

# LiFLoD concept paper prepared for the Global Agenda of Action in support of sustainable livestock development sector development 3<sup>rd</sup> Multi stakeholder meeting Nairobi 22-24 January 2013.

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# 1. The LiFLoD network: context and connection to the GAA

## 1.1 About the LiFLoD network

The Livestock Farming and Local Development (LiFLoD) network seeks to contribute to the current debates and issues in livestock farming and enrich them by underlining the contribution of livestock farming to sustainable development. Specifically, the network believes that livestock farming enhances the integration and interaction of the economic, social and environmental dimensions of sustainable development at the local level.

Livestock farming is a complex socio-ecological system that relies on the feedback between farmer behaviour, the farm's natural resources and its biological systems to generate a range of outputs necessary for human well-being (food, income, lifestyle, etc.), household security (savings), ecosystem integrity (water quality, soil integrity, etc.) and local economy (short chains, employment). Livestock farming is intricately linked to spatial dimensions, due to the heterogeneity of grassland ecosystems and the mobility of animals that in some conditions traverse large areas including transhumance and nomadism. Livestock farming leaves a cultural imprint in areas where it is present as well as in those where it was. The territorial level therefore seems like a relevant entry point to reflect upon the future of livestock farming because this is the level at which the choices made by societies play a role in the organization and transformation of local areas. It is thus through the study of livestock grassland farming systems embedded in their local situations and influencing the past, present and future impacts, that are addressed questions such as the relations between livestock farming and local organisation, land, areas, other activities, ecological processes, resources, people and societies etc.

The main objective of LiFLoD is to generate knowledge and methods to better understand the interactions between livestock farming and territories to guide policy and practice. By exploring a diversity of situations, LiFLoD deals with coupled and dynamic social and ecological systems where relationship and interactions defy "silver bullet" solutions. LiFLoD is developing an analysis framework of the various types of interactions occurring between livestock and territories in a diversity of situations to construct a body of knowledge in a comparative manner and to:

- Guide the design of systems through the identification of characteristics of success
- Inform policy of where the key points of influence sit in a system, i.e. the levers (a lever is where a small shift in one thing can produce big changes in everything)
- Demonstrate the value that livestock systems contribute to local development to encourage investment at the local and global scale
- Identify relationships, behaviour and structure that are required to enable progress towards desired community outcomes

- Inform practice change, based on knowledge of what motivates attitudes and behaviours of individuals, institutions and communities
- Develop a comparative analysis framework to produce either a generic contribution to the Global Agenda of Action or an understanding of the irreducible diversity of links between livestock, grasslands and territories that have to be considered when debating the future of livestock.

Diverse functions of livestock farming and their contribution to the environmental, social and economic aspects of the territory will be factored into the analysis. This should complement and allow for revisiting those analysis frameworks that are currently developed, allowing the simultaneous consideration of other factors such as the impact on greenhouse gas of the production of food, and market trends at the global level.

Within the analysis framework, LiFLoD is also developing specific indicators to enable diagnosis of the current situation, the exploration of scenarios, the design of goals and the monitoring of progress.

In the discussion and development of indicators, LiFLoD takes into consideration the importance of generic indicators for comparative purposes while at the same time respecting the importance of the local relevance of each indicator. System approaches are of major interest to enable the integration of diverse context specific perspectives, including technical as well as social, economic and ecological. Respecting and utilising the expertise of research groups and their associated partners from diverse areas is also a pillar of the network principles of action.

## **1.2 Main beneficiaries and outputs of LiFLoD's work**

The recommendations that emanate from LiFLoD's work are relevant to a wide range of stakeholders including: organisations in charge of facilitating transformations in livestock farming and agricultural development, advisory bodies, local government, decision makers in charge of developing and implementing public policies concerning livestock farming and local development, and stakeholders (farmers and other actors) involved in the design and implementation of local sustainable development projects

The expected outputs are:

- Scientific notes, reports and references that record analysis, interpretation and recommendations
- Creation of environments to stimulate and facilitate collective learning, extend knowledge to a wide range of stakeholders and build capacity
- Principles for use in designing agricultural innovation systems to enable practice change
- Assessment tools from local to international scale

- Provision of case study pilot sites, comparative analysis and opportunities to share lessons with global partners
- Contribution to the debate on future trajectories and scenarios of livestock farming systems through participation in international assessments and foresight projects and provision of useful insights.

### 1.3 The LiFLoD connection to the Global Agenda of Action (GAA)

Within the three topics of the GAA, respectively (1) Closing the efficiency gap, (2) Restoring value to grazing land and (3) Reduced discharge, the LiFLoD network's focus is on theme 2; however many of the means of addressing this theme have co benefits directly related to theme 1.

The specificity of the approach is:

- To emphasise local actors and authority's points of view on farming and grasslands particularly how they embed all the services provided by livestock farming into their sustainable territorial development schemes,
- To develop systemic approaches and participative methodologies in order to promote innovations systems that enhance the contribution of livestock to development considering notably food, environment, social and economy at the local level.

### 1.4 What value can LiFLoD contribute to GAA?

Through its network of pilot sites LiFLoD can provide novel studies, expertise from a variety of research and stakeholder participants, the potential to act as a platform to form regional hubs and provide participants to focus groups related to both theme 1 and 2. Specifically the LiFLoD network can contribute to the following functions identified by the GAA:

**Multi stakeholder Debate:** With assistance from the LiFLoD network, the GAA can be connected to an international diversity of rural strategies, socio – ecological contexts, a variety of farm adaptations and of stakeholder points of view on local life and sustainable development issues dependent on the success of grassland based livestock system.

**Strategic Sector Guidance:** Globally sectors are struggling with how to achieve change at the individual and community level. LiFLoD participants are global leaders in agricultural innovation systems and they are strongly connected to sector leaders who are currently designing fresh approaches to knowledge transfer among all stakeholders. This offers a unique opportunity for the GAA to engage and utilize the lessons from these cases to inform practice change. In addition the multi-scale projects of the LiFLoD network allow a better knowledge and understanding of the local impacts of global changes on grassland and livestock farming systems, within a wide diversity of situations and contexts to inform trajectories of the future. The integrated systems

approach adopted by the LiFLoD network can guide design of holistic solutions that minimize negative unintended consequences. Participants in the network also have experience in undertaking foresight exercises and are involved in various foresight initiatives e.g. the “Forward Thinking Platform” as an open and international platform of exchanges between foresight specialists from different organizations around the world, including the FAO.

