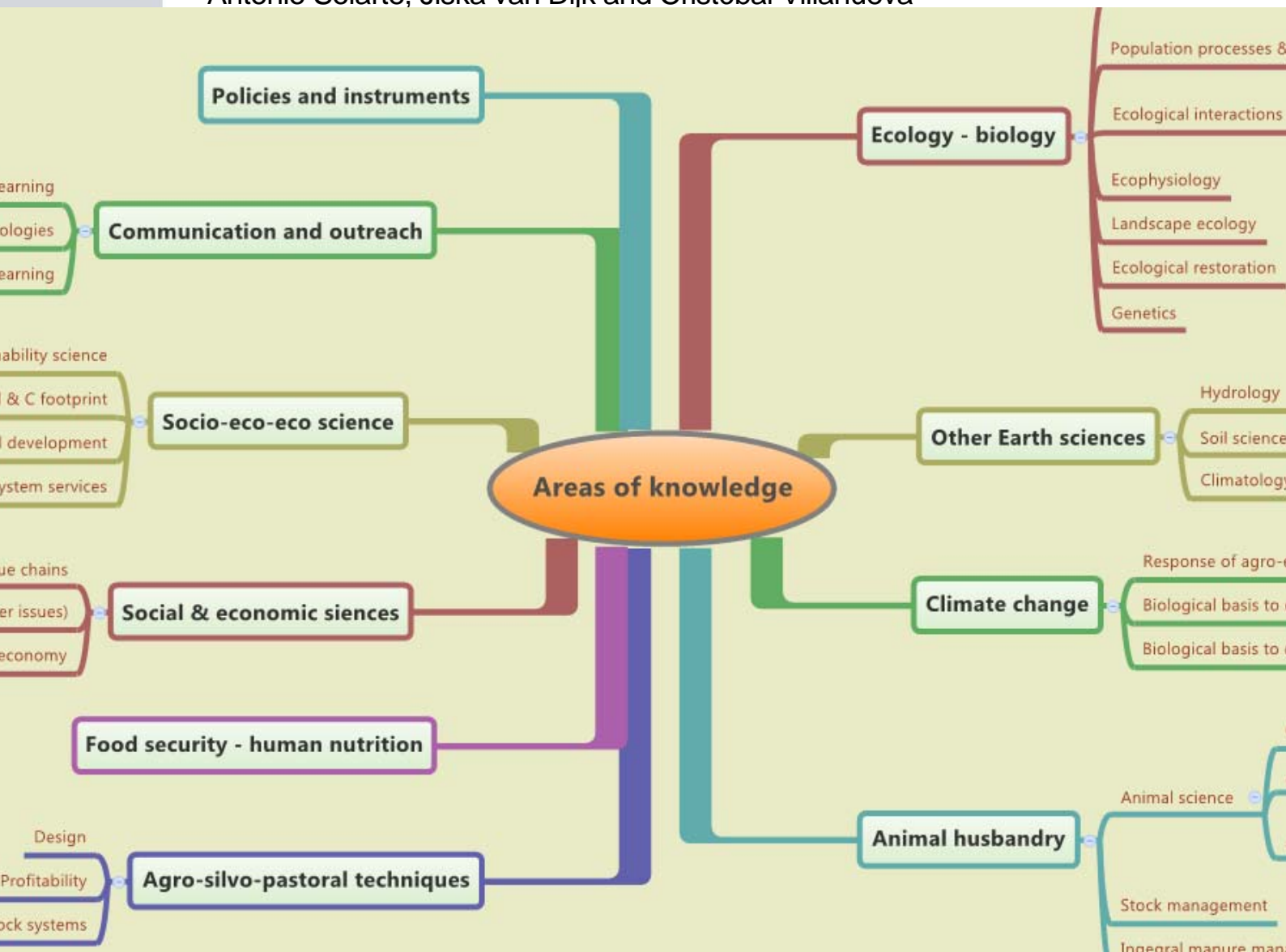


# Knowledge networks on the use of biodiversity for sustainable livestock production in Latin America

A model platform for capacity building

Graciela M. Rusch, Rogerio Martins Mauricio, Enrique Murgueitio, Sonia Ospina, Milton Rivera Rojas, Verónica E. Rusch, Dalia Sánchez, Antonio Solarte, Jiska van Dijk and Cristóbal Villanueva



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## Abstract

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Knowledge networks are self-organized structures where knowledge generation and exchange take place, thereby providing a basis which capacity building programs can build on by facilitating activities that promote knowledge exchange and mutual learning. The suitability of this kind of network relies on a series of characteristics. First, the transformation required to achieve sustainability in food, feed and fiber production needs to address the socio-ecological complexity of these systems. Lessons learned from experiences in the past indicate that the problems of biodiversity management derive from a mindset that oversimplifies and fragments the understanding of socio-ecological systems. Current views stress the necessity to engage scientists in all relevant fields of biodiversity and ecosystem services science. Knowledge networks can have an important role in bringing together a diversity of knowledge sources.

Second, there is a tight linkage between how food production challenges are solved and the sustainable use and protection of biodiversity, which points to the need of a common understanding of the challenges of protecting biodiversity and ecosystem service among sectors. Knowledge networks organized around the problem of social – economic- and ecological sustainability of food production can play an important role in bridging the communication gap between decision makers addressing environmental, food production and development challenges.

Third, the challenges about biodiversity and ecosystem services need to be undertaken at the regional, national and local levels. The lack of a sufficient understanding of the local conditions, of the challenges and of appropriate solutions that are in agreement with the local needs, are severe hindrances to successful bilateral aid programs. To be successful, future capacity-building endeavours need to address the local realities of both knowledge providers and requesters, and the local capacities to produce and use knowledge. Regional knowledge networks sharing common challenges have the potential to foster knowledge exchange and mutual learning with a focus on locally relevant issues.

The network mapping in this report reveals a large number of knowledge provider organizations that deal with silvopastoral systems as an instrument towards social, economic and environmental sustainability in the livestock production sector in Latin America. National and regional projects and international programs have supported coordination and joint implementation activities that have fostered the organization of local and regional networks but, still, the knowledge is perceived as fragmented and knowledge holders are largely isolated. There seems to be a huge potential to foster capacity building through activities that promote knowledge exchange and mutual learning. The mapping exercise also reveals many knowledge requesters, particularly from governmental organizations at the national level, and some at the international level. However, there appears to be an underrepresentation of knowledge requesters operating at the local level, such as professionals that conduct out-reach activities, civil organizations (such as farmers organizations) and the private sector. There seems to be a perception of academic organizations as knowledge providers but not as knowledge requesters, despite dealing with issues of applied research.

This assessment reveals a wide range of knowledge fields and themes that are important to understand the silvopastoral system and that are needed to design socially-economically and ecologically sustainable livestock production systems. These range across various dimensions: from natural sciences, including ecology, other earth sciences and genetics, through economy to social sciences and psychological economics dealing with motivations underlying

decision-making and change; and from basic research on natural and social processes to applied knowledge about management, techniques, and policy formulation. However, two knowledge fields predominate: ecology and livestock production science. These two knowledge fields appear to influence policy-making differently in the environmental and the livestock sectors, respectively.

We conclude with some recommendations on how international initiatives, including those envisaged under the Inter-governmental Platform for Biodiversity and Ecosystem Services (IPBES), could build on some of their capacity building activities based on existing knowledge networks. Supporting knowledge networks of this kind with for instance, staff exchange programs, thematic schools, on-job training workshops, conferences, and other arenas enabling exchange and mutual learning are likely to achieve considerable impact on local capacities on themes of local relevance.

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## Resumen

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Las redes de conocimiento son estructuras auto-organizadas, en donde tienen lugar la generación y el intercambio de conocimiento. Éstas proporcionan, de este modo, una plataforma sobre la cual los programas de capacitación pueden basar actividades que promueven el intercambio de conocimiento y el aprendizaje. La idoneidad para este propósito de este tipo de redes se basa en una serie de características. En primer lugar, la transformación necesaria para lograr la sostenibilidad en la producción de alimentos, forrajes y fibras tiene que abordar la complejidad socio-ecológica de estos sistemas productivos. Las experiencias del pasado indican que los problemas que enfrenta la gestión de la biodiversidad derivan en gran medida de una conceptualización simplista y fragmentaria del sistema socio-ecológico que comprenden los sistemas de manejo de recursos naturales. La visión actual subraya la necesidad de involucrar a científicos de todas las áreas pertinentes a biodiversidad y los servicios ecosistémicos. Las redes de conocimiento pueden jugar un papel importante ya que pueden reunir a una gran diversidad de fuentes de conocimiento.

En segundo lugar, existe una estrecha vinculación entre cómo se resuelven los retos de la producción de alimentos y el uso sostenible y la protección de la biodiversidad. Esta relación señala la necesidad de alcanzar un entendimiento común entre sectores de los retos que enfrentan la protección de la biodiversidad y de los servicios ecosistémicos. Las redes de conocimiento organizadas en torno al problema de la sostenibilidad socio-económica y ecológica de la producción de alimentos puede jugar un papel crítico para promover la comunicación entre los responsables de las decisiones sobre la producción de alimentos, del medio ambiente y del desarrollo.

En tercer lugar, los retos acerca de la biodiversidad y de los servicios ecosistémicos se manifiestan a nivel regional, nacional y local. La falta de un conocimiento sobre las condiciones locales, y sobre los retos y las soluciones adecuadas a las necesidades locales son obstáculos severos en los programas de ayuda bilateral e internacional. Para tener éxito, los esfuerzos de capacitación futuros deben abordar las realidades locales así como involucrar a las capacidades locales para producir y utilizar el conocimiento. Las redes regionales de conocimiento que comparten desafíos comunes tienen el potencial de fomentar el intercambio de conocimientos y el aprendizaje mutuo, con un enfoque sobre temas de relevancia local.

El mapeo de la red en este informe revela un gran número de organizaciones de proveedores de conocimiento referente al sistema silvopastoril como un instrumento hacia la sostenibilidad social, económica y ambiental en el sector de la producción ganadera en América Latina. Los proyectos nacionales y regionales, y los programas internacionales han apoyado la coordinación y fomentado la organización de redes locales y regionales. Sin embargo, el conocimiento se percibe como fragmentado y los actores, están en gran medida, aislados. Existe, entonces, un gran potencial para fomentar el desarrollo de capacidades a través de actividades que promuevan el intercambio de conocimiento y el aprendizaje mutuo. El mapeo también revela muchos actores que solicitan conocimiento, en particular las organizaciones gubernamentales a nivel nacional, y algunas organizaciones que operan a nivel internacional. Aún así, hay una falta de representación de actores que operan a nivel local, como los profesionales que llevan a cabo actividades de extensión, las organizaciones civiles (por ejemplo, organizaciones de agricultores y de profesionales) y el sector privado. También pareciera haber una percepción de que las organizaciones académicas tienen un rol de proveedores, pero no de los solicitantes de conocimiento, a pesar de tratarse de problemas de investigación aplicada.

Esta evaluación revela una amplia gama de áreas de conocimiento y de temas que son importantes para comprender el sistema silvopastoril y que son necesarios para diseñar sistemas de producción ganadera ecológica, social y económicamente sostenibles. Éstos abarcan varias dimensiones: desde las ciencias naturales, incluyendo la ecología, otras ciencias de la tierra y la genética, a través de la economía, hasta las ciencias sociales que estudian las motivaciones que subyacen la toma de decisiones y el cambio. Comprenden desde la investigación básica sobre procesos naturales y sociales, hasta el conocimiento aplicado sobre la gestión, las técnicas y la formulación de políticas. Sin embargo, dos campos de conocimiento predominan, la ecología y la zootecnia. Estos dos campos de conocimiento parecen influir de forma diferente la formulación de políticas en el sector de la ganadería y el medio ambiente, respectivamente.

Concluimos con algunas recomendaciones sobre cómo las iniciativas internacionales, entre ellas las previstas en la Plataforma Intergubernamental sobre la Biodiversidad y los Servicios Ecosistémicos (IPBES), podrían basar algunas de sus actividades de capacitación sobre las redes de conocimiento existentes. Los programas de intercambio de personal, escuelas temáticas, talleres de capacitación, conferencias y otros espacios que permitan el intercambio y el aprendizaje mutuo brindan posibilidades de lograr un impacto considerable sobre las capacidades locales, en temas de relevancia local sobre el uso sostenible de la biodiversidad y los servicios ecosistémicos.

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## Foreword

This assessment maps networks of knowledge providers and of requesters who address the practice of silvopastoralism as a pathway to achieve environmental, social and economic sustainability of livestock production systems that make use of ecosystem services from, originally, forest ecosystems in Latin America.

The mapping exercise aims to raise awareness about the potential of existing networks of knowledge in providing a platform on which a program on capacity building can be built, particularly for initiatives with global reach such as the Inter-governmental Platform for Biodiversity and Ecosystem Services (IPBES). The main reasons by which this kind of networks can be play a pivotal role in capacity building are, first, the involvement of a wide range of local competencies that hold the necessary understanding of the challenges, under their own premises. Second, the capacity of such networks to draw attention on issues of national and local relevance. Third, the potential of high-impact capacity building activities given the regional scope and the wide range of issues embraced. An excellent example of the potential magnitude of this impact are the achievements of European research programs that have strategically supported networks (COST actions), exchange (Marie Curie and related actions to promote exchange and mobility), and supported cross-national research network. All these actions have had a tremendous impact on capacity building across Europe.

Biodiversity conservation objectives are tightly interlinked to the sustainable use of nature, since the problems of ecosystem degradation and biodiversity loss originate in the way ecosystems have been managed, especially, in the past 5 decades. Hence, there is an imperative need to open arenas for knowledge exchange across the relevant sectors in order to achieve a common understanding of the challenges and to explore new solutions that address the multiple dimensions of the problem. Active knowledge networks can fulfil a role in this direction by promoting arenas of knowledge exchange across sectors and knowledge fields.

We wish to thank the Norwegian Environment Agency for providing support to this assessment. We also want to thank Andrea Sierra Alarcón (Corpoica) and Sondre Dahle (NINA) for assistance with the preparation of this report.

Trondheim, 14<sup>th</sup> August 2014  
Graciela M. Rusch

# 1 Mainstreaming biodiversity knowledge for sustainable livestock production

## 1.1 The importance of sustainable livestock production to support biodiversity and ecosystem services

The Strategic Plan for Biodiversity 2011–2020 of the Convention on Biological Diversity (CBD) has the vision that ‘*by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people*’. This vision identifies at the same time a number of challenges, including the need to enhance the capacity of social–ecological systems to support biodiversity and ecosystem services under global change (Larigauderie et al. 2012). The impacts on biodiversity of the production of food and fibers are currently of such magnitude that they profoundly shape ecosystem functions and the processes that maintain the Earth System (Steffen et al. 2011). Therefore, current practices and management paradigms need to be critically scrutinized and changed. The enormous challenge lies in meeting current and future food demands while facing resource and land shortage. For this purpose, signatory parties of the Convention on Biological Diversity have agreed that many of the challenges about the maintenance of biodiversity have to be addressed in the ecological systems that provide food, fibers and materials (see specifically Aichi Targets “Living in Harmony with Nature” number 4, 7 and 13 (Box 1)).

