

Agroforestry Systems and Sustainable Development in Latin America

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Silvopasture systems are common in Latin America, but not widely adopted by small producers. They offer more biological diversity and risk reduction advantages than monoculture crops, as well as potential financial diversification at a small to medium scale. They require less intensive daily management than complex multiple cropping systems. Silvopastoral systems offer promise to retain more land at least partially forested, reduce land erosion and soil degradation, increase biodiversity, and balance ecologic and economic objectives for a wide range of farm producers.

In 2006, the Program for International Affairs provided Professor Fred Cabbage and Ph.D. student Greg Frey a seed grant to examine the prospects for enhanced agroforestry development in Argentina and Latin America. The initial grant and supplemental funds from Cabbage and the Department of Forestry and Environmental Resources (FER) fostered broad-scale cooperation among scientists in several countries, including travel and field visits in Argentina, Paraguay, and Uruguay; a month of field study to survey of silvopasture producers in Misiones and Corrientes, Argentina, in cooperation researchers with the Instituto Nacional de Investigación Agropecuaria (INTA); jointly authored presentations at four agroforestry conferences; a recent review paper comparing agroforestry systems across five regions in the world; and two chapters in the dissertation by Greg Frey.

Cabbage, Frey, Robert Abt, and Erin Sills have followed up with a domestic project on agroforestry economics in the Lower Mississippi Alluvial Valley and a new project on ecosystem services provided by cocoa agroforestry systems in Central America. Furthermore, Cabbage and Dan Robison in FER and colleagues Paul Mueller, James Greenes, and Jean-Marie Luginbuhl in CALS have since initiated a major agroforestry demonstration project at the NCSU Center for Environmental Farming Systems (CEFS) in Goldsboro. This demonstration established a 17-acre alley-cropping tree/crop production system in 2007, and formed the basis for a M.S. thesis research by Hayley Stevenson. Now we will also begin a goat grazing/bottomland hardwood forest regeneration study in 2009 at CEFS as well.

This research in northeastern Argentina identified the perceptions motivating silvopasture system adoption before and after several years of experience. Before adoption, farmers ranked producing outputs at relatively high levels at the same and place as benefits most often (50% of the farmers interviewed). Lower risk from fires (18% of those interviewed) and reduced stress

on cattle from shade (18%) ranked second most important. Weed reduction and erosion control (16% each) ranked next, followed by payment of government incentives (14%).

After several years of experience, perceptions changed substantially. The perceived value of joint production benefits dropped, but remained tied for most important with that of shade reducing stress on cattle (27% of the farmers interviewed). Weed reduction was perceived as more important than before adoption based on farmer experience (23%), as was the production of fast income from cattle (23%), and lower risk of fire (21%). Experience also raised the perceived value of greater profits from 11% before adoption to 16% after adoption.

Farmers really identified few disadvantages of silvopasture systems, before or after adoption. The largest perceived problem before adoption was that forest management was difficult (18% of the farmers surveyed), followed distantly by cattle management being difficult (6.8%), and underfunded government incentives (6.8%). After adoption, the only common perceived problems were compatibility between trees and pasture (11% of those surveyed), not enough light for good pasture growth (11%), capital requirements (9%), forest management is difficult (9%), and underfunded government incentives (9%).

The findings differed somewhat by farm size, but generally confirm that the perceived merits of silvopasture system generally outweigh the disadvantages based on actual farm experience. They further identify the differences between actual and realized benefits and problems. Additional research has analyzed the economic efficiency of pasture, forest, and silvopasture systems and the comparative advantages based on farm size. These results can be used by researchers to help overcome barriers to silvopasture production and adoption, and by extension agents to clarify farm management and environmental opportunities in Latin America and elsewhere.