**Independent research and assessment:** LiFLoD provides a network of pilot sites from which principles and lessons concerning methodological issues can be drawn from . The comparative analysis of the several implemented projects allows a good transversal knowledge of key points to manage. LiFLoD can act as an integrator between theme 1 (resource efficiency) and theme 2 (valuing grazing lands) as these cases are being incorporated.

**Knowledge Management:** The LiFLoD network can also inform the GAA participants about designing and implementing agriculture innovation systems to enable adoption and practice change by all those actors involved in livestock farming.

#### 1.4.1 What value does the GAA bring to LIFLOD?

The connection to the GAA provides the LiFLoD network an opportunity to expose its questions to international debates and explore global lessons. Discussions and sharing of points of view on the lessons drawn from its work will enable an enriching of its analysis and reflections on its understanding of situations and main global questions. The provision of an access point to all global initiatives related to grassland livestock farming offers huge potentials for sharing of methods and ideas.

The GAA will also enable LiFLoD to debate responsibility and options for livestock farming development with multiple stakeholders.

## 2. LiFLoD's network of pilot sites

LiFLoD is built around a portfolio of grassland and rangeland pilot sites characterised by:

- their importance when considering the future of the territories
- a variety of livestock systems and local development problems, depending on the socio-ecological context, on the economic interaction with the global market, and on the projects of local stakeholders
- addressing a diversity of i) pressures on food, environment and on socioeconomics features, ii) of socio-ecological contexts and dynamics
- where research and local actors are already connected and engaged in collaborative arrangements to understand the present dynamics of farming and socio-ecological systems and to co design approaches for innovative futures for livestock within their territories

- a genuine agreement to inform practice change across the whole system

The network therefore provides the diversity required to undertake a global synthesis that is grounded in local territory activity that is driven by local stakeholders collaborating to design and implement future livestock farming systems and associated value chains. All of the activities are embedded within innovation systems of collective learning.

Six representations of grassland states to locate pilot sites are proposed (for details see Appendix 1):

- Intensive grasslands systems in temperate region: the example of New Zealand.
- Extensive grassland systems in temperate region : the example of Pampa, Uruguay
- Extensive system in tropical region : the example of Sahel
- Mediterranean rangeland systems: the examples of Egypt and France
- Mountainous systems ; the examples of Tibetan plateau, France and Vietnam
- Intensive tropical: Brazil

The following table is an outline of each of the pilot sites. For each one, an outline of the livestock and local development problem for the socio-ecological context is presented, and the actual pilot site with its supporting project is described.

<u>Pilot site</u>	<u>Main issue and global relevance</u>	<u>Local situation</u>	<u>Implemented actions</u>
<u>Intensive Grasslands</u>	Increasing intensification of land and the development of pathways to sustainable rural future	New Zealand: Doubling exports through production and added value within resource limits and a free market poses opportunities and challenges for grassland livestock farming. Increasing adoption and changing practice will be a key influence of success as will ensuring there exists a fully functioning agriculture innovation system. This demands interaction between all the actors in the system to enable change.	Two case studies on regional sustainable development underpinned by grassland farming.  Case study with regional policy on the use of ecosystem services from grassland farming in policy development  Case studies on application of agriculture innovation systems to grassland farming
<u>Extensive Grasslands</u>	Uncertainty for livestock breeders has been accentuated due to a free market and the opening of export markets at volatile prices. Two types of farming are emerging, capital intensive and family farms with land appropriation a key factor in both situations.	Pampa in Uruguay In the last ten years some 1 million hectares have been changed from pasture to soybean marginalising family farms unable to find the capital to convert land.	Knowledge Integration Project Cases that utilise interactive tools to explore the potential future pathways for local farmers.  A case in conjunction with New Zealand on increasing the resilience of family farms to market forces through design of grassland farm systems, value chains and the building of rural networks to develop and exchange knowledge between multiple participants in the value chain and rural community
<u>Tropical Extensive Rangelands</u>	Tensions on land tenure due to increasing demographic pressure and the absence of the recognition of land valuing are increasing. A growing urban demand for products offers an opportunity for households. Although moderate production per animal the extent of the rangelands and the number of cattle (4M) offer real production potentials	North Senegal The development of a local pastoral dairy sector to reduce imports and build up livestock farming and associated livelihood security	Case study will test: Policy options for incentives on local milk production; Feeding system improvement; Private Public Partnership approaches; An APESS workshop in Cameroon is planned for 2013.
<u>Tropical</u>	Pasture degradation is a result of poor	Amazonia	Case study Paragominas County

<u><i>Intensive Grasslands</i></u>	management related to socio-economic conditions of small farmers, their weak experience of the bioma and lack of technical support	Building sustainable alternatives to slash and burn agriculture	Test new practices to improve soil fertility Integrated livestock farming systems crops, trees and forage Development of supply chains  Building agriculture innovation systems
<u><i>Mediterranean Rangelands</i></u>	Rebuilding links and solidarities between pastoral areas in the upcountry and the urbanized shoreline	Southern France (OCDE context), Egypt (South context)	Designing adapted livestock farming systems to uncertain fragile environments and enhancing market opportunities for livestock products towards urban retailers and consumers
<u><i>Mountains Grasslands</i></u>	The relationship between pasture degradation and animal management is tied up with the socio-economic factors impacting on individual and collectives of farmers. Uncoupling the drivers from management is important and to do this there is a need to have a full comprehension on the social-economic and farming system relationships via the farmer as the decision maker.	Qilian mountains Tibetan Plateau Animal production follows a grazing pattern of alpine meadows in summer and valley floors close to habitation in winter. Pasture degradation continues.  Livradois Forez France Hill territories are in search of their proper sustainable development path, with self sufficiency and added values to local products  Vietnam A harsh combination of mountainous rangelands and of cultivated forages and byproducts coming from very intensive arable land	Assess performance of livestock systems Identify the link between pasture degradation and management Assess the efficacy of restoration processes  Assess the efficacy of collective action for local food development Self sufficiency as a guideline for the future. What farming systems transitions to achieve that goal?  Assess the efficacy of crops – rangeland – livestock systems and of the way they can be valued through recognised quality signs

### 3. Transdisciplinary approach: Researchers in active and interactive partnerships with stakeholders

A guiding principle of the LiFLoD network is to promote research in actively interacting with its partners: research questions are constructed with them; projects implementation and analysis and interpretation of results are done in partnership. So it is of great importance for us to identify the expectations of our partners, as it will orient our axes of analysis.