It is clear that there is a tight link between the need to meet food demands and development, the way in which the food production system is designed and managed, and ecological sustainability and biodiversity protection (Broom et al. 2013). It has been foreseen that the “Livestock Revolution” would be “the largest structural shift to ever affect food markets in developing countries”, with crucial impacts for future growth prospects in developing country agriculture, for food security and the livelihoods of the rural poor, and for environmental sustainability (Delgado et al. 1999).

Several exploitation pathways used in the past need to be examined and re-thought. For instance, Delgado et al. (1999) point to the problems that originate from the clearing of forest and savannas in humid tropical areas when pastures are established. Conversion of the natural vegetation cover and poor management often lead rapidly to land degradation, soil erosion and loss of productive capacity. For example, a large portion of the pasture areas in the Amazon in Brazil have been abandoned shortly after clearing because of degradation and have remained as pasture fallows (Delgado et al. 1999). Especially beyond a deforestation threshold, natural regeneration of cleared forests can be difficult and restoration expensive when the cleared areas are large (Bernasconi et al 2013). Also, the conditions that have supported food production in today’s wealthy countries after the Second World War have changed. Scarcity of resources (i.e. phosphorus), expensive fossil fuel energy sources and scarcity of productive land form the current setting within which new pathways of agro-pastoral sustainability and development need to be framed. Addressing the global challenges of climate change, food security, and poverty alleviation requires enhancing the adaptive capacity and mitigation potential of agricultural landscapes across the tropics (Harvey et al. 2014)

The search for new nature-based development pathways needs to address ecosystem management in the context of increasing resource scarcity. Effective and sustainable management will depend on an understanding the ecological processes underlying the provision of services in the livestock production system and of the responses of organisms to change (e.g. tolerance to drought and response to nutrient availability). The global DIVERSITAS 2012-2020 vision points to various features of the knowledge base that are needed to support the transformation into new development pathways. It stresses the importance of building the knowledge base for management practices that enhance the ability to maintain biodiversity and ecosystem services (Larigauderie et al. 2012). The involvement of scientists from all regions of the world is

also critical to ensure that science is informed by and relevant to the particular regional, national and local needs. The importance of locally-driven transformation process cannot be stressed sufficiently in a developing context (Ramalingam 2013). Current views further stress the necessity to engage scientists in all relevant fields of biodiversity and ecosystem services science including interdisciplinary approaches (both within and between the natural and social sciences), as well as involving scientists who work across sectors of society - “transdisciplinary scientists” (Larigauderie et al. 2012, Ramalingam 2013). Often, the challenges tend to be approached separately due to a variety of technical, political, financial, and socioeconomic constraints. Many of the activities needed for sustainable agriculture, provide opportunities for climate adaptation and mitigation (Montagnini et al. 2013), and thinking at the landscape scale opens a new dimension for achieving synergies. Intentional integration of adaptation and mitigation activities in agricultural landscapes offers significant benefits that go beyond the scope of climate change to food security, biodiversity conservation, and poverty alleviation (Harvey et al. 2014).

This situation points to the inevitability of linking the sustainable use and the protection of biodiversity with how food production challenges are solved. Past experience and new insights provide indications about how new development pathways could be walked (Ramalingam 2013). One of the main messages is that to a large extent, the problems of biodiversity management derive from a mindset that oversimplifies and fragments the understanding of socio-ecological systems, and disregards the need of a plurality of perspectives, knowledge and values to address complexity.

Spaces need to be opened to enable exchange and learning about how the socio-ecological system is framed and understood. For instance, *a farmer, a seed merchant, a member of parliament and a multinational food company might all frame an agricultural system in different ways. Those various framings will lead to different narratives being told about the same system and different choices being made* (Leach (accessed 2014-04-10)). Therefore, different disciplinary perspectives contributing to the analysis and understanding of the socio-ecological system are also needed. This way of thinking transpires from the strategy of scaling-up silvopastoral systems in Colombia (Calle et al. 2013, Box 2)

The questions of biodiversity conservation, food production and development are closely intermingled and are at the core of decision-making about how natural resources will be used in the future. This report can be useful for decision-makers engaged in policy formulation, scientists, students and practitioners involved and concerned about food production sectors in Latin America, development, biodiversity and the environment, and decision-making on sustainability issues linked to the livestock sector.

## Box 1 Convention on Biological Diversity (CBD). Aichi targets 4, 7 & 13 <http://www.cbd.int/sp/targets/> Accessed April 2014

### Target 4

By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

### Target 7

By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

### Target 13

By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity

## Box 2 A strategy for Scaling-Up Intensive Silvopastoral Systems in Colombia (Calle et al. 2013)

The strategy combines five elements:

First, participatory research on real farms contributed to strengthen a network of pilot farms open to research and peer-to-peer technology transfer.

Second, capacity building, training, and outreach activities spread the principles of SPS among farmers, field workers, researchers, extension workers, and policy makers.

Third, pilot projects explored policy instrument options such as Payment for Environmental Services (PES), technical assistance, soft loans and bonus prices, in spreading SPS.

Fourth, successful pilot projects were instrumental in influencing the live-stock sector as well as the public policy agenda.

Fifth, currently, large-scale projects aimed at mainstreaming SPS are applying the lessons learned in order to achieve landscape-scale benefits, enhance climate change adaptation and mitigation, and introduce SPS products to green markets. Recently, innovation networks have contributed to speed up the adaptation of SPS in different environmental and socio-economic contexts.

## 1.2 The role of knowledge networks in the search for alternative livestock production systems

A second important lesson is the high degree of context dependence of the biodiversity management challenges. Particularly in a development setting, it inevitably entails local capacities, knowledge, perspectives and views about how the challenges could be faced (Ramalingam 2013). Local networks of knowledge provide a sound foundation on which innovative pathways to achieve sustainability can be explored.

This report brings forward the representation of a knowledge network on livestock production systems in Latin America that are based on silvopastoral practices (i.e. the practice of combining trees, shrubs, forages and grazing of domesticated animals in a mutually beneficial way). The network is based on important knowledge producers (local community members, farmers, out-reach practitioners, scientists, etc.) in the region that are concerned about the socio-ecological sustainability of livestock production systems and engaged in exploring alternative developing pathways of local significance, including their role in climate adaptation and mitigation strategies. The ecological systems have in common their origin in naturally forested areas – ranging from temperate forest in southern South America through seasonally-dry forests across the continent, and humid tropical forests in northern South America and Mesoamerica. We have also identified who the main users of the knowledge are and how important this knowledge is for the different sectors. This includes actors that are involved in the formulation of national policies and the design of policy instruments, practitioners making decisions about management practices, the private sector, and those who deal in one way or another with the management of biodiversity in livestock production systems. Lastly, we produce an indication of the kinds of knowledge and discipline fields that are considered important now and in the future, and for which a forum for knowledge exchange, deliberation and cross-fertilization would be of much value. The network could for instance, identify participants in various activities such as task forces, fast-track assessments for IPBES, organize thematic conferences (already ongoing), and have a common platform for communication. The network is, in addition, relevant for the capacity building processes as stated in objective 1 of the IPBES work-programme (i.e. Strengthen the capacity and knowledge foundations of the science-policy interface to implement key functions of the Platform).

### **1.3 Silvopastures as a strategy for sustainable livestock production**

The adaptation and transformation of the livestock production system in Latin America have the potential for considerable positive environmental impacts, including the enhancement of the capacity to cope with climatic and other uncertainties. Silvopastoral systems can provide several environmental benefits. An important one is that silvopastoral systems rely on increased vegetation and tree cover as part of the production system, which leads to the control of soil erosion and water run-off; and of the retention of sediment and soil nutrients along water courses (Niemeyer et al. 2014). These functions result in improved water flow regulation, water quality and soil fertility (Casals et al. 2013). A second important impact is on biodiversity protection. Silvopastoral trees along water courses, tree and forest patches and live fences are elements in the agro-pastoral landscape that contribute to the provision of habitat for wildlife and other organisms (Harvey et al. 2005 & 2008, Murgueitio et al. 2011). They enhance habitat cohesion (Harvey et al. 2008, Murgueitio et al. 2010), and are important reservoirs of the local and regional tree species and a pool of forms of local adaptation (FUNCiTREE 2013).

Silvopastures provide the opportunity to manage biodiversity and to enhance the capacity of the livestock production system to cope with natural adversities and uncertainty. Livestock farmers are among the most affected by climate change because they depend strongly on the natural resource- base at the same time that they have little capacity to cope with climate seasonality and extreme events such as drought spells. Silvopastoral practices offer unexploited opportunities that can ameliorate these impacts. They incorporate trees and shrubs into the traditional pasture-cattle production, some of which are perennial and, in seasonally-dry climates, they can continue growth during the dry season when the grasses stop growing (Ospina et al. 2012, Rusch et al. 2014, FUNCiTREE database). Several tree species provide highly nutritious feed for livestock (leaves and fruits) and can be used as fodder banks and fodder supplements (Pérez Almarío et al. 2013). In addition, the regional pool of native tree species is rich and provides several other goods such as timber, materials and fruits for human consumption (Harvey et al. 2011). There is a huge potential for nature-based solutions to improve the amount and the quality of the fodder produced, to reduce fodder shortage caused by rainfall seasonality, as well as to diversify the production of commodities. All these functions can help ameliorate the impacts of climate and market fluctuations and thereby contribute to

enhance resilience, i.e. the capacity of the system to reorganize after major environmental and contextual shifts.

#### **1.4 The potential of knowledge networks to support capacity building in the context of IPBES**

This initiative, centered around the practice of silvopastoralism as an ecologically and economically sustainable livestock production system, aims to establish a pilot framework of knowledge exchange across relevant research disciplines, institutions, and research groups to promote the development of sustainable livestock production that makes full use of biodiversity and biological systems to restore and enhance productivity, sustain production and increase resilience to cope with drastic and unexpected changes such as climate changes. The initiative is grounded on activities that will promote mutual learning on how to make more full use of biodiversity and to take into account Ecosystem Service (ES) aiming at a long-term transformation of livestock production systems. The initiative builds upon the experience gained within the European Union Framework Programme 7 project KNEU - Developing a Knowledge Network for European expertise on biodiversity and ecosystem services to inform policy making economic sectors (see <http://www.biodiversityknowledge.eu>), but has a narrower scope (i.e. silvopastoral practice in Latin America).

Mapping the networks of actors that provide and request knowledge, as reported here, as well as the fields of knowledge that are relevant in the context of the silvopastoral practice in Latin America can help to gain a common understanding about the kind and breadth of the knowledge needed, raise awareness about the roles the different organizations play, and gain insights how new pathways can be shaped. Forums that enable this exchange make it possible to identify knowledge gaps and serve as corner stones for capacity building processes. Linking different disciplines, institutions and research groups may help them in establishing more profound science-policy connections and policy makers, practitioners and other end-users can more easily get in contact with the relevant knowledge providers. The degree of organization and functionality of the national networks differ, and a continental network would be particularly important for the smaller and or more isolated sub-networks and research environments.

The initiative feeds well into the currently ongoing work of the expert group for deliverable 1 (a: prioritizing capacity-building needs) and 1 (b: capacity building activities) of the IPBES work-programme (see <http://ipbes.net/work-programme/objective-1/45-work-programme/451-deliverable-1ab.html>) and has the potential to implement the working groups' aim to create a 'match-making facility'. A next step of the initiative can be the organisation of training workshops, incorporating exchange programmes and elaborate the science-policy component in line with the experience from the European FP7 projects KNEU and SPIRAL (see SPIRAL handbook: <http://www.spiral-project.eu/sites/default/files/The-SPIRAL-handbook-website.pdf>).

What is understood by knowledge provider and knowledge requester as well as knowledge hubs and other terms used in this report are explained in Appendix I.

## 2 Methodology

### 2.1 Partners and their trajectories in sustainable livestock systems

The *Centro para la Investigación en Sistemas Sostenibles de Producción Agropecuaria* (CIPAV) and the *Centro de Agricultura Tropical de Investigación y Enseñanza* (CATIE) in cooperation with the Food and Agriculture Organization of the United Nations (FAO) have built a network of Agroforestry for Livestock Production since 1999. These partners have organized seven international congresses in Latin America and the Caribbean. In May 2015, the “VIII Congress of Agroforestry for Sustainable livestock and forestry production” will be held in Iguazú, Misiones, Argentina.

With funding from the Global Environmental Facility (GEF), under the World Bank, the partners have focused on integrative management of ecosystems in Costa Rica, Nicaragua and Colombia (2002-2007) and the project on sustainable livestock production: “Mainstreaming biodiversity in Sustainable Cattle Ranching” (2012-2017).

CIPAV participates in south-south exchange programs to promote agro-silvopastoral systems, for instance among Colombia, Mexico, Nicaragua, Panama, Brazil, Argentina, and also the US. Both collaborative projects and private initiatives have participated in the exchange. In 2014, a program facilitated by GEF – World Bank, with Exchange with Ruanda, Burundi and Etiopía has started.

The *Corporación Colombiana de Investigación Agropecuaria* (Corpoica), has, since 2013 financial support and political commitment from the Ministry of Agriculture and Rural Development in Colombia to for a five-year research programme focused in developing technologies and ecological solutions for sustainable livestock production in five Colombian ecoregions. The research agenda includes cooperation with partners as CIPAV and the International Center for Tropical Agriculture (CIAT).

The *Tropical Agricultural Research and Higher Education Center* (CATIE) is an international center for development innovation in agriculture and natural resource management that combines graduate education, strategic training through short courses for professionals and producers, and research and technical cooperation with partners throughout Latin America and the Caribbean, to widen the impact of products generated by the institution. The Center includes thirteen regular member countries with projects dispersed in most of them. One of CATIE’s five research and development programs is Livestock and Environmental Management (GAMMA), whose mission is to develop sustainable livestock production models based on silvopastoral systems and best practices; this group has been the pioneer in this focus at the regional level. Furthermore CATIE has generated ample experience in the design of mechanism and incentives to promote sustainable land uses and good practices.

The *Instituto Nacional de Tecnología Agropecuaria* (INTA, Argentina) is the national agency under the Ministry of Agriculture with the mandate to provide knowledge and technological development for the agricultural and forestry sectors. INTA’s focus includes the integration of capacities to promote interagency cooperation, knowledge and technology generation, and implementation through out-reach, information and communication channels. INTA was founded in 1956, and consists of 16 research institutes, 50 experimental stations and over 300 Agricultural Extension Agencies distributed throughout the Country. Research on silvopastoral systems started in the mid 90s. In 2005 silvopastoral systems is one of four national project integrative program, and include research and out-reach activities on silvopastoral systems derived from native forest and from plantations. INTA has established a national network of trial plots and demonstration farms which has contributed to the dissemination of silvopastoral practices. The regional working groups have organized two national congresses on silvopastoral systems.



