Researching grasslands for complex production systems: an example with silvopastoralism

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There is a well established consensus that the main challenges addressing the future of agriculture in today's world are the increasing human population and food consumption. According to FAO, global demand for meat is projected to increase by 85% from 2005/2007 to 2050. In Brazil, the growth projection for beef consumption is 17.8% from 2015 to 2025 (MAPA). Likely, this demand will have to meet an increasingly scarce natural resource base and a scale up of agricultural input prices, as well as possible scenario of climatic change. Therefore, complex farming systems worldwide will have to increase their natural resources use efficiency, recover the existent degraded areas and intensify food production with limited inputs. The silvopastoral systems (SPS) have been noted as a viable integrated agricultural system for sustainable farming, particularly at low-income, emerging economies of the world.

The importance of using a global, comprehensive integration approach of grassland-livestock-forest systems at farm scale has been recently stated at the 2016 Global Agenda for Sustainable Livestock Development (UN/FAO, Panamá), which included the Global Network on Silvopastoral Systems (GNSPS). To face these multiple and complex challenges with focus and coordination, it is necessary to share goals and set common research priorities among research institutions and the livestock stakeholders committed to the sustainable development sector. At farm level, main key research priorities in SPS have been regularly pointed out as: (i) Optimizing animal performance; (ii) Promoting animal welfare; (iii) Encouraging livestock and grassland management; (iv) Providing environmental services; (v) Applying a whole system economic analysis; (vi) Adding value to SPS products; (vii) Modeling farming systems with SPS; (viii) Study temporal and spatial interactions between tree-grassland-livestock.

At regional and global scales, some research challenges may be addressed, among others, as follows: (i) To set the role of SPS in climate change adaptation and mitigation; (ii) To set the role of SPS in soil and water conservation and biodiversity; (iii) To optimize overall productivity of grasslands, forestry and livestock within integrated systems. From these priorities, many demands arise also for public policies and decision makers to support sustainable SPS. Some of the policies and incentives that may effectively promote silvopastoralism worldwide are: (i) Territorial planning focused on diversifying agro-ecosystems; (ii) National frameworks for forest plantation, grassland protection, use and restoration; (iii) National programs to pay for environmental services; (iv) Governmental incentives for joint ventures schemes between scientific, industry, government and financial sectors; (v) Grassland and grazing regulatory incentives for promoting natural resources use efficiency; (vi) Government cost-sharing grants; (vii) Promotion of rural Extension Services specialized on integrated agricultural systems and training programs. In addition, private sector should also play a key role by identifying market opportunities and promoting business for products from integrated agricultural systems, such as certified and labeled products, developing niche markets and exploring extra revenues (eco-tourism). In conclusion, silvopastoralism may play an important role on building up a global agenda for sustainable agricultural development. This requires coherent and coordinated efforts across scientific institutions, private and government sectors. As a complex production system, SPS science

must look further than the farm scale and target its functional issues within and among agro-ecosystems and across the society.