#### 3.1 Mobilization of the stakeholders' expectations

Within LiFLoD projects, several stakeholders are from various origins: national policy, regional council, local community, university, research institute, technical institute, agribusiness, and/or professional organization. Depending on the region and the project, stakeholders will differ as will their objectives. The following table lists the kinds of stakeholders involved in our projects and their expectations.

<b>Stakeholders</b>	<b>Their expectations</b>
<b>National policy</b>	Help communities to face and adapt to climate change; promote partnerships between industry and the government; improve local production and secure farming systems and act as a conduit of global drivers to national initiatives.
<b>Regional council</b>	Environmental preoccupation at territorial scale; support individual and collective initiatives; implement collaborative approach with multi stakeholders and promote sustainable regional development.
<b>Local community</b>	economic opportunities; adaptation and resilience of communities
<b>Research institute/University</b>	Improve research methods; support and organize research networks; improve the utilization of research results by farmers and build capability; help define the problem; support decision making in the innovation process and help co-construct new knowledge.
<b>Technical institute</b>	Identify sustainable technical options and build capacity
<b>Agribusiness</b>	Improve productivity with a low environmental footprint; improve resource efficiency; develop quality value chains; improve partnerships with farmers and ensure profitable, viable business propositions.
<b>Producers' organization</b>	Develop more sustainable, flexible and resilient farm systems; act as advocates for the common good of their stakeholders.
<b>Producer/Consumer relationship</b>	Develop a greater understanding of the dynamic of the producer decisions and the consumer wishes and where the costs and benefits lie and are valued.

## **4. Methodological themes to explore**

The following are the main themes emerging from our discussions with our partners concerning the way we should organize and structure our analysis:

- a. Multi stakeholder participation to identify rural futures based on valuing grassland farming systems, mixing local and scientific knowledge
- b. Multi scale and participative approach to define innovation systems, change practices, including social, technical and policy.
- c. Methods development for the analyses of complex problems dealing with livestock farming systems and local development.

### **4.1 Multi stakeholder participation to identify rural futures based on valuing grassland farming systems mixing local and scientific knowledge**

The focus of this theme is first to identify, describe and understand interactions between farming systems and territories by mixing local and scientific knowledge. The transversal analysis of the several projects (and pilot sites) resulting from shared experiences will allow the development of baselines concerning the value of grassland used by farming systems. To enable this activity we have developed a range of collaborative assessment tools, workshop processes and interactive models. Each pilot site will have a key focus described as follows:

- Identification of sustainable technologies (Sub-Saharan Africa)
- Identification of profitable use of limited resources by farming systems (New Zealand, Vietnam)
- Identification and characterisation of rangelands ecosystems services (Latin America, mountains (Tibet)
- Identification of desired practice change by farmers and what influence transitions (New Zealand, Livradois),
- The conception of a set of indicators to: find high social and environmental quality of grassland products; qualify “good” livestock systems (Latin America)
- Organization of multi-stakeholder platform to discuss pathways (Latin America, Sub-Saharan Africa, Mediterranean areas, Livradois)
- Conception of a shared point of view on the value of grassland (Sub-Saharan Africa)
- Collective action to promote local food systems and their interaction with farming practices (Livradois, Mediterranean areas)
- Identification of pathways to comfort co-evolution of livestock farming activities and local development of territories historically structured by pastoral activities (Mediterranean areas)

## **4.2 Multi scale and participative approach to define innovation systems, change practices, including social, technical and policy.**

The focus of this theme is to design, implement and test several innovative options with multi-scale integration and a participative approach. The diversity of contexts and situations analysed allow the design of specific innovative options depending on the context and on the stake-holders expectations.

More concretely this will concern:

- Design an integrative innovative value chain for pastoral milk production (Sub-Saharan Africa)
- Design agriculture innovation systems for grassland value chains and regional development (New Zealand, Livradois)
- Test an innovation platform and associated tools to enable strategic planning and collective learning about future farming systems and their relationship with rural development (New Zealand/Uruguay)
- Design and implement multi-scale and participative approaches to promote technical and institutional innovations: collective management of pastoral lands (grazing under forest) (Mountainous Asia, Livradois, Mediterranean areas)
- Design and implement policy options (Sub-Saharan Africa, Latin America, Tibet): for instance through the “Livestock production on natural grassland board” (Latin America)
- Implement and test the NTICs approach of our learning platform including educational videogames (Latin America)

## **4.3 Methods developed for the analyses of complex problems dealing with livestock farming systems and local development.**

The focus of this theme is to realize a transversal analysis of the several projects and to propose the lessons to be drawn from this in terms of methodological practices. Results from this part should be useful to help our partners (as the GAA members) in applying “good” methodological practices to deal with complex questions.