The *Department of Bioengineering of The Federal University of Sao Joao Del Rei* conducts research on sustainable livestock production including research areas of are forage evaluation, including mitigation of enteric methane emissions, and functioning and design of silvopastoral systems. The research is associated with the post graduation program - <http://www.ufsj.edu.br/ppbe/> (MSc and Ph.D.). The projects have financial support from several national sponsors (e.g. CNPq - National Council of Scientific and Technological Development) and collaboration with universities (e.g. The University of Sydney - Australia), national institutions in the regions (CIPAV, Colombia) and global organizations (FAO – Global Agenda).

The *Norwegian Institute for Nature Research* (NINA) is Norway's leading institution in applied with a focus on the linkages between nature and society, and sustainable solutions to the use and management of nature. NINA has cooperated with the network partners during the past decade with funding from the Research Council of Norway (SILPAS, Multi-functional Landscapes and PESILA-REDD projects), and from the European Commission 7<sup>th</sup> Frame Program (FUNCiTREE and POLICYMIX). Three of these projects address explicitly the functioning of silvopastoral systems, and the remaining two, have a focus on environmental policies in the forest sector, and including silvopastoral practices. NINA has an extensive international network of cooperation in the environmental sector.

## 2.2 Data collection

To map the existing network of knowledge about the use of biodiversity for sustainable silvopastoral systems in Latin America, we reviewed the knowledge landscape in Latin America (Argentina, Brazil, Colombia, Venezuela, Mexico and the Central American region) in terms of experts, existing networks and knowledge holders, with the aim to understand the flows of knowledge, i.e. where is the knowledge coming from and where does it go.

The first task relied on the partners in the project to identify and map the relevant actors in the knowledge network (i.e. knowledge holders influencing the knowledge flow to practitioners and/or to policy advisors and policy makers). A second task consisted in identifying the fields of knowledge that are relevant to design sustainable silvopastoral systems that take into account biodiversity and biological/ecological processes, based on silvopastoral practices. A third task was to understand in more detail the relevance of the knowledge that is generated and transferred between the different knowledge holders/providers and the different knowledge requesters.

## 2.3 Data bases to gather the information

The information was collected in a series of spread-sheets templates. The following material was submitted to the partners:

- 1) A glossary with definitions. The definitions about knowledge were provided and the participants were asked to provide their own understanding of '*the use of biodiversity for sustainable livestock production systems based on silvopastoral practices in Latin America*'. The definition could be formulated in English, Spanish or Portuguese (see Appendix II).
- 2) A guideline to compile information about knowledge providers, requesters and fields of knowledge about the use of biodiversity and sustainable livestock production systems based on silvopastoral practices in Latin America (Appendices III and IV)
- 3) Templates to fill in information about knowledge providers, knowledge requesters and fields of knowledge about the use of biodiversity and sustainable livestock production systems based on silvopastoral practices in Latin America. (Appendix V (A-C)).

In the first step, the partners identified national, regional and international organizations (including research institutions, projects, decision-makers, etc.) with competence in the area of biodiversity in silvopastoral systems as either knowledge providers or knowledge requesters. The partners identified first a list of organizations and filled in their roles and functions based on information available on the web on the organizations internet pages and/or their own knowledge. (See list of references and information sources). In some cases (INTA), minutes of meetings when silvopastoral issues were treated were revised.

Then, a matrix of national and regional organizations was populated, and the data were compiled into one database and checked for typing errors and inconsistencies. At a second step, the compiled databases on knowledge providers and requesters were re-submitted to the partners to make corrections, complete missing data, and for a general revision. In the second consultation round, the categories in some of the fields in the templates were refined and a few new were added.

The data received about areas and themes of knowledge was organized in a diagram (Fig. 2) following a procedure of mind-mapping, the production of a diagram to organize visually information (Edraw Mind Map free share software) and sent to the partners to check consistency with the data that had been provided and for quality check.

After the data check, the information was summarized in graphs and tables.

### 3 Knowledge providers

The assessment included a total of 154 knowledge provider organizations (Table 1, Appendix VII). The majority of the knowledge providers are in the academia, but there are various, similarly important types of organizations filling this role, including research and outreach organizations, non-governmental organizations (NGOs), and government agencies. An important part of knowledge is provided by individual projects. This diversity of knowledge sources indicates that there is probably a potential to improve the interaction among them, pointing to the need of establishing structures that can enable and facilitate exchange and learning.

*Table 1: Type of knowledge provider organizations in the countries participating in the analysis.*

Academia	30
Civil Society & NGO	17
Conference	4
Funding Agency	4
Government Agency	16
Intergovernmental Agency	5
Project – Research	16
Project - Research & Outreach	4
Project - Research and development	5
Research & Outreach Organization	22
Research Organization	14
Other (< 2 counts)	17
<b>Grand Total</b>	<b>154</b>

This impression about the need to promote knowledge exchange is further strengthened by the fact that most of the knowledge provider organizations operate at the national and subnational level (85%), and a smaller part at the regional (12%) and global (3%) levels (Fig. 1). Since many of the challenges are common, support to regional and supra-national structures that can promote knowledge exchange would most likely be very fruitful.

Despite the larger portion of knowledge providers being academic organizations, the level of activity of these organizations in the field of biodiversity in silvopastoral systems is comparatively low (Table 2). NGOs and government organizations are, in contrast, somewhat more active, and a rather large portion of research and outreach organizations seem to be little active. This could be because these themes have comparatively low priority in the research agendas, because of little funding, particularly because some of the relevant research questions require long time frames to be answered, limited technical capacity, or both, as reported by the organizations participating in the survey.

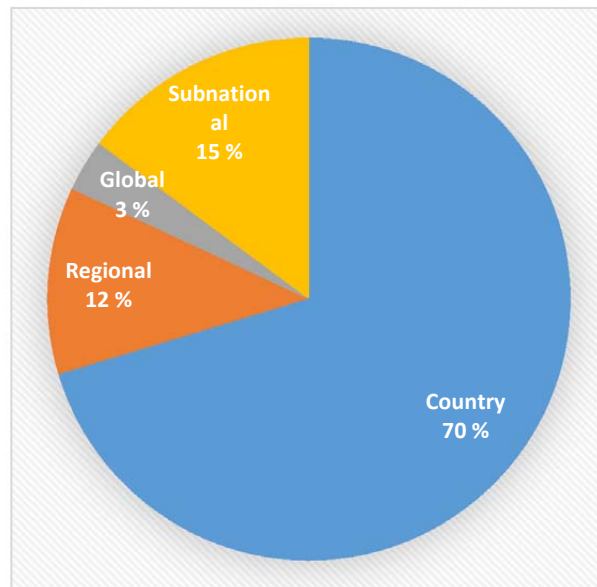


Figure 1: Operating level of knowledge provider organizations

Table 2: Level of activity of knowledge provider organizations

Count Classes of Activity					
Row Labels	Sometimes active	Active	Very active	N/A	Grand Total
Academia	9	10	4	7	30
Academia & Outreach		1		1	2
Academia & Research		1			1
Civil Society & NGO	1	6	7	3	17
Conference		1	3		4
Funding Agency		2	2		4
Government Agency	2	5	9		16
Intergovernmental Agency		4	1		5
Learned Society		1			1
Metadatabase portal			1		1
NGO			1		1
Project	3	9	8	10	30
Research & Outreach Organization	11	3	9	1	24
Research Organization	3	8	2	1	14
Science Policy Interface Body			1		1
Scientific Network	2				2
Technical High School			1		1
<b>Grand Total</b>	<b>31</b>	<b>51</b>	<b>49</b>	<b>23</b>	<b>154</b>

Table 3: Level of visibility of knowledge provider organizations

Counts of Visibility classes				
Type of organization	Frequently heard of	Sometimes heard of	N/A	Grand Total
Academia	1	22	7	30
Academia & Outreach	1		1	2
Academia & Research	1			1
Civil Society & NGO	9	4	4	17
Conference	4			4
Funding Agency	4			4
Government Agency	14	2		16
Intergovernmental Agency	4	1		5
Learned Society		1		1
Metadatabase portal	1			1
NGO	1			1
Project	11	9	10	30
Research & Outreach organization	10	13	1	24
Research Organization	9	4	1	14
Science Policy Interface Body	1			1
Scientific Network		2		2
Technical High School	1			1
<b>Grand Total</b>	<b>72</b>	<b>58</b>	<b>24</b>	<b>154</b>

Table 4: Level of influence of knowledge provider organizations in policy and decision-making

Classes of influence in policy and decision-making					
Type of organization	Little influential	Influential	Very influential	N/A	Grand Total
Academia	20	3		7	30
Academia & Outreach	1			1	2
Academia & Research		1			1
Civil Society & NGO	3	7	4	3	17
Conference		2	2		4
Funding Agency		2	2		4
Government Agency	1	7	8		16
Intergovernmental Agency		4	1		5
Learned Society	1				1
Metadatabase portal			1		1
NGO			1		1
Project	3	11	6	10	30
Research & Outreach Organization	11	6	6	1	24
Research Organization	3	9	1	1	14
Science Policy Interface Body			1		1
Scientific Network		2			2
Technical High School		1			1
<b>Grand Total</b>	<b>43</b>	<b>55</b>	<b>33</b>	<b>23</b>	<b>154</b>

## 4 Knowledge requesters

There were 60 knowledge requesters identified in the assessment (Appendix VII). The majority of the knowledge requesters are governmental organizations, followed by approximately 20 % of non-governmental organizations (Table 5). Very few academic and research and outreach organizations are seen as knowledge requesters. Funding agencies also seem not to be among those who request the knowledge produced. This pattern may indicate to a large extent a one-way flow of knowledge from the academic and research organizations to the main knowledge requesters, and also a disconnect between funding agencies and the knowledge providers in terms of the knowledge that is produced. There also seems to be a limited involvement of the private sector in this context. The pattern observed of involvement of the different knowledge requesters is corroborated by data on opinions about the degree of visibility of the different groups of organizations in terms of requesting knowledge (Table 6).

As in the case of the knowledge providers, most of the organizations requesting knowledge in the region do so at the national and sub-national levels (Figure 4). There appears to be a slightly higher proportion of knowledge requesters operating at the global level compared to the knowledge providers, and few knowledge requesters operating at the regional levels (beyond the national level).

Table 5: Type of knowledge requester organizations

Organization type	Counts
Academic and Research & Outreach organizations	1
Governmental organization	36
NGOs & Civil Society	13
Other: Funding agency	2
Private sector	8
<b>Total</b>	<b>60</b>

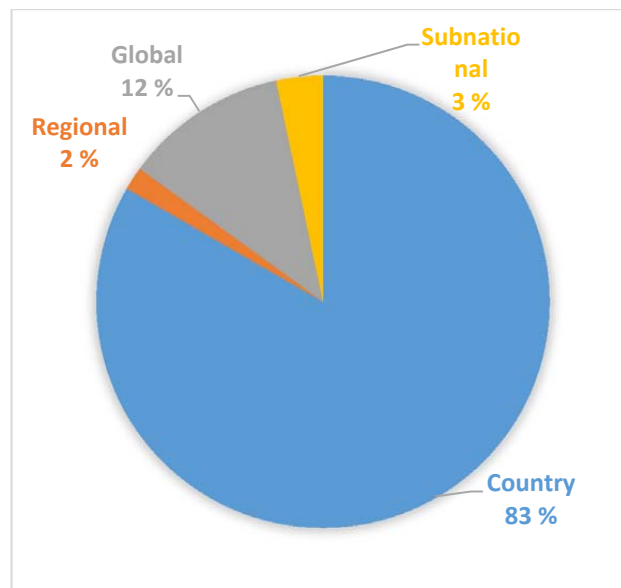


Figure 4: Operating level of knowledge requester organizations

Most of the knowledge requesters have a role related to policy formulation and implementation (Figure 5). Other roles of organizations that requested knowledge, making up to 15%, included: private advisors and professional associations, humanitarian aid and market development. There seem to be a relatively small proportion of knowledge requesters that have a role in outreach activities. These patterns may indicate a gap between the flow of knowledge produced and those implementing outreach activities and also between the level of policy formulation and that of implementation, i.e. technical assistance supporting on-the-ground implementation of practices.

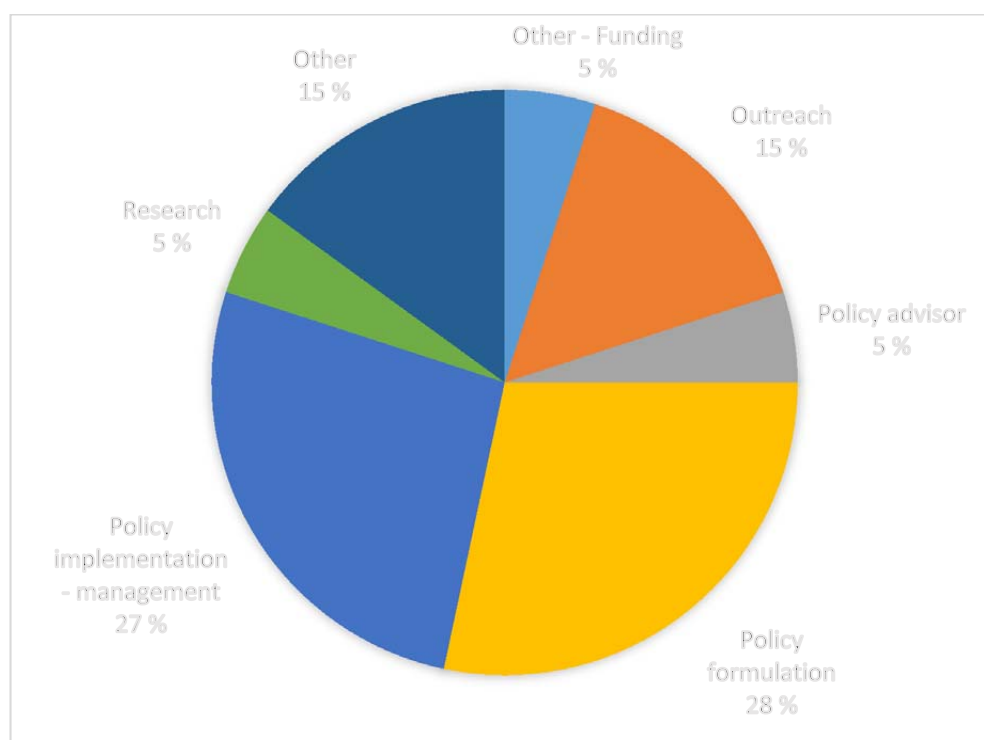


Figure 5: Main role of knowledge requester organizations included in the assessment.

