize in butter production in the future. However, butter as a source of income will remain important for some time until infrastructure expands into rural areas. This research will first do detailed characterization of the butter system in the LIVES project zones, conduct economic analysis related to scale and returns, estimate supply determinants, and analyze the input supply and service provision. The focus of the research will be to draw implications for the role of farmer collective action, involvement of the private sector in input supply and output marketing, and the role of the private sector in especially service provision.