We will undertake the following:

- **The use of systems approaches to deal with complex problems:** trans-disciplinary approaches and how it helps provide solutions to complex problems, solutions for

balancing the trade-offs apparent in grassland farming when attempting to meet multiple objectives across multi stakeholders

- **The comparative analysis allowing transversal treatment of redundant questions:** use of a network of pilot site projects
- **The development of multi-criteria analysis framework** to propose an integrated assessment method for pastoral livestock system development
- **The way to integrate different policy and agribusiness signals into farming systems:** agent based model to explore the impact of multiple drivers on farmer decisions for use in exploring the impacts of drivers and informing strategic planning
- **The role of collective engagement and group learning** in addressing complex problems: the way to engage with multi-stake-holders effectively, lessons in collaborative partnership to assist with setting up pilot projects, the way to develop and implement trans disciplinary teams
- **The innovation systems to enable adoption** : identification of technologies and their fit within farm systems, innovation platform that consists of social processes and tools to explore impacts of drivers and identify adaptive management practice and policy, other decision support tools that can assist farmers to identify the trade-offs that occur when certain practices are implemented

#### **4.4 Concrete actions by project**

The following technical sheets identify the actions that are related to each of the pilot sites

**Technical Sheet for intensive grasslands systems in temperate regions New Zealand Pilot Site**

**Title: Rural Futures**

2012 – 2016

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**Main objective:**

The objective of this project is to develop a suite of tools and processes to enable multiple actors associated with livestock pastoral farming to explore the impact of pressures (market, policy and climate) operating simultaneously on the farm, value chain and region.

**Partners:**

**Agribusiness:** Rural professionals including farm consultants, vets, seed and fertiliser companies and other input providers, financial organizations

**Policy:** National and Regional policy planners

**Research institute/University:** AgResearch, New Zealand Institute of Economic Research, Otago University

**Financial support:**

**Research Projects:** AgResearch core capability funding, Ministry for the Environment

**Priority and sub-priority of the GAA concerned:** (within the “Restoring value to grassland” theme)

**Priority of action 1: Knowledge and methods**

Develop accounting systems to value grasslands (economic, environmental and social services) including the value of the associated value chains

**Priority of action 2: Pilot projects to find evidence-** testing the impact of policy and market pressures on farm system performance and resulting flow on effects to the local economy, environment, and social outcomes

Building adaptive capacity with players in the value chain to uncertainty and risk

Designing agriculture innovation systems to enhance adoption and practice change of actors influencing on farm and value chain performance and local development.

### **What will be tested?**

- Policy options (resource limits, trading of resources such as for Carbon, Nitrogen and water) for their impact on farm system behavior and outcomes
- Market options such as price signals for meat and milk and consumer preferences for environmental and animal ethic assurances
- Improved collaborative methodology to assess global impact on local development
- Innovation platform as a means to enable collective learning and build adaptive capability
- Agriculture innovation systems for enhancing adoption and practice change
- System processes for exploring consequences of multiple simultaneous pressures interacting at the farm system

### **Expected results**

- Rigorous policy development that takes into account a whole system perspective to minimize the impact of unintended negative consequences
- Discussion between agribusiness, farmers, policy planners to identify future farming systems that meet economic, environmental and social goals at the individual farm scale, the value chain and the local community.
- Multi-stakeholder platform to elaborate and accompany livestock system innovations
- Effective adoption and practice change developed through the use of agriculture innovation systems.

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**Technical Sheet for intensive grasslands systems in extensive temperate regions Uruguay  
Pilot Site**

**Title: Knowledge Integration Project II**

2011-2014

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**Main objective:**

To develop tools for analyzing the family farm systems dynamics, and join them in an unique integral framework that is a “Learning platform” taking advantage of the NTics, but also of Discussion Support Systems, such as different kind of analysis grids.

**Partners:**

Farmer’s organizations, National University, Government. Links to Mouve (French project) and Rural Futures (NZ project)

**Financial support:**

Uruguayan Government

**Research Projects:** AgResearch core capability funding, Ministry for the Environment, ANR Mouve (France)

**Priority and sub-priority of the GAA concerned:** (within the “Restoring value to grassland” theme)

**Priority of action 1: Knowledge and methods**

**Priority of action 2: Pilot projects to find evidence**

**What will be tested?**

Participatory farm monitoring. A subject is elected with the farmers, and periodical meetings with his neighbors are held to promote a shared vision and to integrate local empirical knowledge in the used frameworks and tools. These tools are related to the biophysical and economic system but also to the social system (the problem of succession) or ecological system (grassland state&transition models).

**Expected results**

- A set of decision support tools integrated in a “learning platform” that could aid farmer’s decision process and collective discussion.

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## Example of technical Sheet for Semi-arid Africa Pilot Site

### Title: Dairy market chain and sustainable local development in pastoral semi-arid areas of Africa

2012 – 2015?

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#### Main objective:

The objective of this project is to analyze and improve the positive impact of a pastoral dairy market chain on semi-arid rangeland valorization (resources management, production, employment...).

#### Partners:

**Agribusiness:** Medium Size Industrial Milk Factory (Laiterie du Berger), Danone foundation

**Technical institute:** GRET

**Professional organizations:** “Maison des Eleveurs”,...

**Research institute/University:** ISRA (Senegal), CIRAD (France), IFPRI.

**Financial support:** Private: Laiterie du Berger

Development projects: Danone Foundation, GRET, AFD

Research Projects: ANR “Mouve” (France); Animal Change (EU)

**Priority and sub-priority of the GAA concerned:** (within the “Restoring value to grassland” theme)

**Priority of action 1: Knowledge and methods-** Develop accounting systems to value grasslands (economic, environmental and social services) including the value of the associated value chains

**Priority of action 2: Pilot projects to find evidence-** Water access to facilitate mobility and reduce mobility where intensification is appropriate- PPP for risk management and development of resilient communities- Test integrated policy and incentive frameworks for value chain development

- Collective rights and its impact on restoring grasslands

### **What will be tested?**

- Policy options (taxes regulations, infrastructures,...) for economic incentive on local milk production
- Feeding system improvement in collaboration with private sugar company
- Improved collaborative methodology to assess global impact on local development
- Collaborative PPP platform to improve dairy chain performance and management

### **Expected results**

- Economic viability of the dairy factory, market and improved pastoralist livelihoods (improved milk delivery, relevant price incentives etc.)
- Discussion between platform and policy makers on animal products economic policies in semi-arid areas
- Intensification and sedentarisation of part of pastoral herds and families with secured access to services, forage feed and water resources
- Multi-stakeholder platform to elaborate and accompany livestock system innovations

Collective sustainable management of resources (rangelands, feed, crop

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**Technical Sheet: Sustainable alternatives for Mediterranean Livestock Farming Systems:  
From Rangeland to Irrigated Land**

**Title: CLIMED**

The future of Mediterranean Livestock Farming Systems:  
Opportunity and efficiency of Crop–Livestock Integration  
2013 – 2016

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**Main objective:**

The project aims to assess technical, economic and socio-ecological viability of crop/livestock systems in the Mediterranean context to help farmers, local communities, researchers and decision makers in thinking future planning for Mediterranean livestock and in designing priorities, rules, policies that could better deal with the socio-environmental issues in link with demographic and land pressure, increasing demand and strong international competition.