Regarding the level of activity of the knowledge requester organizations, there appear to be no major differences among NGOs and other Civil Society organizations, governmental organizations and those in the private sector. Organizations operating at the regional level are few, but appear to be particularly active (Table 6). In terms of visibility, NGOs and civil society organizations have comparatively the highest visibility, and with no major differences among the other kinds of organizations (Table 7). Government organizations and NGOs and other civil society organizations were the ones with most influence on policy and decision-making processes (Table 8).

Table 6: Type of knowledge requester organization and their level of activity

Organization's main role	Sometimes active	Active	Very active	Grand Total
Extension and research		1		1
Other - Funding	1	2		3
Other - Private advisors, association of professionals	2			2
Other: Humanitarian aid		1		1
Other: Market development			1	1
Outreach	2	5	2	9
Policy advisor	2	1		3
Policy formulation	1	10	6	17
Policy implementation			1	1
Policy implementation - management	7	3	6	16
Research		2	1	3
Research and education		2		2
Technical assistance		1		1
<b>Grand Total</b>	<b>15</b>	<b>28</b>	<b>17</b>	<b>60</b>

Table 7: Type of knowledge requester organization and their visibility

Organization's main role:	Frequently heard of	Sometimes heard of	Grand Total
Extension and research		1	1
Other - Funding	1	2	3
Other - Private advisors, association of professionals		2	2
Other: Humanitarian aid	1		1
Other: Market development	1		1
Outreach	7	2	9
Policy advisor		3	3
Policy formulation	16	1	17
Policy implementation	1		1
Policy implementation - management	7	8	15
Research	3		3
Research and education	1	1	2
Technical assistance	1		1
<b>Grand Total</b>	<b>39</b>	<b>20</b>	<b>59</b>



*Table 8: Type of knowledge requester organization and their degree of influence in policy and decision-making processes*

Organization's main role	Little in- fluential	Influential	Very in- fluential	N/A	Grand To- tal
Extension and research		1			1
Other - Funding	1	2			3
Other - Private advisors, association of professionals	2				2
Other: Humanitarian aid		1			1
Other: Market development			1		1
Outreach	2	5	1	1	9
Policy advisor		2	1		3
Policy formulation		8	9		17
Policy implementation			1		1
Policy implementation - management	3	9	3	1	16
Research		2	1		3
Research and education	1		1		2
Technical assistance		1			1
<b>Grand Total</b>	<b>9</b>	<b>31</b>	<b>18</b>	<b>1</b>	<b>60</b>

## 5 Fields of knowledge

A broad range of knowledge areas are considered important to adapt and transform current production systems and to search for new nature-based production alternatives (Figure 6). Within the broad knowledge areas, some fields are considered of particular importance. Some key elements that emerge from the assessment include: i) discipline-specific knowledge (genetics, ecological interactions, micro-economy) hand-in-hand with knowledge integrated across disciplines (ecosystem services, environmental footprint) , ii) several fields show the integration of science and other knowledge sources with applications (i.e. technical solutions, value chains, sustainability science, ecosystem services), iii) integration of knowledge across levels and sources (adaptation and learning, management learning, decision-support methodologies).

It is therefore important that those forums that enable exchange and learning are thought to promote the needed exchange at appropriate levels. They also need to enable a flow between science and applications and technical solutions, including, but not only, the communication between science and policy.

Themes within ecology and livestock production were the ones most often mentioned as important to transform current production systems (Table 8). Knowledge on livestock production was considered to be most influential to policies directed to promote sustainable livestock production (Table 9) whereas themes within both ecology and livestock production were considered influential to environmental policies, including those directed to climate change mitigation and adaptation (Table 11). These patterns indicate the importance of promoting structures that enable knowledge flow across sectors with the aim of reaching a common understanding of the challenges and of new opportunities for change.

*Table 9: Number of times that the fields of knowledge were mentioned in the assessment.*

Fields of knowledge	Counts
Ecology (incl. landscape ecology)	22
Earth Sciences (other)	3
Soil fertility	1
Climate change	1
Livestock Production	12
Agro-silvo-pastoral techniques	1
Food security - human nutrition	1
Food security - human nutrition	1
Economy	5
Multidisciplinary approach	1
Socio-ecological science	5
Policies and instruments	3
Communication and outreach	1
<b>Grand Total</b>	<b>56</b>

*Table 10: Number of times that the field of knowledge was considered to have an impact in current formulation of policies and policy instruments aiming at sustainable livestock production systems (including Silvopastoral systems)*

Fields of Knowledge	Little influential	influ- Influential	Very influen- tial	Total
Ecology (incl. landscape ecology)	5	11	6	<b>22</b>
Earth Sciences (other)		2	1	<b>3</b>
Soil fertility			1	<b>1</b>
Climate change			1	<b>1</b>
Livestock Production	2	1	9	<b>12</b>
Agro-silvo-pastoral techniques		1		<b>1</b>
Food security - human nutrition		1		<b>1</b>
Economy		2	3	<b>5</b>
Multidisciplinary approaches			1	<b>1</b>
Socio-ecological science	3	1	1	<b>5</b>
Policies and instruments		1	2	<b>3</b>
Communication and outreach			1	<b>1</b>
<b>Total</b>	<b>10</b>	<b>20</b>	<b>26</b>	<b>56</b>

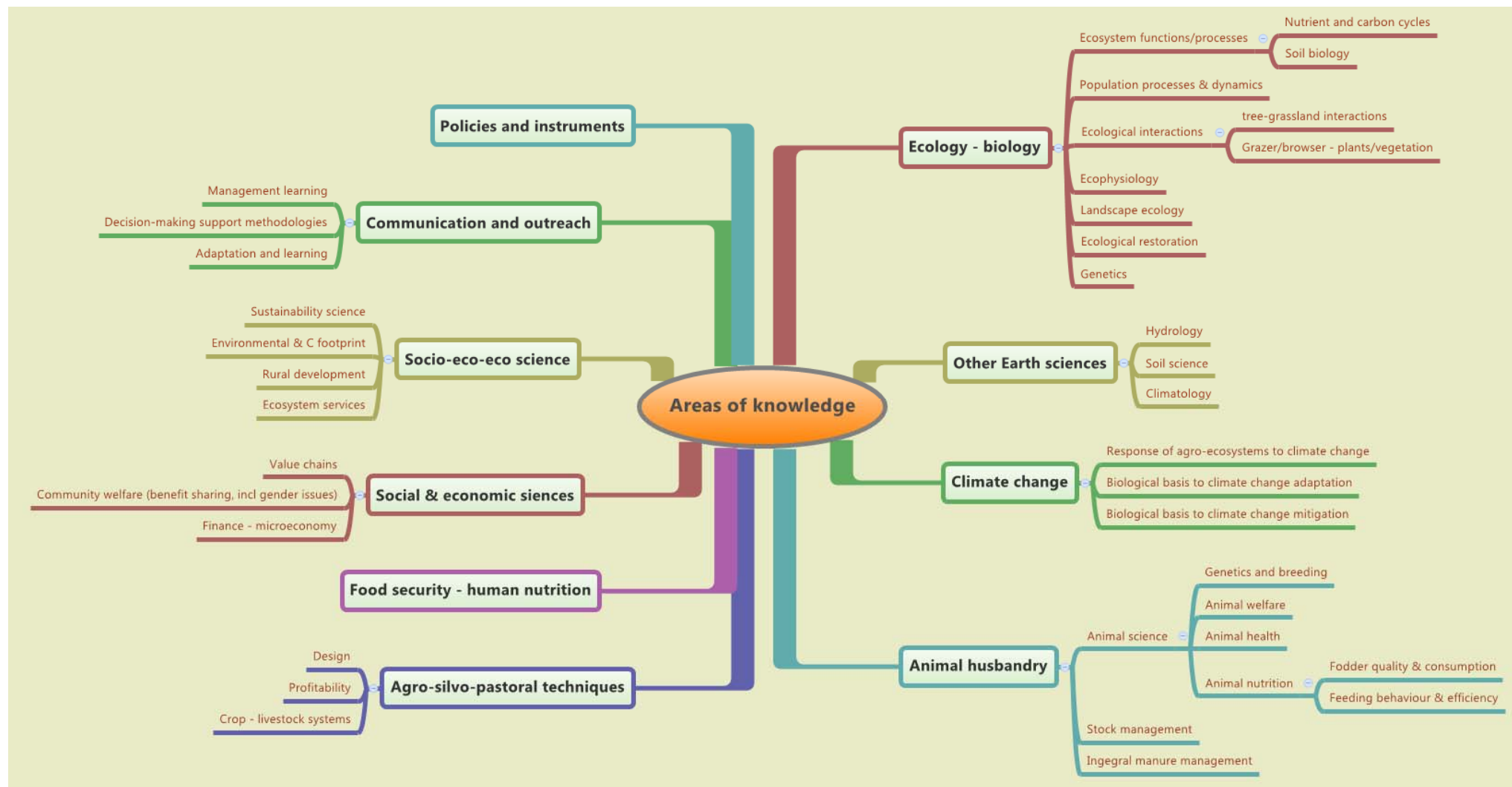


Figure 10: Areas of knowledge that were considered relevant for the design and implementation of ecologically, socially and economically sustainable silvopastoral systems in the region

*Table 11: Times that the field of knowledge was considered to have an impact in current formulation of policies and policy instruments aiming at environmental protection, including climate change mitigation and adaptation actions*

Fields of knowledge	Little influential	influential	Very influential	N/A	Total
Ecology (incl. landscape ecology)	5	6	11		<b>22</b>
Earth Sciences (other)			3		<b>3</b>
Soil fertility			1		<b>1</b>
Climate change			1		<b>1</b>
Livestock Production	2	1	9		<b>12</b>
Agro-silvo-pastoral techniques			1		<b>1</b>
Food security - human nutrition		1			<b>1</b>
Economy	2		2	1	<b>5</b>
Multidisciplinary approaches			1		<b>1</b>
Socio-ecological science	2	1	2		<b>5</b>
Policies and instruments			3		<b>3</b>
Communication and outreach			1		<b>1</b>
<b>Grand Total</b>	<b>11</b>	<b>9</b>	<b>35</b>	<b>1</b>	<b>56</b>

## 6 Relevance of the network for IPBES

At the global level, efforts by the international community to operationalize the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES) have led to its official launch in April 2012 (see <http://www.ipbes.net>). Since 2012 a work programme and working bodies, including a Bureau to guide the work in-between plenary sessions and a Multidisciplinary Expert Panel to guide the scientific work, have been developed, established and adopted.

There is a common agreement that many topics related to biodiversity and ecosystem services need to be tackled at the regional, national and even local level and that these scales need to be taken into account in global efforts. The lack of a sufficient understanding of the local conditions, of the challenges and possible, feasible and desirable place-based solutions, in agreement with local needs has been considered as severe hindrances to successful bilateral aid programs (Ramalingam 2013). To be successful, future capacity building endeavours need to address the local realities of both knowledge providers and requesters, and the capacities to produce and use knowledge; and direct efforts to promote learning as opposed to facilitating flows of knowledge. Accordingly, targeting activities that enable exchange and mutual learning would likely be a considerably effective support measure which could be provided by IPBES. Exchange at the regional level in Latin America has the advantage of a common language (knowledge sharing in Spanish, for instance, is still a pre-requisite for exchange to occur for a majority of the knowledge providers and of end-users in the region), and of sharing problems and similar ecological conditions. Support to this kind of networks, that include contact points with global networks, would most likely help advance the addressing of sustainability issues which affect a considerable portion of the livestock sector in Latin America. The organization of knowledge holders on silvopastoral practices in Latin America could be valuable in the context of the development of IPBES, and could provide a platform to build on a cross-sectorial regional support body for IPBES.

One of the four functions of IPBES is to “Prioritize and enable key capacity-building needs to improve the science-policy interface at appropriate levels” (paragraph 1 in Appendix I to Annex I in UNEP/IPBES.MI/2/9, available at [www.ipbes.net](http://www.ipbes.net)). Concrete activities to implement this function could be 1) the establishment of a regional task force on capacity-building, 2) convene regularly a forum on the issue, 3) develop a programme of fellowships, exchange and training programs, and 4) invite Platform members and observers to submit statements of their capacity-building needs directly related to the implementation of the Platform’s work program for the period 2014-2018 (see first work programme of IPBES UNEP/IPBES/2/4, available at [www.ipbes.net](http://www.ipbes.net)).

We therefore foresee that the IPBES processes can play a critical role in this context by contributing to:

- Support for **building the knowledge base on sustainable livestock production** through ecological intensification (in line with Sub global Assessment and the European Commission ‘Mapping and Assessment of Ecosystems and their Services (MAES), see <http://www.ecosystemassessments.net/>; Teller 2014, European Commission, 2014).
- **Enable the full-participation of the local research capacities in the IPBES** process. This would include identifying critical challenges.
- **Facilitate the transformation to sustainable solutions** by bridging knowledge-policy-management gaps. Lessons learned in one place are often not replicable, because of the high degree of context dependency of the problems and the complexity of socio-ecological systems (Ramalingam 2013). Hence, spaces that gather a plurality of knowledge holders (across knowledge areas and geographical and administrative borders), and networks that foster exchange of knowledge and learning are likely to be more fruitful than simply copying ‘best practices’ and duplicating experiences from other regions (Ramalingam 2013).
- Achieve **a common understanding across sectors** of the challenges about biodiversity loss and ecosystem degradation by addressing the sector-wise relevant problems, and providing opportunities for mutual exchange and learning. Cross-sector and cross-disciplinary networks have the potential to facilitate the understanding of different mind-sets, values, interests, paradigms, methodological approaches, and ultimately to reach a common understanding about the kind of solutions that are required to achieve sustainable solutions.

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## 7 From pilot study to operationalization phase of the network

The capacity building component is especially important for regions such as Latin America where (scientific) knowledge on silvopastoral practice is scattered. Capacity building activities would strengthen the community of knowledge holders and its ability to participate in fellowships, exchange and training programmes by creating an environment for exchange. The Network could support building a common research and development agenda with the aim of understanding the functioning of silvopastoral systems and their drivers of change (i.e. biophysical causes as well as the socio-economic factors underlying choices about land-use and livestock production systems); with the ultimate goal of transforming livestock production systems in the region. Coordinated actions could help avoid duplication of efforts and resource use, at the same time that it would foster exchange and learning. It would also help identify and evaluate alternatives of Information and Communication Technology (ICT) to disseminate successful experiences and knowledge. Knowledge exchange and knowing where knowledge is available can also help these practices to get more profound in the political agenda.

Currently, there is a gap (local and regional) as to where the different stakeholders involved in the livestock production sectors can search for experiences and scientific knowledge; each country holds a considerable amount of knowledge, which is accessible to few. A network consisting of knowledge providers and users serves as a basis to improve access to their knowledge.