A pending 2009 conference paper compares silvopastoral systems in six regions within five countries of the world: Misiones and Corrientes provinces, Argentina, La Pampa province, Argentina, the Southeast United States, New Zealand, Paraguay, and Uruguay. While silvopasture systems represent a unique class of production systems that combine trees, forage and livestock, they are by no means homogeneous. Farmers integrate livestock and forest plantations or native forests in many different ways, and for many different reasons. Culture and tradition lead producers to primarily focus on management of either the livestock and forage or the trees in New Zealand and in Uruguay in the past. Northeast Argentina and the U.S. South manage joint cattle and timber production on the same land purposefully, mostly with U.S. southern pine species in both countries. Uruguay currently grazes cattle in most forests with planted exotic eucalyptus and U.S. loblolly pine to minimize fire risks; and La Pampa, Argentina grazes cattle extensively in native *Prosopis* (mesquite) forests for shade and cover.

Related references as proceedings, speeches, posters, or theses:

Professional Proceedings Articles

Frey, Gregory, Hugo Fassola, Nahuel Pachas, Luis Colcombet, Santiago Lacorte, Frederick Cabbage, and Oscar Pérez. 2007. Adoption and economics of silvopasture systems by farm size in northeastern Argentina. In: Oliver, A. and S. Campeau, eds. When Trees and Crops Get Together. Proceedings of the 10th North American Agroforestry Conference, Québec City, Canada. 10-13 June 2007.

Frey, G.E., Fassola, H., Pachas, N., Colcombet, L., Lacorte, S., Cabbage, F. & Pérez O. 2008. Perceptions of silvopasture systems in northeastern Argentina. Presented at: 13^{as} Jornadas Técnicas Forestales y Ambientales, 5-7 June 5-7. Eldorado, Misiones, Argentina. Available from: INTA, Instituto Nacional de Tecnología Agropecuaria, Montecarlo, Argentina.

Speeches and Posters

Frey, G.E.; A.N. Pachas; E. Noellemeyer; G. Balmelli; H.E. Fassola; L. Colcombet; H.D. Stevenson; J. Hamilton; W. Hubbard; F.W. Cabbage. 2009. Resumen y comparación de los sistemas silvopastoriles en seis regiones del mundo (A review and comparison of silvopastoral systems in six regions of the world). Speech to be presented at: 1st Congreso Nacional de Sistemas Silvopastoriles. Misiones, Argentina. 14-16 May.

Frey, G.E., Fassola, H.E., Pachas, A.N., Colcombet, L., Lacorte, S.M., Cabbage, F.W. and Pérez, O. 2008. Perceptions of Silvopasture Systems in Northeastern Argentina . Poster presented at 3rd Working Forests in the Tropics Conference. October 6-8, Gainesville , FL.

Frey, G.E., Fassola, H., Pachas, N., Colcombet, L., Lacorte, S., Cabbage, F. & Pérez O. 2008. Perceptions of silvopasture systems in northeastern Argentina. Presented at: 13^{as} Jornadas Técnicas Forestales y Ambientales, June 5-7. Eldorado, Misiones, Argentina.

Frey, Gregory, Hugo Fassola, Nahuel Pachas, Luis Colcombet, Oscar Perez, and Frederick Cabbage. 2007. Adoption and Economics of Silvopasture Systems by Farm Size in Northeastern Argentina. Speech to be presented at: 10th North American Agroforestry Conference, Association for Temperate Agroforestry (AFTA). Université Laval, Québec City. June 10-13.

Stevenson H.D., D.J. Robison, F.W. Cabbage, J.P. Mueller, M.H. Gocke, M.G. Burton. 2008. Organic farm wastes and black plastic as weed-suppressing mulch in agroforestry. Poster presented at the Weed Science Society of North Carolina, Raleigh, North Carolina. March 6.

Stevenson H.D., D.J. Robison, F.W. Cabbage, J.P. Mueller, M.H. Gocke, M.G. Burton. 2008. Use of black plastic and farm wastes as weed-suppressing mulch in agroforestry. Poster presented at the Southern Weed Science Society conference, Jacksonville, Florida. January 28-30.

Thesis / Dissertation Chapters

Frey, Greg. Pending. Changing perceptions of silvopasture systems among adopters in Northeast Argentina. Dissertation, Chapter 1.

Frey, Greg. Pending. A within-farm efficiency comparison of silvopasture systems to conventional pasture and forestry systems in Northeast Argentina. Dissertation, Chapter 2.

Stevenson H.D.. 2009. Organic farm wastes and black plastic as weed-suppressing mulch in agroforestry. M.S. Thesis.

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