**Partners:**

**Agribusiness:** Rural professionals from the farmer to the consumer, develop agencies,

**Policy:** Local and regional policy planners

**Research institute/University:**

Egypt: ARC/Agricultural Research Center, DRC/Desert Research Center, Cairo University,  
Ain Shams University, Cirad & Icarda

Morocco: IAV Hassan II, ENA-Meknes, Cirad & Icarda

France: Inra, SupAgro, Cirad

**Financial support:** CLIMED = European Research Project

**Priority and sub-priority of the GAA concerned:** (within the “Restoring value to grassland” theme)

**Priority of action 1:** - Better understand and modeling the crop-livestock farming systems, especially the functions of livestock and its role in the reduction of vulnerability at family and community scales.

**Priority of action 2:-** Identify, modeling and test sustainable alternatives for crop-livestock farming systems, at farm and community scales, from the fork of the peasant to the fork of the consumer, and based on participatory methods, integrating local knowledge and scientific technologies.

- Define appropriated public policies in capacity building, financial supports, rural sector assessment and local coordination.

### **What will be tested?**

- New successions of crops and forages in the irrigated fields in the Nile delta and in the wadis
- New varieties of barley and adapted associations of cereals and legumes in the rain fed agriculture
- Integrated mixed systems based on fruit trees (olives and figs), barley and forages in the dry areas.
- New fertilization practices using local manure and urban residues
- Better valorization of by-products in animal feeding, at farm and local scales.
- Policy options for their impact on farm system behavior and outcomes, including subsidies programs for small holders and emerging collective initiatives
- Market options related to local farming products

### **Expected results**

- Strengthening of synergies and scientific collaborations between the partners given the interdisciplinary nature of it.
- Production of analysis methods (disciplinary, interdisciplinary and comparative analysis); shared on the national and international data bases in Mediterranean (national data bases, FAO, World Bank, IFAD). This joint of analysis methods could become a base for scientific network about livestock farming systems in Mediterranean.
- To present new science insights in more accessible and informative ways to stakeholders, especially to policymakers and producers.
- Without underestimating the risks due to livestock intensification (waste management, CO<sub>2</sub> or methane emission etc..), to explore capacities to adapt to the global changes and also to reduce the vulnerability by different pathways embedded with the multifunctional nature of livestock, both an economic activity and social and biological assets.
- Possible impacts on employment, on the creation of new activities in the studied zones depending on the results and on their integration in present and future political priorities to support some adapting and vulnerability reduction processes showed in the project.
- Better define sustainable pastoral and agropastoral systems, with associated scenarios, depend on legal systems implemented, including key factors in resilience (right of access to resources, land/ resource rights and environmental law).
- Involvement of local stakeholders in sustainable management through a local regulation based on a territory charter, connecting local representation to regional issues or national.

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## **Technical Sheet: Livestock Farming Systems in the Amazon Rainforest**

### **Title: DP - Amazonia**

Priority Collaborative Program

2011 – 2014

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### **Main objective:**

Building sustainable alternatives to slash and burn agriculture for small holders, including social initiatives and new public policies, using participatory approaches in Paragominas County, located in the Eastern Brazilian Amazon.

### **Partners:**

**Agribusiness:** small and large farmers, rural professionals, develop agencies,

**Policy:** Local and regional policy planners

**Research institute/University:** Embrapa Amazônia Oriental, Federal University of Pará, Emilio Goeldi Museum and Cirad

**Financial support:** Funds of the institutions. Research projects have been submitted to regional, national and international funds.

**Priority and sub-priority of the GAA concerned:** (within the “Restoring value to grassland” theme)

**Priority of action 1:** In the small farms of the Brazilian Amazon, the pasture degradation is a direct result of inadequate management of pastures leading to the reduction of soil fertility and the strong development of weeds. The inadequate management should be related to the socio-economic conditions of small farmers, their weak experience in the bioma and the lack of technical support. Better understand the practices and objectives of the small holders for their livestock farming systems, including their landownership strategy.

**Priority of action 2:** Based on participatory methods, build and develop sustainable practices of tree-crop-pasture management adapted to the small holders in the Amazon.

### **What will be tested?**

- New practices of crops and forages management adapted to small holders in the Amazon, especially focused on the improvement of soil fertility
- Integrated farming systems mixing tree, crops and forages
- Supply chains adapted to small holders and specific markets to better valorize products, including local and regional policies of positive discrimination, as exist in other parts of Brazil
- Social innovations in capacity building and networking between the small holders

### **Expected results**

- Efficient and sustainable farming systems adapted to small holders in Brazilian Amazon
- Put small holders in the same conditions than large farmers facing the new regulations in the Brazilian Amazon
- Integrate small holders constraints in the local and regional policymaking

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## **Technical Sheet: Livestock farming systems in the Tibetan Plateau**

### **Title: SULQIM**

**Sustainable livestock in the Qilian Mountains, Tibetan Plateau, China**

2012 – 2015

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### **Main objective:**

Develop and implement adapted tools and methods to monitoring the livestock farming systems in the Qilian Mountains, at farm and community levels, in order to better control the pasture degradation, to strengthen the livelihood of families and reduce the vulnerability of in rural area.

### **Partners:**

**Agribusiness:**, farmers, rural professionals, local governance and rural services,

**Policy:** Local and regional policy planners

**Research institute/University:** Lanzhou University, Beijing Normal University

**Financial support:** National funds

**Priority and sub-priority of the GAA concerned:** (within the “Restoring value to grassland” theme)

**Priority of action 1:** Due to the climatic conditions, animal production is the main activity in the Qilian mountains. The herds of yaks and sheep and goats pasture on the natural rangeland of alpine meadows, from the end of the spring to the middle of autumn. During the other part of the year, they pasture on the grassland in the valleys, near of the villages. Forages and by-products are used during the winter and the beginning of the spring for the young animals and their mothers. The priority is to better define the diversity of the practices and modeling the main representative livestock farming systems and market chains.