## 8 References and sources of information

Agencia Alemana de Cooperación Técnica (GIZ). Available at:  
<http://www.giz.de/en/worldwide/396.html>

Agencia Danesa de Desarrollo Internacional (DANIDA). Available at:  
<http://www.giz.de/en/worldwide/396.html>

Agencia Suiza para el Desarrollo y la Cooperación (COSUDE). Available at: <http://www.cooperacion-suiza.admin.ch/nicaragua/>

Aldy, J. E; Hrubovcak, J; Vasavada, U. 1998. The role of technology in sustaining agriculture and the environment. *Ecological Economics* 26:81-96.

Alonzo, Y; brahim,M. 2001. Potential of silvopastoral systems for economic dairy production in Cayo, Belize and constraints for their adoption. In Ibrahim, M. ed. *International Symposium on Silvopastoral Systems and Second Congress on Agroforestry and Livestock Production in Latin América*. (2001, San Jose, CR). Memoria. CATIE. p. 465-470.

Asociación Cubana de Producción Animal (ACPA). Available at: [http://www.ecured.cu/index.php/Asociación\\_Cubana\\_de\\_Producción\\_Animal](http://www.ecured.cu/index.php/Asociación_Cubana_de_Producción_Animal)

Asociación Latinoamericana de Producción Animal (ALPA). Available at:  
<http://www.alpa.org.ve/acerca.html>

Asociación para la diversificación y el desarrollo agrícola communal (ADAC). Available at:  
<http://www.addac.org.ni/>

Balian, E., A. Berhault, L. Jones-Walters, A. Torre-Marin, C. Neßhöver, and M. Vandewalle. 2012. Overview of experts and requesters of a potential NoK: Mapping knowledge holders, identifying requesters and barriers on how to link them. KNEU Project, Deliverable 1.1. pp 76.

Bernasconi, P. 2013. Custo-efetividade ecológica da compensação de reserva legal entre propriedades no estado de São Paulo. Universidade Estadual de Campinas.

Betancourt, K; Ibrahim, M Harvey, C. y Vargas, B. 2003. Efecto de la cobertura arbórea sobre el comportamiento animal en fincas ganaderas de doble propósito en Matiguás, Matagalpa, Nicaragua. *Revista Agroforestería en las Américas* 10(39-40):47-51.

Broom DM, Galindo FA, Murgueitio E. 2013 Sustainable, efficient livestock production with high biodiversity and good welfare for animals. *Proc R Soc B* 280: 20132025.

Bruntland Report (WCED 1987) <http://www.fao.org/docrep/w7541e/w7541e04.htm>

Cámara Nacional de Productores de Leche de Costa Rica (CNPL). <http://www.proleche.com>



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Calle, Z., E. Murgueitio, J. Chará, C. H. Molina, A. F. Zuluaga, and A. Calle. 2013. A strategy for scaling-up intensive silvopastoral systems in Colombia. *Journal of Sustainable Forestry* 32:1-17.

Casals, P., J. Romero M., G. M. Rusch, and M. Ibrahim. 2013. Soil organic C and nutrient contents under trees with different functional characteristics in seasonally dry tropical silvopastures. *Plant and Soil* 374:643-659.

Catholic Relief Services (CRS). Available at: <http://www.crsespanol.org/quienes-somos/nuestra-mision>

Centro Agronómico Tropical de Investigación y Enseñanza (CATIE). Available at: [www.catie.ac.cr](http://www.catie.ac.cr)

Centro de Investigaciones para el Mejoramiento Animal de la Ganadería Tropical (CIMAGT).

Centro Internacional de Agricultura Tropical (CIAT). Available at: <http://ciat.cgiar.org/es/nosotros>

Centro Nacional de Tecnología Agropecuaria y Forestal (CENTA). Available at: [http://www.ecured.cu/index.php/Centro\\_de\\_Investigaciones\\_para\\_el\\_Mejoramiento\\_Animal\\_de\\_la\\_Ganader%C3%ADa\\_Tropical](http://www.ecured.cu/index.php/Centro_de_Investigaciones_para_el_Mejoramiento_Animal_de_la_Ganader%C3%ADa_Tropical); <http://www.catec.cu/index.php?cat1=5>

CIPAV - <http://www.cipav.org.co/>

Colegio de la Frontera Sur (ECOSUR). Available at: <http://www.ecosur.mx/>

Collins English Dictionary – Complete & Unabridged 10th Edition 2009, accessed April 2014

Comisión Nacional Ganadera de Nicaragua (CONAGAN). Available at: <http://conagan.wordpress.com/about/>

Comisión Trinacional del Plan Trifinio (Comisión Trinacional del Plan Trifinio). Available at: [http://www.sica.int/trifinio/ctpt/breve\\_ctpt.aspx?IdEnt=140](http://www.sica.int/trifinio/ctpt/breve_ctpt.aspx?IdEnt=140)

Consejo Agropecuario Centroamericano (CAC). Available at: <http://www.sica.int/cac/>

Convention on Biological Diversity (CBD) Convention on Biological Diversity (CBD). Aichi targets 4, 7 & 13 <http://www.cbd.int/sp/targets/> Accessed April 2014.

Cooperativa de Productores de Leche Dos Pinos R.L (Dos Pinos). Available at: [http://www.dospinos.com/app/cms/www/index.php?id\\_menu=30](http://www.dospinos.com/app/cms/www/index.php?id_menu=30)

Corporación de Fomento Ganadero de Costa Rica (CORFOGA). Available at: <http://corfoga.org/quienes-somos/?animacion=1>

Delgado, C., M. Rosengrant, H. Steinfeld, S. Ehui, and C. Courbois. 1999. Livestock to 2020. The next food revolution. International Food Policy Research Institute (IFPRI), Food and Agriculture Organization of the United Nations (FAO), International Livestock Research Institute (ILRI), Washington, DC, USA. Rome, Italy

Nairobi, Kenya. Dirección de Ciencia y Tecnología Agropecuaria (DICTA). Available at: <http://www.dicta.hn/>

Escuela Agrícola Panamericana (El Zamorano). Available at: <http://www.zamorano.edu/>

Escuela de Agricultura de la Región Tropical Húmeda (EARTH). Available at: <http://www.earth.ac.cr/?lang=ES>

Estación Experimental de Pastos y Forrajes "Indio Hatuey". Available at: <http://www.ihatuey.cu/>

Estrategia Centroamericana de Desarrollo Rural Territorial (ECADERT). Available at: <http://www.magfor.gob.ni/descargas/planes/ECADERT.pdf>

Estrategia Regional Agro-ambiental y de Salud (ERAS). Available at: <http://www.magfor.gob.ni/descargas/planes/ERAS.pdf>

European Commission 2014. Mapping and Assessment of Ecosystems and their Services. Indicators for ecosystem assessments under Action 5 of the EU Biodiversity Strategy to 2020. 2nd Report.

Facultad de Medicina Veterinaria y Zootecnia de la Universidad San Carlos de Guatemala (FMVZ-USAC). Available at: [http://www.usac.edu.gt/principal\\_dua.php?f=veterinaria](http://www.usac.edu.gt/principal_dua.php?f=veterinaria)

Facultad Regional Multidisciplinaria de Estelí- UNAN Managua (FAREM/Estelí). Available at: <http://www.farem.unan.edu.ni/>

Federación Nacional de Agricultores y Ganaderos de Honduras (FENAGH). Available at: [www.fenagh.ne](http://www.fenagh.ne)

FUNCiTREE 2013. FUNCiTREE Final report, Issue no. 11. Trondheim, Norway. 37 pp. Available at: [funcitree.nina.no/](http://funcitree.nina.no/)

Harvey, C.A; Sáenz, J. 2008. Prefacio de evaluación y conservación de biodiversidad en paisajes fragmentados de Mesoamérica. Eds. C.A Harvey; J Sáenz. *In* Evaluación y conservación de biodiversidad en paisajes fragmentados de Mesoamérica. 1era ed. Santo Domingo de Heredia, CR. INBIO. 9 – 11 p.

Harvey, C.A; Alpízar, F; Chacón, M; Madrigal, R. 2005. Assessing linkages between agriculture and biodiversity in Central America: historical overview and future perspectives. Mesoamerican and Caribbean Region, Conservation Science Program. The Nature Conservancy (TNC), San José, CR. 140 p.

Harvey, C. A. 2008. Prefacio de evaluación y conservación de biodiversidad en paisajes fragmentados de Mesoamérica. Pages 9-11 in C. A. Harvey and J. Sáenz, editors. Evaluación y conservación de

biodiversidad en paisajes fragmentados de Mesoamérica. INBio, Santo Domingo de Heredia, Costa Rica.

Harvey, C. A., M. Chacón, C. I. Donatti, E. Garen, L. Hannah, A. Andrade, L. Bede, D. Brown, A. Calle, J. Chara, C. Clement, E. Gray, M. H. Hoang, P. Minang, A. M. Rodríguez, C. Seeberg-Elverfeldt, B. Semroc, S. Shames, S. Smukler, E. Somarriba, E. Torquebiau, J. van Etten, and E. Wollenberg. 2014. Climate-smart landscapes: opportunities and challenges for integrating adaptation and mitigation in tropical agriculture. *Conservation Letters* 7:77-90.

Harvey, CA; Villanueva, C; Esquivel, H; Gómez, R; Ibrahim, M; Martínez, J; Muñoz, D; Restrepo, C; Villacís, J; Sáenz, J; Sinclair, F. 2011. Conservation value of dispersed tree cover threatened by pasture management. *Forest Ecology and Management* 261(10):1664-1674.

Heifer Internacional (HI). Available at: <http://www.heifer.org/ending-hunger/our-work/index.html>

Ibrahim, M; Villanueva, C; Casasola, F. 2007. Sistemas silvopastoriles como una herramienta para el mejoramiento de la productividad y rehabilitación ecológica de paisajes ganaderos en Centroamérica. *Prod. Anim. Vol. 15 (Supl. 1)*. 73-87.

Ibrahim, M; Harvey, C. 2003. Diseño y manejo de la cobertura arbórea en fincas ganaderas para mejorar las funciones productivas y brindar servicios ambientales. *Agroforestería en las Américas* 10(39-40):4-5.

Instituto de Ciencia y Tecnología Agrícola (ICTA). Available at: <http://www.icta.gob.gt/>

Instituto Dominicano de Investigaciones Agropecuarias y Forestales (IDIAF). Available at: [http://www.idiaf.gov.do/el\\_instituto/el\\_idiaf.php](http://www.idiaf.gov.do/el_instituto/el_idiaf.php)

Instituto Interamericano de Cooperación para la Agricultura (IICA). Available at: <http://www.iica.int>

Instituto Internacional en Conservación y Manejo de Vida Silvestre (ICOMVIS/UNA). Available at: <http://www.icomvis.una.ac.cr/>

Instituto de Investigaciones Agropecuarias de Panamá (IDIAP). Available at: <http://www.idiap.gob.pa/>

Instituto de Investigación y Desarrollo (NITLAPAN/UCA). Available at: <http://www.nitlapan.org.ni/site/es/acerca-de-nitlapan/quienes-somos.html>

Instituto Nacional de Innovación y Transferencia de Tecnología Agropecuaria (INTA/Costa Rica). Available at: <http://www.inta.go.cr>

Instituto Nacional de Tecnología Agropecuaria (INTA Argentina) 2009. Actas 1er Congreso Nacional de Sistemas Silvopastoriles. CD, ISBN -978-987-521-350-0

Instituto Nacional de Tecnología Agropecuaria (INTA Argentina) 2012. Actas 2 do Congreso Nacional de Sistemas Silvopastoriles. Ed INTA, 488pp. ISBN 978-987-679-123-6

Instituto Nicaragüense de Tecnología Agropecuaria (INTA/Nicaragua). Available at: [www.inta.gob.ni](http://www.inta.gob.ni)

Instituto para la Cooperación y Autodesarrollo (ICADE). Available at: <http://www.icadehonduras.org>

Instituto Técnico de Capacitación y Productividad (INTECAP). Available at: <http://www.intecap.edu.gt/>

Kaimowitz, D. 2001. Will live stock intensification help save Latin America's Tropical Forest? In: Angelsen; Kaimowitz, D. (Ed.) *Agricultural Technologies and Tropical Deforestation*. Wallingford, UK, CABI. p 1-20.

KNEU project. BiodiversityKnowledge project. <http://www.biodiversityknowledge.eu/project>

Larigauderie, A., A.-H. Prieur-Richard, G. M. Mace, M. Lonsdale, H. A. Mooney, L. Brussaard, D. Cooper, W. Cramer, P. Daszak, S. Diaz, A. Duraiappah, T. Elmqvist, D. P. Faith, L. E. Jackson, C. Krug, P. W. Leadley, P. Le Prestre, H. Matsuda, M. Palmer, C. Perrings, M. Pulleman, B. Reyers, E. A. Rosa, R. J. Scholes, E. Spehn, B. L. Turner, II, and T. Yahara. 2012. Biodiversity and ecosystem services science for a sustainable planet: the DIVERSITAS vision for 2012-20. *Current Opinion in Environmental Sustainability* 4:101-105.

Leach, M. New Director Blog at IDS. <http://www.developmenthorizons.com/2014/04/new-director-blog-from-melissa-leach-at.html> Accessed April 2014.

León G, J. A. 2006. Conocimiento local y razonamiento agroecológico para toma de decisiones en pasturas degradadas en El Petén Guatemala. MSc thesis, Turrialba, Costa Rica, CATIE. 100 pp.

Mercados Centroamericanos para la biodiversidad (Proyecto CAMBIO). Available at: [www.proyecto-cambio.org](http://www.proyecto-cambio.org)

Ministerio Agropecuario y Forestal (MAGFOR). Available at: <http://www.magfor.gob.ni>

Ministerio de Agricultura y Ganadería (MAG). Available at: <http://www.mag.go.cr>

Ministerio de la Agricultura (MINAGRI). Available at: <http://www.minag.cu>; [http://www.ecured.cu/index.php/Ministerio\\_de\\_la\\_Agricultura](http://www.ecured.cu/index.php/Ministerio_de_la_Agricultura)

Ministerio de Agricultura, Ganadería y Alimentación (MAGA). Available at: <http://web.maga.gob.gt/historia/>

Ministerio de Ciencia, Tecnología y Medio Ambiente (CITMA). Available at: <http://www.medioambiente.cu/>

Ministerio de Desarrollo Agropecuario (MIDA). Available at: <http://www.mida.gob.pa/>

Ministerio de Agricultura. Available at: <http://www.agricultura.gob.do>

Ministerio de Agricultura y Ganadería. Available at: <http://www.mag.gob.sv>

Montagnini, F., M. Ibrahim, and E. Murgueitio. 2013. Silvopastoral systems and climate change mitigation in Latin America. *Bois et Forêts des Tropiques* 316:5-18.