**Priority of action 2:** Assessment the degradation of the rangeland according to the practices and the restoration processes applied by the farmers and recommended by the livestock agencies.

### **What will be tested?**

- Assessment the performances on the different livestock farming systems and identify the main factors of their diversity.
- Through participatory methods and scientific data, better define the link between the degradation of the pasture and the management of the herds.
- Identify relevant criteria to monitoring the livestock farming systems and their impacts in terms of pasture degradation
- Draft some scenarios for the future using LKS method.

### **Expected results**

- Better knowledge on livestock farming systems in Qilian Mountains
- Implement research-development actions, including capacity building to farm at post-graduate levels, aiming better eco-efficiency of livestock farming systems.
- Propose a monitoring of livestock farming systems adapted to Qilian Mountains.

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## **Technical Sheet: Wet mountain areas in France**

### **Title: Livradois-Forez**

Livestock dynamics and sustainable development of a wet mountain territory: the Livradois-Forez 2011-2015

### **Main objective:**

French mountain territories are based on agrarian systems valuing a diversity of fodder resources reflecting gradients of altitude and the fact that animals are housed for six months of the year. Two opposite dynamics are to be seen. The first is an enlargement and specialisation of farms structures linked to the increase in the volumes produced per livestock farm and per worker. This is accompanied by an increase in production per animal that is made possible by the intensification of the production of forage along with an increase in dependence of feed sourced from outside of the territory. The second trend concerns the maintenance or appearance of small livestock farms, with diversified productions, where the farming practices are based on the diversity of locally available resources. Meat and milk are collected and processed by local institutions such as milk cooperatives or private enterprise, which are often looking for valorization of the products via quality and origin identification label. Direct sales and local distribution channels are growing.

The objective of this project is to analyze forms and conditions of a better contribution of livestock farming to the sustainable development of the territory

### **Partners:**

Regional parc: Parc Naturel Régional du Livradois Forez

Territorial and Agriculture institutions: Chambres d'agriculture; Institut de l'élevage

Education institutes, Research institutes

### **Research institute/University:**

INRA, IRSTEA

Agroparistech and VetAgro-Sup

**Financial support:** ANR, Mouve (France)

**Priority and sub-priority of the GAA concerned:** (within the “Restoring value to grassland” theme)

In what different ways does livestock farming contribute to the sustainable development of the territory: what are the economical functions of livestock farming? What are the environmental functions? Social functions? In the diversity of possible models of livestock farming dynamics which ones can best combine the different dimensions of sustainable development? Our approach is based on:

- A multi-scale analysis of local livestock farming dynamics: innovations at plot scale and/or farming system; transformation of agro-food chains (interaction between producers, food industries and retailers); livestock farming dynamics at territory scale.
- Taking into account the points of views of diversified stakeholders: farmers, stakeholders of agro-food chains, stakeholders of environmental and territorial management institutions
- Temporal analysis of dynamic interactions between territory and livestock farming

### **What will be tested?**

Participative approach:

- co-construction with the “Natural Regional Parc”
- participation of stakeholders as information and data sources through surveys and enquiries: farmers, retailers, stakeholders of environmental and territorial management institutes, etc.
- Participation of stakeholders as experts and for the validation of the results through the restitutions of the results at different steps of the program.
- Crossing social and biotechnics approaches: geography, agronomy, economy to address collective action (added value on products, local food) and transitions to self sufficiency.

### **Expected results**

Multi-scale approach (method and results) on livestock dynamics

- Knowledge on diversity of livestock farming dynamic in a territory
- A shared vision of the diversity of models of sustainable development at different scales between the stakeholders participating to this program
- Transition to agro-ecology (agricultural and food system)

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## **Technical Sheet: Promoting competitive beef-cattle farming in the Northern highlands of Vietnam**

### **Title: Northern Highlands Beef cattle project**

2011 – 2015

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#### **Main objective:**

The northern mountains of Vietnam are facing high rural poverty rates, with many ethnic minorities involved in smallholder mixed farming systems. In those highlands, beef-cattle production is complementary to other agricultural activities. Those livestock systems are based on the use of natural pastures in the highlands, crop residues and cultivated feeds. Based on a partnership between local stakeholders, national research institutes and international research centres, the “ACIAR North-West beef cattle project” is designed to produce knowledge and methods to improve commercial beef cattle activities among those poor rural communities. In particular, the project is involved in organizing producers groups, promoting mixed feeding systems (based on the use of forage + pastoral lands), and developing value-chain linkages to promote marketing relationships with urban markets.

#### **Partners:**

**Agribusiness:** Producers’ groups, private traders, slaughter-houses, Development agencies.

**Policy:** Local (Commune, District) policy planners, Province authorities, Ministry of Agriculture and Rural Development (MARD)

#### **Research institute/University:**

National Institute of Animal Science (NIAS),

Center for Agrarian systems research and development (CASRAD),

Centre de Coop. Intern. en Rech. Agronomique pour le développement (CIRAD)

Tasmanian Institute of Agriculture (TIAR)

**Financial support:** ACIAR, CIRAD, ANR

**Priority and sub-priority of the GAA concerned:** (within the “Restoring value to grassland” theme)

**Priority of action 1:-** Develop accounting systems to value grasslands (economic, environmental and social services) including the value of the associated value chain

**Priority of action 2:-** Identify and test sustainable alternatives for crop-livestock farming systems, at farm and community scales based on participatory methods, integrating local knowledge and scientific technologies.

- Define appropriated public policies in capacity building, financial supports, rural sector assessment and local coordination.

#### **What will be tested?**

- Producers’ interest groups for improving the management of natural pastures, the use of cultivated feed and crop residues
- New associations of crop-forages rotations and associations
- Business-to-business linkages in order to promote the beef-cattle value chain to the capital city
- Policy options, including credit and grants programs for small holders and emerging collective initiatives
- Consumers degustation and media events to enhance consumers knowledge on the quality of beef from north-West highlands of Vietnam

#### **Expected results**

- Methods for improving management of highlands pastures in north Vietnam
- Involvement of local stakeholders in promoting sustainable management of grasslands and beef-cattle value chain
- Policy options likely to promote competitive beef farming
- Impacts on rural employment and households welfare in the northern highlands of Vietnam: at the farm level, at the value chain level (traders, slaughter-houses, delivery business enterprises)
- Improved knowledge on rural mixed farming systems using highlands grasslands and forest land
- Strengthening of synergies and scientific collaborations between partners

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## **5. Appendix 1 Detailed description of grassland representative states**

### **Temperate intensive grassland systems areas**

In temperate intensive grassland system areas many simultaneous pressures acting on grassland livestock farming exist including: market (e.g. accreditation, product price, input costs, land values, skilled labour), societal (e.g. consumer perception) and policy factors (e.g. environmental regulation). These pressures operate in a world of constrained natural resources, offering both risks and opportunities for shaping the livestock sector growth. These drivers do not operate independently, but interact to produce complex and uncertain system behaviour both on- and off-farm, adding to the complexity of the challenges facing the sector and its multiple stakeholders. New means of enabling farmers' and other stakeholders' ability to explore, learn, plan, innovate and thus gain confidence to proactively and effectively respond to complexity are required if the grassland livestock sector is to continue to exist and thrive in the future.

New Zealand will be the pilot site of such systems, with a focus on temperate pastoral farming with dairy and beef and sheep farms. There are a variety of farm ownership structures including owner operators, family trusts, corporate and multiple ownership structures most frequent in the Maori population. The large contribution to New Zealand's GDP that pastoral farming makes means that influences on the sector come not only from the industry itself but also national and regional policy. Multi-stakeholder approaches are therefore common and this programme is designed to assist collective learning between these influencers to guide strategic decision making and design of future farm systems and resulting rural communities.

We have designed a research program, "Rural Futures", to address these issues using an integrated and participatory approach requiring the application and development of system dynamics and systems thinking methodologies suited to dealing with complexity.

The Rural Futures project coordinated by AgResearch is working with regional councils, national policy, agribusiness and farmers. They are all interested in informing their strategic planning through understanding and exploring the combined impact of global and local drivers on their ability to farm grassland, and the flow on effects into the rural community. All of these actors are integrated into decision making and action. Understanding the consequences intended and unintended of their policies and signals and how they operate to produce desired change is key to the programme outcome. Policy makers are also interested in introducing ecosystem services as well as rural employment and measurements of their function into planning so that the full impact of land use change can be taken into account before finalising policy. We have a related

programme of work that has a focus on ecosystem services and function provided by soils in livestock systems.

### **Extensive livestock farming systems in Pampa in Latin America**

In the Pampa of Latin America, South of Brazil, Center East Argentina and Uruguay the context of a free market economy and the opening of export markets at volatile prices aggravate the uncertainty for livestock breeders. This context has produced a differentiation of the forms of farming, into capital-intensive agriculture and familial agriculture. Land appropriation is a key factor in both systems. Current research in the pampa biome has a focus on the integration of cash crops and livestock breeding.

A region providing food for the world; livestock to the margins ? (crops)

In the last decades, there has been a very important substitution of grasslands by afforestation, mainly by huge international companies, making it a very unique region because elsewhere in the world the current situation goes in the other direction, from forest to grasslands. The impacts are the same including, changing the hydrologic cycle, degrading soils, reducing biodiversity and so on. In the last ten years, fuelled by the international market, some 10 million hectares has been changed from pastures to soyabean production, putting aside family farmers unable to buy the huge machinery needed to compete with the new organizations, “network companies” who mainly rent land.

Uruguay will have a pilot site coordinated by Institute Plan Agropecuario. We have designed a research and development program, called Knowledge Integration Project, (PIC in Spanish) that stands on the certitude that the farm-family system and the local level knowledge must be taken into account when trying to understand the functioning of the livestock farms and their interactions with local development. The preferred tools are “participative modelling” and “interactive simulations to explore the future”, always engaging farmers in a participative framework, and taking advantage of recent developments in communication and knowledge management. Our project is linked to the Mouve project (France – see below) and the Rural futures project (NZ, above).

Our main associates are communities of livestock farmers who regularly discuss with us the tools that we are proposing to support the different types of decisions that they make. There is a strong collaboration with the national University and research centres to assist in advancing toward more effective action. We are coordinated with other government projects that have as an objective promote a sustainable inclusive development, and we are in touch with the main agribusiness related to beef production. Recently, a National Round Table about livestock production on Natural Grasslands (Campos) (Mesa de Ganadería sobre Campo Natural) has been put in place,

and it should promote the advance of science, coordinating different stakeholders and provide advice the policy design by the government

### **Pastoral systems in semi-arid areas of sub-saharan Africa**

In these regions, pastoral societies have valued for a long time natural resources, rangeland and complementary crop-livestock systems thanks to the mobility of their herds in a very unpredictable environment. The tensions on land tenure due to increasing demographic pressure and absence of recognition of land valuing through rangeland livestock systems, in particular for the use of crop and irrigable lands, are increasingly strong. However, we observe a rapid growth in the business of animal products in connection with the development of urban demand. This is also concomitant to an increase of tensions on the feed market. This market has led to dairy intensification in pastoral and agro pastoral areas. The development of precise connections, relationships between buyer and breeders, concrete outlets and adapted modalities, influence livestock farmers turn to intensification. The key question is how to develop this option in a manner that does not increase the vulnerability of the households and does not degrade the environment?

North Senegal will be the pilot site, with CIRAD as a collaborating organisations. In Senegal, the main objective of the partners within the program “Laiterie du Berger” is to develop the local pastoral dairy sector to reduce milk imports in Senegal while developing livestock farming and secure livelihoods in semi-arid areas. Whereas production per hectare and per cow will remain moderate because of the low potential in these semi-arid areas, the important number of cattle (around 4M) and the extent of rangeland represent a real production potential that can be a strong complementary production beside intensified rural or peri-urban systems that are very much input dependant systems.