Mulder, C., F. S. Ahrestani, M. B. Bahn, D. A. Bohan, M. Bonkowski, B. S. Griffiths, R. A. Guichard, J. Kattge, P. H. Krogh, S. Lavorel, O. T. Lewis, G. Mancinelli, S. Naeem, J. Peñuelas, H. Poorter, P. Reich, L. Rossi, G. M. Rusch, J. Sardans, and I. J. Wright. 2013. Connecting the green and brown worlds: Allometric and stoichiometric predictability of above- and below-ground networks. Pages 69-175 in G. Woodward and D. A. Bohan, editors. *Ecological Networks in an Agricultural World*. Elsevier, Academic Press.

Murgueitio, E., Calle, Z., Uribe, F., Calle, A. and Solorio, B. 2011. Native trees and shrubs for the productive rehabilitation of tropical cattle ranching lands. *Forest Ecology and Management* 261: 1654-1663. doi:10.1016/j.foreco.2010.09.027.

Niemeyer, R. J., A. K. Fremier, R. Heinse, W. Chavez, and F. A. J. DeClerck. 2014. Woody Vegetation Increases Saturated Hydraulic Conductivity in Dry Tropical Nicaragua. *Vadose Zone Journal* 13. *Ologies & Isms*. Copyright 2008 The Gale Group, Inc.

Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO). Available at: <http://www.fao.org/home/es/>

Ospina, S., G. M. Rusch, D. A. Pezo, F. Casanoves, and F. L. Sinclair. 2012. More stable productivity of semi natural grasslands than sown pastures in a seasonally dry climate. *Plos One* 7:e35555.

Paciullo, D. S. C., C. R. T. de Castro, C. A. D. Gomide, R. M. Mauricio, M. D. A. Pires, M. D. Muller, and D. F. Xavier. 2011. Performance of dairy heifers in a silvopastoral system. *Livestock Science* 141:166-172.

Pérez Almario, N; Ibrahim, M; Villanueva, C; Skarpe, C; Guerin, H. 2013. Diversidad forrajera tropical. 1. Selección y uso de leñosas forrajeras en sistemas de alimentación ganadera para zonas secas de Nicaragua. *Agroforestería en las Américas* 50:37-43.

Programas del Fondo Nacional de Financiamiento Forestal (FONAFIFO). Available at: <http://www.fonafifo.go.cr>

Ranganathan, J., R. J. R. Daniels, M. D. S. Chandran, P. R. Ehrlich, and G. C. Daily. 2008. Sustaining biodiversity in ancient tropical countryside. *Proceedings of the National Academy of Sciences of the United States of America* 105:17852-17854.

Programa de ganadería (GAMMA). Lista de proyectos. Available at: <http://catie.ac.cr/index.php/es/en-que-trabajamos/ganaderia-sostenible/proyectos>

Rusch, G. M., P. Zapata, F. Casanoves, P. Casals, M. Ibrahim, and F. DeClerck. 2014. Determinants of grassland primary production in seasonally-dry silvopastoral systems in Central America. *Agroforestry Systems*:517–526.

Save the Children (Save the Children). Available at: <http://www.savethechildren.org.ni/>

Secretaria de Agricultura y Ganadería (SAG). Available at: <http://www.sag.gob.hn/>

Secretaría de Agricultura, Ganadería, Desarrollo rural, Pesca y Alimentación (SAGARPA). Available at: <http://www.sagarpa.gob.mx>

Secretaria de Medio Ambiente y Recursos Naturales (SEMARNAT). Available at: <http://www.semarnat.gob.mx>

Steffen, W., A. Persson, L. Deutsch, J. Zalasiewicz, M. Williams, K. Richardson, C. Crumley, P. Crutzen, C. Folke, L. Gordon, M. Molina, V. Ramanathan, J. Rockström, M. Scheffer, H. J. Schellnhuber, and U. Svedin. 2011. The Anthropocene: From Global Change to Planetary Stewardship. *Ambio* 40:739-761.

Soluciones Empresariales para la Pobreza (TECHNOSERVE). Available at: <http://www.technoserve.org/about-us>; <http://www.technoserve.org/blog/tag/Nicaragua>

Szott, L; Ibrahim, M; Beer, J. 2000. The hamburger connection hangover: cattle pasture land degradation and alternative land use in Central America. Serie Técnica. Informe Técnico/CATIE; no. 313. CATIE, Costa Rica. 71 p.

The Nature Conservancy (TNC). Available at: <http://www.mundotnc.org/>

Universidad de Costa Rica (UCR). Available at: <http://www.ucr.ac.cr/>

Universidad Nacional Agraria (UNA). Available at: [www.una.edu.ni](http://www.una.edu.ni)

Universidad de Panamá. Available at: <http://www.up.ac.pa/PortalUp/index.aspx>

Universidade Federal de São João Del Rei – Brazil, <http://www.ufsj.edu.br/ppbe/>

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## 9 Appendices

### Appendix I – Definition of concepts addressed in the report.

#### **Biodiversity**

The word 'biodiversity' is a contraction of biological diversity. We follow the definition of UNEP-WCMC that states "...diversity is a concept which refers to the range of variation or differences among some set of entities; biological diversity thus refers to variety within the living world. The term 'biodiversity' is indeed commonly used to describe the number, variety and variability of living organisms. This very broad usage, embracing many different parameters, is essentially a synonym of 'Life on Earth' " and can be considered as 'ecological diversity'.

#### **Ecosystem**

We follow a pragmatic definition of Ecosystem with a focus on a geographic area: "any area or region regarded as a unit for ecological observation and study of the interrelationships between organisms and their environment " (Ologies & Isms 2008.). An ecosystem is "*viewed as a system of interacting and interdependent relationships and including such processes as the flow of energy through trophic levels and the cycling of chemical elements and compounds through living and nonliving components of the system*" (The American Heritage Science Dictionary 2005).

#### **Sustainable**

Capable of being maintained without exhausting natural resources or causing severe ecological damage (Collins English Dictionary 2009).

*Sustainable development* is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Bruntland Report (WCED 1987)  
<http://www.fao.org/docrep/w7541e/w7541e04.htm>

#### **Sustainable livestock production**

In this report we refer to the cattle production systems that are economically viable, socially inclusive and that do not threaten the natural resource base of the land. This means that the cattle farms are viewed and managed as a socio-ecological system taking into account biological functions in the soil, the vegetation, the grazing animals, the hydrological cycle as well as the needs and the knowledge of the farmers. (Appendix X –partners' own definition of sustainable livestock production).

#### **Information**

Data that have been processed, analysed and interpreted in a particular context (Gotret y Gutiérrez 2011), and that are systematically organized (Balian et al. 2012)

#### **Knowledge**

Is the information acquired, processed, analysed and interpreted by an individual, that is the product of his/her own experience, values, education, social environment and context (Gotret and Gutiérrez 2011).

### Knowledge hub

Any institution that is important for the flow of knowledge, e.g. a main player in knowledge production/provision, or in knowledge requesting, or in both.

### Traditional knowledge

The concept of traditional knowledge has many different dimensions, but common notions are that it is "a cumulative body of knowledge, know-how, practices and representations maintained and developed by peoples with extended histories of interaction with the natural environment" (ICSU 2002). These kinds of are crucial for the subsistence and survival and are generally based on accumulations of empirical observation and interaction with the environment (León 2006).

### Knowledge on the use of biodiversity of sustainable livestock production

Any information that has been processed to support dialogue on the use of biodiversity for sustainable livestock production and for better decision making. This includes information from a wide range of disciplines, and from practical (management) and experience, as well as scientific knowledge.

### Knowledge provider

People and institutions that possess relevant knowledge in various areas of expertise, including scientists from different fields, practitioners of livestock management, extensionists, administrative bodies, companies, NGOs and indigenous and local people; and which redistribute their knowledge (either generated by themselves (source) or gained from a source (relay) or combined between new and gained knowledge) to either a restricted number of users or multiple users (Ref KNEW).

### Knowledge requester

People and institutions responsible for management and policy strategies on sustainable livestock production and management of Ecosystem Services in Latin America that request knowledge related to their responsibility (Ref KNEW).

### Funding organization

Any institution that may have an influence on providing or the requesting of knowledge through a flow of money.

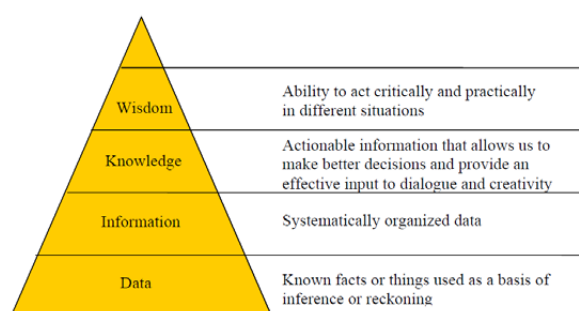


Figure 1: Source, Balian et al. 2012



## Appendix II – Definitions provided by participants about the use of biodiversity for sustainable livestock production.

*“Este enfoque permite el desarrollo de sistemas ganaderos competitivos, socialmente inclusivos y que restauran y mantienen la base de recursos naturales tanto dentro como fuera de la finca. La diversidad vegetal (herbáceas como leñosas) juega un rol relevante en la optimización de las funciones productivas y diversificación de productos del sistema; además, de los múltiples beneficios ambientales como conservación de la biodiversidad, secuestro de carbono, protección de suelo y ciclo hidrológico que son la base para la adaptación y mitigación al cambio climático. Por otro lado, este modelo de producción apuesta a mantener o reducir el área dedicada a la ganadería, sin descuidar la atención en la demanda de los productos ganaderos, lo cual permite la liberación de áreas críticas con mayor potencial para la generación de servicios ecosistémicos.”*

*“Variedad genética (incluyendo especies); de comunidades, paisajes y ecosistemas que conforman la biota de una región y que están directa o indirectamente, relacionados con los sistemas productivos agropastoriles, y que puede modificar las funciones de dichos sistemas o su estructura o dinámica ser modificados por estos.”*

*“Hace referencia a la inclusión en forma predeterminada, sistemática o aleatoria de elementos de especies de la flora o fauna, en los diferentes sistemas de producción agrícola y pecuaria, generando medios de vida para los productores, que les permite construir sistemas productivos sostenibles.”*

*“Aprovechamiento de la oferta biológica de la finca y de la matriz de paisaje (esto incluye, un número amplio de especies, los genes que ellas contienen y los distintos escalas de paisaje en donde se encuentran) donde la ganadería es el elemento base de una actividad ecoómica rentable y amigable con el medio ambiente, mediante la cual los productores y sus familias se mantienen orgullosos de su rol en la sociedad rural con un alcance temporal de largo plazo.”*

*“Producción basada en sistemas integrados (agrícola-pecuario-forestal) que garantiza que la ganadería es el elemento base de una actividad socioeconómica rentable y amigable con el medio ambiente, mediante la cual los productores ganaderos y sus familias se mantienen motivados y orgullosos de su rol en la sociedad rural con un alcance temporal de largo plazo. (Definición Corpoica Agrosilvopastoral project 2013-2017).”*

## Appendix III - Guidelines to fill in the database

### Knowledge network for capacity building on the use of biodiversity for sustainable agro-silvo-pastoral systems in Latin America

#### Guideline for knowledge network mapping

To build a network of knowledge about use of biodiversity for sustainable agro-pastoral systems in Latin America, we need to review the current knowledge landscape in LA and internationally in terms of experts, existing networks and knowledge holders; and to understand the flows of knowledge in LA, i.e. where is the knowledge coming from and where does it go. The first task relies on the partners in the project to identify and map the relevant actors in a knowledge network about the use of biodiversity in livestock production systems (i.e. knowledge holders influencing the knowledge flow to practitioners and/or to policy advisors and policy makers). A second task relies on identifying fields of knowledge that are relevant to designing sustainable agro-pastoral systems that take into account biodiversity and biological processes. A third task is to understand more in detail how knowledge is generated and transferred between the different knowledge holders/providers and the different knowledge requesters.

#### Data bases to gather the information

Here we describe the steps to collect information for knowledge network mapping. Please, fill in the excel sheets attached, information about the fields follow in the headings. There are four sheets with material:

- 1) A Glossary with definitions. The definitions about knowledge are provided; see also the glossary section below. In the case of 'the use of biodiversity for sustainable agro-pastoral systems in Latin America', we ask you to fill in your own definition, or the one you use. Please, use English or Spanish/Portuguese in this case.
- 2) A sheet to fill in information about knowledge providers on the use of biodiversity and sustainable agro-silvo-pastoral systems in LA.
- 3) A sheet to fill in information about knowledge requesters (those who use information without producing it themselves).
- 4) A sheet to fill in information about fields of knowledge and themes that are relevant for the use of biodiversity in sustainable agro-silvo-pastoral systems.

#### Steps

The report that we will deliver will be based on information collected following these steps:

**Step 1: Overview of the knowledge holders, requesters and knowledge fields produced and used in the area of biodiversity for sustainable agro-pastoral systems.** The first step consists of a survey filled in by the partners to identify national, regional and international organizations (including Research Institutions, Projects, decision-makers, etc) with competence in the area of biodiversity in agro-pastoral systems as either knowledge holders or knowledge users.

**Step 2: Visualization of networks and flows of knowledge in Latin America.** Once the databases are filled in by all the partners, the material will be prepared for a second round of inputs on knowledge flows (direction, intensity, relevance).

**Step 3: Analysis and synthesis of results.** This step will consist of the reparation of the report.

## Glossary and definitions (Source: Balian et al 2012)

*Knowledge on sustainable agro-pastoral systems (Fig. 1<sup>1</sup>):* Any information that has been processed to support dialogue on sustainable agro-pastoral systems and to better decision making. This includes information from a wide range of disciplines, and from practical (management) and experience as well as from scientific knowledge.

*Knowledge provider:* People and institutions that possess relevant knowledge in various areas of expertise, including scientists from different fields, practitioners of livestock management, extensionists, administrative bodies, companies, NGOs and indigenous and local people and which redistribute their knowledge (either generated by themselves (source) or gained from a source (relay) or combined between new and gained knowledge).

*Knowledge requester:* People and institutions responsible for the management and policy strategies on sustainable agro-pastoral systems and management of ESs in LA that request knowledge related to their responsibility.

*Funding:* Any institution that may have an influence on knowledge provision or request through a flow of money.

*Knowledge hubs:* Any institution that is important for the flow of knowledge, i. e. main player in the knowledge production/provision or in knowledge requesting, or in both.

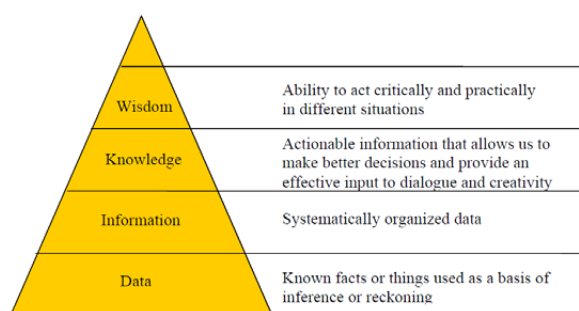


Figure 1: Source, Balian et al. 2012

<sup>1</sup> Balian et al. 2012. Overview of experts and requesters of potential networks of knowledge (NoK): Mapping knowledge holders, identifying requesters and barriers on how to link them. Biodiversity Knowledge (KNEU) project.