Researchers are involved today in a medium-term research-development program together with “La laiterie du Berger”, a medium-sized private milk factory whose objective is to collect milk from pastoral areas in north Senegal in order to ensure local production and provide quality products. Together with other partners (Professional organisations, Extension services, NGO, Danone foundation, Government services, IFPRI,...), this program aims to find sustainable options (feed, partial herd sedentarisation, tax regulations, market development, natural resources management, etc...) that enable intensification of these systems without endangering social systems and ecosystems but providing at the same time enough milk to run an economical viable factory.

## **Extensive livestock farming systems in Mediterranean areas**

The recent demographic dynamic of increasing concentrations of population on the Mediterranean coast has created a growing caesura with the hinterlands. In the North in European countries (French Mediterranean areas), we assist a new meshing of territories (mosaic) and the problems of management of landscapes historically organised in deep relationships with pastoral activities (development of forested areas endangering biodiversity, favouring fire, degradating pastoral resources weakening in return livestock activities). This results an historical threshold and historical breaking point between livestock farming activities and the society changes as a whole. At the moment, questions we are dealing with consist in favoring emergence and combining of diverse forms of livestock activities that are profitable and sustainable but also according with new expectations from local society that are not, concerning land use, exclusively motivated by production of resource for farming activities. In the South (Egypt), the demographic pressure and the development of the trade exchanges has weakened the technical and identical cultures. Between the city and the deep countryside the farmlands (in particular those irrigated) have tried to integrate agriculture and breeding via a wide diversity of systems of production from the intensive breeding (based on intensified cultivable meadows and transfer of fertility via the manure, to an extensive breeding on rangeland). The questions of development of market chains - sometimes in great difficulty or in competition - and of environment - preservation of opened pastoral landscapes, biodiversity, risk prevention of fire - highlight where the breeding is expected in the future.

South France and Egypt will be the two pilot sites of Mediterranean with INRA and CIRAD as corresponding organisation.

## **Wet mountain areas in France**

Those French mountain territories are based on agrarian systems valuing a complementarity of resources organized according to gradients of altitude, and corresponding to specific biomes (by floor). The drift from the land since the middle of the 19th century has not occurred in the same intensity everywhere, Massif Central remains for example a zone with a strong density of small scale agriculture, and today it is in full restructuration. The breeding, associated with high quality signs, is strongly expected on questions of management of the biodiversity and preservation of opened landscapes. It is the support of an economic vitality of countryside, either, very urbanized and subjected to the tourist pressure (Alps, Pyrenees), or, much more rural and more inquiring on the ways for economic development (Livradois - Drill). The recent volatility of the prices of products and inputs questions in a new way the resistance of the systems to hazards, while the working constraints remain a source of tension for a lot of households.

In an economic and social changing context, two opposite dynamics are to be seen. The first one is an enlargement and specialisation of farms structures linked to the increase in the volumes produced per livestock farm and per worker. It is accompanied by an increase in production level per animal, made possible by the intensification of the production of forage. It is also accompanied by the frequent recourse to feed coming from outside the territory. This dynamic is concomitant with the concentration of processing and the simplification or elimination of the rounds (costs : higher price of diesel and lower density of producers on the territory). The second trend concerns the maintenance or appearance of small livestock farms, with diversified productions, where the farming practices are based on the diversity of locally available resources looking for self sufficiency. Meat and milk are collected and processed by local structures products like milk cooperatives or private enterprise, which are often looking for valorization of the products via quality and origin identification label or short local chains. Direct sales and local distribution channels are growing.

The Livradois-Forez will be the pilot site for wet mountain areas in France. On this area, our research program aims at analysing the forms and conditions of a better contribution of livestock to the sustainable development of the territories. This research program will be coordinated by two french research institutions (INRA, IRSTEA) and two french graduate institutes Agroparistech and VetAgro-Sup). Also territorial and agricultural stakeholders (“Parc Naturel Régional du Livradois Forez”, “Chambres d’agriculture”, “Institut de l’élevage”) will participate in order to assure the acceptability and the efficiency of the results.

### **Mixed farming systems in the northern highlands of Vietnam**

In Vietnam, Pastoral livestock breeding is an important activity among farming communities located in the highlands of Vietnam. Those ecosystems are concentrated in the North and in the Center of the Country. A large proportion of ethnic minorities live in those areas, with the highest proportion of poor households compared to coastal lowlands and deltas. The development of livestock grazing activities in the mountains of Vietnam is however constrained by restricted access to market and by insufficient valuation of available pastoral resources. Most of the natural pastures are under forest, and their access is managed through complex tenure arrangements defined by both traditional rules and environmental regulations and principles. However, extensive and semi-extensive livestock systems offer good opportunities for promoting the development of those rural communities. The high quality of indigeneous meat produced on those pastures (beef and black pig), the traditional know-how of some of those ethnic communities (H'Mong, Thai..), and the good reputation of some of these areas among urban consumers give serious prospects for enhancing the value of those mountainous grasslands.

We have designed a research-development project to support the development of beef-cattle livestock in the Northern highlands of Vietnam. Based on a partnership between local stakeholders, national research institutes and international research centres, the “ACIAR North-West beef cattle project” is designed to produce knowledge and methods, as well as to develop technical and institutional innovations likely to improve commercial beef cattle activities among those poor rural communities. In particular, the project is involved in organizing producers groups, promoting mixed feeding systems (based on the use of forage + pastoral lands), and developing value-chain linkages to promote marketing relationships with urban markets. Those actions are based on a systemic “value chain assessment” that will help local stakeholders in improving economic and social value of grasslands.

In Vietnam, the North West Beef Cattle project works in 4 communes located in the North-West of Vietnam (Province of Son La and Dien Bien). The local authorities a part of the project, and play an important role in making national and international research partners coping with the local context : understanding local livestock and pro-poor development policies, promoting collective organisations and local communities, and assisting building commercial relationships between farmers, collectors, slaughterhouses and retail enterprises.