## Appendix IV – Guidelines to revise and upgrade database inputs.

### Knowledge network for capacity building on the use of biodiversity for sustainable agro-pastoral systems in Latin America

#### Guideline to revise the database

Please, mark any changes you make in the table with a color of the cell or the text, so that we can track the changes. Please, do not use the 'comments' function in Excel.

#### Revise knowledge providers table:

- Knowledge providers may also be knowledge requesters, and vice versa. E.g. FONAFIFO (CR) is listed as knowledge provider only, but it is also a knowledge requester.
- Please, revise your list of knowledge providers (including projects, networks, conferences, etc.). Check what other partners have filled in.
- Please check the typology of organizations suggested in Column E (Comments/changes GMR\_Type of organization, in red).
- Please check the operating level in Column G (Comments/changes GMR\_Operating level, in red).
- Please check and update the status in Column I (Comments/changes GMR\_Status, in red).
- Please, complete additional information in columns L, M and N (in green). These refer to a revised typology of how active, and/or influential the organizations are in terms of policy formulation and decision-making. There are 3 classes of activity (plus not applicable N/A), two classes of visibility (plus not applicable N/A) and 3 classes of 'influence' (plus not applicable N/A).
- Please, check missing information (question marks and empty cells).

#### Revise knowledge requesters table:

- Check whether there are knowledge providers that are also knowledge requesters, and in that case add them to the list.
- Please, double check your list of knowledge requesters. Check what other partners have filled in.
- We wish to distinguish between the type of organization and the role the organization plays. This was unclear in the previous step. Apologies for this! Please, fill in columns E, F and G (in green). Column E, (new) organization typology, the MAIN role (column F) and secondary roles (Column G). Please, if more than one secondary role, separate them with a semi-colon (;).
  - o Organization:
    - governmental organization (national, local, and other authorities)
    - NGOs & Civil society organizations (interest groups, non-profit organizations)
    - Private sector (companies)
    - Academic & Research and out-reach organizations.
  - o Roles:
    - Policy formulation
    - Policy implementation – management
    - Policy advisor
    - Research

- 
- Education
  - Outreach, technical assistance, dissemination
- Please, complete additional information in columns N, O and P (in green). These refer to a revised typology of how active, and/or influential the organizations are in terms of policy formulation and decision-making. The typologies are the same as in the knowledge providers table.
  - Please, check missing information (question marks and empty cells).

**Revise knowledge fields table:**

- Please, complete the columns D about the impact of the knowledge field in policies in current formulation of policies and policy instruments that affect sustainable livestock production systems (including SPS). "Little influential", "Influential", "Very influential", "N/A".
- Please, complete the columns E about the impact of the knowledge field in current formulation of policies and policy instruments that affect biodiversity conservation. "Little influential", "Influential", "Very influential", "N/A".
- The areas of knowledge and the themes associated with these areas have been summarized in the diagram attached (Power point). Please, 1) check that the themes are in agreement with those that you have proposed and 2) add missing themes if those proposed by you do not fit the ones in the list. Please, do this directly in the Power point presentation attached (or in a Word file).

**The report**

You will find attached an outline of report. We need your contributions particularly for the last section. Please, provide some paragraphs with your ideas under the topics in the list. You can write either in English or in Spanish/Portuguese. If you have some ideas that fit the topics in the the introduction chapter at this stage, please, send them as well.

## Appendix V – Database templates

### A- Knowledge provide database template

Name Knowledge Provider/Knowledge Hub/Initiative	ACRONYM	Type of Organisation (Research Organisation; National Funded project; Internal Funded project; EU-funded project; Other international funded project (please, specify agency); Data portals/initiatives/infrastructures; Intergovernmental (please, specify); Scientific Network; Civil Society & NGO; Government Agency; Science Policy Interface body; Learned Society such as "Asociación Colombiana de Ciencias Biológicas"; Conventions; Other - please specify other)	Operating at level (Global; Regional; Country - please specify country)	Status (Finished;Temporary Active; Permanent)	Subjective acknowledgement (Very active/frequently heard of; Sometimes active/sometimes heard of; Not active/rarely heard of)

### B- Knowledge requester database template

Name Knowledge Requester	ACRONYM	Type of Organisation (e.g. Local, national, authorities, policy makers, decision makers, extension services)	Operating at level (Global; Regional; Country - please specify country)	Status (Finished;Temporary Active; Permanent)	Subjective acknowledgement (Very active/frequently heard of; Sometimes active/sometimes heard of; Not active/rarely heard of)

## C- Fields of knowledge database template

<b>Name fields of knowledge relevant for management of biodiversity and ecosystem services, and to design sustainable livestock production (e.g. animal genetics, animal nutrition, soil biology, rangeland ecology, eco-physiology, economics, social science, etc)</b>	<b>Knowledge themes (e.g. carbon cycle, nutrient cycle, local ecological knowledge, Ethnobotany, social networks, etc)</b>	<b>"Currently relevant" or "Likely relevant in the future"</b>
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## Appendix VI - Process of information gathering by the partners

### **Centro de Agricultura Tropical de Investigación y Enseñanza (CATIE) – Central America (Regional).**

1. Se preparó una lista de socios de CATIE involucrado en el tema de investigación y desarrollo en ganadería, principalmente de la región Mesoamérica y el Caribe. También, las páginas de los ministerios de agricultura y ambiente de los países de la región fueron exploradas para identificar proyectos o programas relacionados con el tema de ganadería sostenible.
2. Se logró un listado de 55 actores principales que más influyen en el tema de sistemas de producción ganadera sostenible o han tenido mayor incidencia en la toma de decisiones en los países. Además, se agregaron 18 proyectos y 2 congresos desarrollados en los últimos 10 años y 3 años respectivamente que han contribuido significativamente en investigación y desarrollo de ganadería sostenible, basada en sistemas silvopastoriles.
3. Posteriormente se procedió con el llenado de la matriz “Mapping Knowledge Networks Silvopastoralism” iniciando a escribir los nombres o abreviaturas de las organizaciones o instituciones que se seleccionaron, así como también el tipo de organización, estatus a nivel regional, global o de país.
4. Verificación de la información ingresada.

### **Centro para la investigación en sistemas sostenibles de producción agropecuaria (CIPAV) - Colombia**

1. El análisis se enfocó en Colombia. Se realizó una revisión de los proyectos en que ha participado CIPAV en los últimos 10 años, identificando en cada uno de ellos los principales actores involucrados. Este listado preliminar fué revisada y complementada por los investigadores relacionados con el tema específico, sistemas agrosilvopastoriles.
2. A partir de esta identificación inicial se realizó una clasificación por grupos con características similares. De este listado generalizado, se definieron proveedores y demandantes de conocimientos relacionados con sistemas agrosilvopastoriles. Se determinó que algunos actores aplicaban en ambos sentidos.
3. Una vez clasificados como proveedores o demandantes, se diligenciaron los diferentes campos de la base de datos, con base en el conocimiento y experiencia que se tiene con cada tipo de actor por parte de investigadores de las áreas de ganadería sostenible y servicios ambientales.
4. Los temas de investigación, fueron identificados a partir de los proyectos analizados y del plan estratégico de investigación de CIPAV 2012-2015.

### **Corporación Colombiana de Investigación Agropecuaria (CORPOICA) - Colombia**

La región Caribe Colombiana es una de las principales zonas del desarrollo ganadero del país y cuenta con una tradición histórica en este sistema productivo; lo que permite identificar con relativa facilidad los diferentes actores que se involucran alrededor de la ganadería. Tres profesionales de las Ciencias Agropecuarias y Forestales de Corpoica, se reunieron, revisaron los objetivos, los procedimientos y los alcances de la Red en la región colombiana en la que los tres se desempeñan o se han desempeñado en los últimos años. Entonces, concretamente para la región Caribe Colombiana, se identificaron los actores que más influyen o empiezan a influir en la producción ganadera tradicional y sostenible y se realizó el listado de instituciones de orden académico, científico, gubernamental, comercial, asociativo entre otros.

Posteriormente se llenó la matriz: Mapping Knowledge Networks Silvopastoralism, llenando en la medida de lo posible todos los campos y recurriendo según el caso, a las páginas de internet de los diferentes actores.



Cabe destacar que la información y los criterios utilizados para el llenado de la matriz (roles, impactos, avances, proyectos) fue en la mayoría de los casos soportado en la experiencia y el conocimiento que tenían los tres profesionales sobre dichos actores. Esto dado que varios de los actores, a pesar de contar con páginas de internet o espacios electrónicos, no tienen información actualizada o pertinente para utilizar dichas fuentes como medio de consecución y verificación de información.

### **Instituto Nacional de Tecnología Agropecuaria (INTA) – Argentina**

1. Information about groups working in INTA (Argentinean National Institute of Agriculture and Range Management Research) was collected through contacts and institutional web pages, including projects developed during the last 10 years. Characteristics and products of those projects were also investigated through internet search tools and the main working groups were identified.
2. Based on two national congresses on Silvopastoral Systems were organized (Posadas 2009; Santiago del Estero 2012). Both Congress Proceedings were revised and other research groups were detected and their production analyzed.
3. Since a new law is being implemented to promote sustainable management and conservation of native forests (National Law 26331/09), and a Program is being developed to attend demands that come from management authorities, the author (national program coordinator) is aware of national and provincial demands of research, and their level of application (main subjects and institutions).
4. Mapping Knowledge matrix was filled in with information that comes from the experience of the authors.

### **Federal University of São Joao Del-Rei, Bioengineering department (DEPEB), São João DelRei – Brazil**

The experience obtained since 2002 on silvopastoral system allowed our group to fill the matrix using results from several scientific studies developed in Minas Gerais State (south east of Brazil) and also in the north east (Maranhao State). The experience gathered during these years allowed us to be part and to build a solid network on silvopastoral systems that also contribute for the process of compiling the information.

## Appendix VII - List of knowledge-provider and knowledge requester organizations

Name Knowledge Provider/Knowledge Hub/Initiative	ACRONYM	Operating level
Tropical Agricultural Center for Research and Teaching	CATIE	Regional-Latin America
Nicaraguan Institute of Agricultural Technology	INTA-Nicaragua	Country-Nicaragua
Ministry of Agriculture and Forest	MAGFOR	Country-Nicaragua
Institute of Research and Development	NITLAPAN/UCA	Country-Nicaragua
International Center of Tropical Agriculture	CIAT	Regional-Latin America
National Agrarian University	UNA	Country-Nicaragua
Regional Multidisciplinary Faculty of Esteli- UNAN Managua	FAREM/Esteli	Country-Nicaragua
International Institute for Conservation and Wildlife Management	ICOMVIS/UNA	Country-Costa Rica
Cattle National Federation of Costa Rica	CORFOGA	Country-Costa Rica
Ministry of Agriculture and Livestock	MAG	Country-Costa Rica
Ministry of agriculture	MA	Country-Dominican Republic
Ministry of agriculture	MAG	Country-El Salvador
University of Costa Rica	UCR	Country-Costa Rica
National Forestry Financing Fund Programs	FONAFIFO	Country-Costa Rica
National Institute of Innovation and Transfer of Agriculture Technology	INTA-Costa Rica	Country-Costa Rica
National Association of Milk Producers of Costa Rica	CNPL	Country-Costa Rica
Agriculture School of the Humid Tropic Region	EARTH	Country-Costa Rica
Agricultural Research Institute of Panama	IDIAP	Country-Panama
University of Panama	Universidad de Panamá	Country-Panama
Panamerican Agricultural School	El Zamorano	Country-Honduras
Institute for Cooperation and Autodevelopment	ICADE	Country-Honduras
Department of science and Technology	DICTA	Country-Honduras
United Nations Food and Agriculture	FAO	Global
The Nature Conservancy	TNC	Global
German Agency for Technical Cooperation	GIZ	Global
Technical Institute for Training and Productivity	INTECAP	Country-Guatemala
Faculty of Veterinary and husbandry - Universidad de San Carlos de Guatemala	FMVZ-USAC	Country-Guatemala
Secretariat of Environment and Natural Resources	SEMARNAT	Country-Mexico
College of the southern border	ECOSUR	Country-Mexico

Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food	SAGARPA	Country-Mexico
National research institute	INIFAP	Country-Mexico
Trifinio Plan Commission	Trifinio Plan Comission	Regional-Mesoamerica
American Strategy for Rural Development	ECADERT	Regional-Mesoamerica
Regional Agro-Environmental and Health Strategy	ERAS	Regional-Mesoamerica
Agricultural Council	CAC	Regional-Mesoamerica
National Centre for Agricultural and Forestry Technology	CENTA	Country-El Salvador
Institute of Agricultural Science and Technology	ICTA	Country-Guatemala
Dominican Institute of Agricultural and Forestry Research	IDIAF	Country-Dominican Republic
Save the Children	Save the Children	Global
Danish International Development Agency	DANIDA	Regional-Latin America
Swiss Agency for Development and Cooperation	COSUDE	Regional-Latin America
Inter-American Institute for Cooperation on Agriculture	IICA	Regional-Latin America
Experimental Station of Pastures "Indio Hatuey"	Estación Experimental de Pastos y Forrajes "Indio Hatuey"	Country-Cuba
Ministry of Science, Technology and Environment	CITMA	Country-Cuba
Latin American Association of Animal Production	ALPA	Regional-Latin America
Cuban Association of Animal Production	ACPA	Country-Cuba
Ministry of agriculture	MINAGRI	Country-Cuba
Tropical Livestock Research Center	CIMAGT	Country-Cuba
Developing methods and models for assessing in fragmented landscape.	FRAGMENT (project funded by the EU 6 FP, Theme: Environment)	Country-Nicaragua & Costa Rica
Participatory development of sustainable land use alternatives in Central America	PD	Country-Nicaragua, Honduras, Guatemala
Impact of improved cattle practices on biodiversity conservation in Central America	BNPP	Country-Nicaragua, Honduras
Trees as drivers of silvopastoral system function in the Neotropics	SILPAS (project funded by the Research Council of Norway)	Country-Nicaragua
Technological innovation for climate change mitigation in dairy zones in Nicaragua and Panama	CATIE/NESTLE	Country-Nicaragua, Panama
Sustainable management of agricultural territories in Central America	MESOTERRA	Country-Nicaragua, Guatemala

Functional Diversity: An ecological framework for sustainable and adaptable agro-forestry systems in landscapes of semi-arid and arid ecoregions	FUNCI TREE (project funded by the EU 7 FP, Theme: Food, Agriculture and Fisheries)	Country-Nicaragua
Bio-engineering multi-functional silvopastoral landscapes: A case study in Nicaragua	MF-Landscapes (project funded by the Research Council of Norway)	Country-Nicaragua
Evaluación del grado de la función de los instrumentos económicos en la política de mezclas para la conservación de biodiversidad y la prestación de servicios de los ecosistemas	POLICYMIX (project funded by the EU 7 FP, Theme: Environment)	Country-Costa Rica, Brazil
Diseño de sistemas silvopastoriles como estrategia para la adaptación y mitigación al cambio climático de sistemas ganaderos del trópico Centroamericano	FONTAGRO	Country-Nicaragua, Costa Rica, Panamá
Payments for Ecosystem Services in Latin América in the context of REDD (PESILA-REDD): integrating methods for evaluating the enabling conditions and cost-effectiveness of PES	PESILA-REDD (project funded by the Research Council of Norway)	Country-Costa Rica
Bridges and Barriers: Conservation in the Agricultural Matrix and Benefits to Connectivity and Ecosystem Services	Bridges and Barriers	Country-Costa Rica
Innovative Mechanisms for a Cooperative Climate Change Adaptation Program in Sierra Madre and the Coast of Chiapas, Mexico.	TNC	Country-Mexico
Programa de gestión rural empresarial sanidad y ambiente	PROGRESA	Country-Nicaragua
Mercados Centroamericanos para la Biodiversidad	CAMBIO	Country-Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica
Construcción de dos territorios climáticamente inteligentes en América Central	MAPN	Regional
Enfoques Silvopastoriles Integrados para el Manejo de Ecosistemas	ESIME	Regional
Programs of the National Forestry Financing Fund	FONAFIFO	Country-Costa Rica
VI Congreso Latinoamericano de Agroforestería para la Producción Pecuaria Sostenible. Panamá 28-30 septiembre 2010.	Congreso SSP	Regional-Latin America

VII Congreso Latinoamericano de Agroforestería para la Producción pecuaria Sostenible. Belem do Pará. Brasil 8 -10 noviembre 2012. <a href="http://www.viicongressolati-noamericanosapps.com/es/">http://www.viicongressolati-noamericanosapps.com/es/</a>	Congreso SSP	Regional-Latin America
Fundación Centro para la Investigación en Sistemas Sostenibles de Producción Agropecuaria	CIPAV	Regional-Latin America
International Center for Tropical Agriculture	CIAT	Global
Corporación Colombiana de Investigación Agropecuaria	CORPOICA	Country-Colombia
RED LATINOAMERICANA DE AGROFORESTERÍA PECUARIA		Regional-Latin America
Enfoques Silvopastoriles Integrados para el Manejo de Ecosistemas	ESIME	Regional
Mainstreaming biodiversity into Colombian Sustainable Cattle Ranching	MBSCR	Country-Colombia
Instituto de Investigación de Recursos Biológicos Alexander von Humboldt	IAvH	Country-Colombia
Red Agroforestal de Universidades de Colombia	RAUC	Country-Colombia
Universidad Nacional de Colombia		Country-Colombia
Universidad Tecnológica del Chocó		Country-Colombia
Universidad de Nariño		Country-Colombia
Universidad del Tolima		Country-Colombia
Universidad de los Llanos		Country-Colombia
Universidad de Caldas		Country-Colombia
Universidad de la Amazonia		Country-Colombia
Universidad de la Salle		Country-Colombia
Universidad de Antioquia		Country-Colombia
Universidad de Ciencias Ambientales	UDCA	Country-Colombia
Programa Adaptación al Cambio Climático en la Región Andina		Regional-Andes
Departamento Administrativo de Ciencia, Tecnología e Innovación	Colciencias	Country-Colombia
The Nature Conservancy	TNC	Country-Colombia
Federación Colombiana de Ganaderos	FEDEGAN	Country-Colombia
Ministerio de Agricultura y Desarrollo Rural	MADR	Country-Colombia
Ministerio del Medio Ambiente y Desarrollo Sostenible	Minambiente	Country-Colombia
INSTITUTO NACIONAL DE TECNOLOGIA AGROPECUARIA	INTA	Country-Argentina
Proyecto Integrador "Manejo sustentable de Bosques Nativo"	PNFOR 104081	Country-Argentina

Proyecto Específico "Manejo Sustentable de Sistemas Silvopastoriles en Bosques Nativos"	PNFOR 1104083	Country-Argentina
Proyecto específico "TECNOLOGIAS Y CAPACIDADES PARA EL MANEJO DE SISTEMAS SILVOPASTORILES Y AGROFORESTALES EN BOSQUES IMPLANTADOS"	PNFOR 1104075	Country-Argentina
Proyecto Integrador "Sistemas silvopastoriles. Tecnología para su instalación, Manejo y Evaluación"	PNFOR 43001	Country-Argentina
Proyecto específico "Interacciones ecológicas en sistemas silvopastoriles"	PNFOR 43211	Country-Argentina
Proyecto específico "Evaluación productiva, ambiental y socioeconomica de sistemas silvopastoriles"	PNFOR 43252	Country-Argentina
Proyecto específico "Interacciones ecologicas entre los componentes vegetal (herbaceo y leñoso) y edáfico de sistemas silvopastoriles"	PNFOR 3221	Country-Argentina
Proyecto específico " Instalación y manejo del componente forestal de sistemas silvopastoriles"	PNFOR 3222	Country-Argentina
Produccion de carne en sistemas silvopastoriles.	PNFOR 3224	Country-Argentina
1 er Congreso Nacional de Sistemas Silvopastoriles (Posadas, 2009)		Country-Argentina
2 ° Congreso Nacional de Sistemas Silvopastoriles (mayo 2012) ( <a href="http://inta.gob.ar/noticias/2b0-congreso-nacional-de-sistemas-silvopastoriles">http://inta.gob.ar/noticias/2b0-congreso-nacional-de-sistemas-silvopastoriles</a> )		Country-Argentina
Participating Units - INTA - Argentina ( <i>it's a title</i> )		Country-Argentina
EEA Montecarlo, Misiones		Subnational-Argentina
EEA Concordia, Entre Ríos		Subnational-Argentina
EEA Delta del Paraná, Buenos Aires		Subnational-Argentina
EEA Oliveros, Santa Fe		Subnational-Argentina
EEA Reconquista, Santa Fe		Subnational-Argentina
EEA Saenz Peña, Chaco		Subnational-Argentina
EEA Colonia Benitez, Chaco		Subnational-Argentina
EEA Ing Juárez, Formosa		Subnational-Argentina
EEA Santiago del Estero		Subnational-Argentina
EEA Santiago Este, Santiago del Estero		Subnational-Argentina
EEA Manfredi, Córdoba		Subnational-Argentina
EEA La Rioja, La Rioja		Subnational-Argentina
EEA Quimili, Catamarca		Subnational-Argentina
EEA Bariloche, Río Negro		Subnational-Argentina
EEA Esquel. Chubut		Subnational-Argentina
EEA Santa Cruz, Santa Cruz		Subnational-Argentina

EEA Alto Valle, Río Negro		Subnational-Argentina
EEA Salta, Salta		Subnational-Argentina
EEA Leales , Tucuman (en ganadería)		Subnational-Argentina
EEA Cerro Azul, Misiones (plantaciones)		Subnational-Argentina
Faculta de Agronomía de la Universidad de Buenos Aires	FAUBA	Country-Argentina
Cátedra de Forrajicultura		Country-Argentina
Cátedra de Economía general		Country-Argentina
Facultad de Agronomía. Universidad Nacional de Santiago del Estero	UNSE	Country-Argentina
Facultad de Cs Veterinarias. Universidad del Nordeste, Corrientes	UNNE	Country-Argentina
Facultad de Ciencias Agrarias . Universidad de Lomas de Zamora	UNLZ	Country-Argentina
Universidad Nacional del Sur, Bahia Blanca	UNSE	Country-Argentina
Dirección de Bosques. Santiago del Estero		Subnational-Argentina
Centro Austral de Investigaciones Cientificas	CADIC	Subnational-Argentina
Federal University of São João Del Rei (including scientists)	UFSJ	Country-Brazil
Brazilian Center for Sustainable Livestock Production - including farmers, local people, extension technician, scientis from university partners, international institutions	CBPS	Subnational-Brazil
The National Council for Scientific and Technological Development (CNPq)	CNPq	Country-Brazil
Corporación Colombiana de Investigación Agropecuaria	CORPOICA	Country-Colombia
Centro para la investigación en sistemas sostenibles de producción agropecuaria	Fundacion Cipav	Country-Colombia
Universidad de Córdoba, programa de Veterinaria y Zootecnia	UNICOR	Country-Colombia
Universidad de Sucre, Facultad de Ciencias Agropecuarias	UNISUCRE	Country-Colombia
Universidad del Magdalena, programa de Agronomía, programa de Biología	UNIMAG	Country-Colombia
Universidad de La Guajira, Programa de Biología	ULG	Country-Colombia
Universidad Popular del Cesar, programa de Ingeniería Ambiental	UPC	Country-Colombia
Servicio Nacional de Aprendizaje	SENA	Country-Colombia
Federación Nacional de Gaderos, Proyecto Ganadería Sontenible	FEDEGAN	Country-Colombia
Fondo de Adaptación, proyecto Rehabilitar	FA	Country-Colombia

Instituto de Hidrología, Meteorología y Estudios Ambientales	IDEAM	Country-Colombia
Corporaciones Autonomas Regionales de Córdoba, Sucre, Bolivar, Magdalena, Atlantico, Cesar, La Guajira	Car's de 7 departamentos	Country-Colombia
Fundación Prosierra Nevada de Santa Marta	FPSN	Country-Colombia
Instituto de Investigación de Recursos Biológicos Alexander Von Humbold	IVH	Country-Colombia
Gobernaciones Departamentales de Córdoba, Sucre, Bolivar, Magdalena, Atlantico, Cesar, La Guajira	GOB	Country-Colombia
Corporacion Nacional de Investigacion y Fomento	CONIF	Country-Colombia
Office National des Foret	ONF Internacional	Country-Colombia
Office National des Foret	ONF Andina	Country-Colombia

<b>Name Knowledge Requester</b>	<b>ACRONYM</b>	<b>Operating Level</b>
Ministry of agriculture and forestry	MAGFOR	Country-Nicaragua
Nicaraguan Institute of Agricultural Technology	INTA-Nicaragua	Country-Nicaragua
Nicaraguan national livestock comission	CONAGAN	Country-Nicaragua
Catholic Relief Services	CRS	Global
Business Solutions to Poverty	TECHNOSERVE	Global
Heifer Internacional	HEIFER	Global
Association for communal agricultural diversification and development	ADAC	Country-Nicaragua
Cattle National Federation of Costa Rica	CORFOGA	Country-Costa Rica
Ministry of livestock and agrculture	MAG	Country-Costa Rica
Forestry Financing National Fund	FONAFIFO	Country-Costa Rica
National Institute of Innovation and Transfer of Agriculture Technology	INTA-Costa Rica	Country-Costa Rica
Ministry of Agricultural Development	MIDA	Country-Panama
Ministry of Agriculture	MA	Country-Dominican Republic
Ministry of Agriculture and livestock	MAG	Country-El Salvador
Livestock National Association	ANAGAN	Country-Panama
Secretary of Agriculture	SAG	Country-Honduras
National Federation of Farmers and Ranchers of Honduras	FENAGH	Country-Honduras



Ministry of Agriculture, Livestock and Food	MAGA	Country-Guatemala
Secretariat of Environment and Natural Resources	SEMARNAT	Country-Mexico
Trifinio Plan Commission	Trifinio Plan Commission	Regional-Mesoamerica
Cooperative Milk Producers Dos Pinos R.L.	Dos Pinos	Country-Costa Rica
The Nature Conservancy	TNC	Global
Fondo Acción Ambiental		Country-Colombia
Fondo Patrimonio Natural		Country-Colombia
Asociación de Productores Indígenas y campesinos de Riosucio Caldas	Asproinca	Country-Colombia
Federación Colombiana de Ganaderos	FEDEGAN	Country-Colombia
Comité de ganaderos ( Municipal level)		Country-Colombia
Ministerio de Agricultura y Desarrollo Rural	MADR	Country-Colombia
Ministerio del Medio Ambiente y Desarrollo Sostenible	Minambiente	Country-Colombia
Autoridades ambientales regionales a nivel de Colombia (existen 32)	CAR	Country-Colombia
Unidad Municipal de Asistencia Técnica	Umata	Country-Colombia
Fondo para el Financiamiento del Sector Agropecuario	FINAGRO	Country-Colombia
Gobernaciones departamentales (32)	Gobernación	Country-Colombia
Municipios		Country-Colombia
Secretaría de Ambiente y Desarrollo Sustentable, Dirección de Bosques.	SAyDS	Country-Argentina
Consejo Federal de Medio Ambiente**	COFEMA	Country-Argentina
Direcciones de Bosques y/o ambiente de diferentes provincias: esta demanda va en aumento, a veces en forma directa a las instituciones, en el futuro cercano a través de COFEMA también. Las más activas hasta el momento:		Country-Argentina
Dirección de Bosques de Santa Cruz		Country-Argentina
Dirección de Bosques de Santiago del Estero		Country-Argentina
Subsecretaría de Bosques de Chubut		Country-Argentina
Subsecretaría de Bosques de Río Negro		Country-Argentina
Dirección de Bosques de Chaco		Country-Argentina
Dirección de Bosques de Corrientes		Country-Argentina
Administración de Parques Nacionales (APN)	APN	Country-Argentina
Regional Patagonia de APN		Country-Argentina
Consejo Profesional de Ingeniería Agronómica	CPIA	Country-Argentina
Independent professionals		Country-Argentina
Ministerio de Agricultura, Ganadería y Pesca de la Nación	Minagri	Country-Argentina

Federal University of São João Del Rei (including scientists)	UFSJ	Country-Brazil
Farmers - including farmers associated to CBPS or others that "want to change" from unsustainable for sustainable livestock production systems	CBPS	Country-Brazil
The National Council for Scientific and Technological Development (CNPq)	CNPq	Country-Brazil
Corporaciones Autonomas Regionales de Córdoba, Sucre, Bolivar, Magdalena, Atlantico, Cesar, La Guajira, Corporación Antonoma el Alto Magdalena	CVS, CARSUCRE, CSB, CORPAMAG, CRA, COPORCESAR, CORPOGUAJIRA, CAM	Sub-national-Colombia
Gobernaciones Departamentales de Córdoba, Sucre, Bolivar, Magdalena, Atlantico, Cesar, La Guajira		Sub-national-Colombia
Fondo Regional de Tecnologia Agropecuaria	Fontagro	Global
Fondo Mundial para el Medio Ambiente	GEF	Global
The Nature Conservancy	TNC	Global
Banco Mundial	BM	Country-Colombia
Ministerio del Ambiente y desarrollo Rural	MADR	Country-Colombia
Departamento administrativo de Ciencia, Tecnología e Innovación	Colciencias	Country-Colombia
Banco Interamericano de Desarrollo	BID	Country-Colombia





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