SP-6 New frontiers of forest economics

Organizers: Shashi Kant *University of Toronto, Canada, shashi.kant@utoronto.ca*; Martin Hostettler *Cycad, Switzerland, martin.hostettler@cycad.ch*; Hans Heinimann *ETH, Switzerland, hans.heinimann@env.ethz.ch.*

The experimental method and forest economy. Fischbacher, U. (*University of Konstanz, Germany; urs.fischbacher@uni-konstanz.de).*

What is the potential role of experiments in forest economics research? Forests are public goods and provide positive externalities such as the stabilization of soil, binding of carbon dioxide, biodiversity, or landscape quality. How people contribute to public goods has to be investigated empirically, and experiments are particularly well-suited for this question. It is possible to implement different institutions and investigate their impacts on cooperation. Furthermore, experiments are also well-suited to study peoples' preferences. It has been discovered that non-selfish preferences are important for an understanding of how people contribute to public goods. For instance, people are conditionally cooperative; therefore, higher contributions can result when people are optimistic about the other's contribution. Furthermore, willingness to incur costs in order to enforce norms can establish stable and high levels of contribution. To understand the structure of non-selfish preferences, many experiments have been conducted. It has been shown that people are heterogeneous in their non-selfish motives, and that important motives are inequity aversion, efficiency seeking, and reciprocity, that is, the willingness to reward kind and to punish unkind behavior. We will present experiments that demonstrate how institutions interact with these non-selfish preferences.

Forest economics in the 21st century. Kant ,S. (*University of Toronto, Canada; shashi.kant@utoronto.ca*).

The existing paradigm of forest economics is focused on the economics of timber, and is based on neo-classical economics driven by the assumption of a rational economic agent. In this century, forest ecosystem services (such as biodiversity, climate regulation, and watershed services) are becoming as important as timber for sustainable development. Hence, forest economics has to move from timber economics to economics of forest ecosystems and ecosystem services. Many streams of economics have challenged the basic foundations of neo-classical economics. For example, behavioral economics has moved economics from assumptions-based analysis to actual human-behavior-based analysis. Similarly, inclusion of multiple ecosystem services in the forest production function introduces higher-level non-linearities, and it requires economic analysis based on multiple equilibria rather than a single equilibrium. In addition, ecological economics, institutional economics, public choice theory, post-Keynesian economics, and social choice theory provide better frameworks for the economic analysis of multiple values of forests. The paper discusses various emerging values of forests and their economic characteristics; diversity and dynamics of social, economic, and cultural contexts of forest management; and relevance of various streams of economics to address economic challenges faced by foresters in this century.

Public choice, forest economics, and sustainable forest management. Laband, D. (*Auburn University, USA; labandn@auburn.edu*).

Although Adam Smith's recognition of humans' propensity to 'truck, barter, and exchange' was made in the context of private markets, this same propensity also applies to political markets. With the increasing recognition of, and appreciation for, the fact that forests generate multiple values, some of which are public goods, comes a strong implication that our understanding of sustainable forest management generally and forest economics specifically will be enhanced by explicitly incorporating principles of decision-making in a collective market context—public choice analysis. The self-interested behavior of politicians (elected), bureaucrats (unelected), and voluntary associations of individuals (NGOs) combined with the agency problems inherent to representative government has strong implications for the decision-making environment of private timberland owners. Unlike individuals who plant traditional row crops that are harvested after one growing season, timber growers make decisions that span (perhaps several) dozens of years. As public aspects of forests increase in value, collective decisions increasingly will influence forest management generally and private decision-making by landowners. But long-term decisions made even under conditions of scientific certainty necessarily are made in a context of political uncertainty. This political uncertainty must be integrated into models of sustainable forest management.

Reflections on new frontiers of forest economics. Löfgren, K.G. (*Umeå University, Sweden; Karl-Gustaf.Lofgren@econ.umu.se*).

Forest economics is a subfield of economics that used to contain both theoretically and empirically the most mature pieces of the economic sciences. The main contributors were the German forest economists and silviculturalists active during most of the 19th century. The development during the 20th century was meagre and is typically clustered to the end of the century. This paper will contain an analysis of the obstacles that may have slowed down the development of the discipline. It will, however, focus on the current and future challenges to forest economics and existing subfields of economics that may be relevant for its future development. One of the most important challenges is how forestry, and in particular forest economics. can contribute to the $C0^2$ issue. The main problem there on a global scale seems to be the lack of cooperation, and to this issue mainstream economics can be potentially helpful by making use of the recent developments in game theory. However, perhaps more important for the forest economics is the cost-benefit analysis of forest sequestration. Here the accounting framework needs a brush up, both through economic theory and natural sciences.

Change in forest conditions and sustainable forest management. Ostrom, E. (*Indiana University, USA; ostrom@indiana.edu*), Nagendra, H. (*ATREE, India; nagendra@indiana.edu*).

Much current research on forest economic takes into consideration a variety of measures of current forest conditions, including quantitative assessments of variables such as extent, density, diversity, and biomass; but also more qualitative and integrated estimates of forest condition provided by foresters and users. Very few studies of forest economics examine the change in forest

conditions over time so as to assess the consequences of institutional arrangements, economic pressures, or local organization—yet such assessments are also critically needed. The International Forestry Resources and Institutions research program, spread across 11 countries, takes a variety of measures of forest condition at repeated intervals of time. Using a dataset of 59 forests from 5 countries—Nepal, India, Kenya, Uganda, and the USA—we compare multiple indicators of forest change. Our findings indicate that human-impacted forests demonstrate considerable variation in different aspects, and that developing a single index of forest change that indicates whether a forest is deteriorating or improving over time is a very challenging task. Especially in light of current discussions on climate change and forest governance, these issues need to be highlighted and discussed as a foundation for future research and analysis.

SP-7 Agroforestry: the way forward

Organizers: P.K. Nair, *University of Florida, USA, pknair@ufl.edu*; Tony Simons *World Agroforestry Centre-ICRAF, Kenya, t.simons@cgiar.org*

Carbon sequestration potential of agroforestry in the African Sahel. Luedeling, E., Neufeldt, H. (*World Agroforestry Centre, Kenya; eluedeling@ucdavis.edu; h.neufeldt@cgiar.org*).

Recent conversion of large areas of Sahelian cropland to agroforestry has shown that adding trees to existing agricultural acreage can be a strategy for sequestering atmospheric carbon. We aim to quantify the extent of suitable areas for such conversions and the amount of carbon that could be stored. The analysis builds on a global dataset on the extent and geographical patterns of agroforestry developed at the World Agroforestry Centre. This dataset integrates information on cropland and land cover to estimate tree cover on cropland. Using multivariate statistics on these data, as well as auxiliary datasets and available knowledge of cropping systems across the Sahel, distinct agroforestry types are characterized. The maximum entropy approach is used to characterize the ecological niches of each of these types, based on regional data on temperature, precipitation, and soil. The potential spatial extent of each agroforestry type is derived from its climatic and environmental requirements. Since climatic conditions in this region can no longer be assumed to be static, projections are presented for a range of climate change scenarios. Using current and potential agroforestry areas and available information about biomass carbon in agroforestry systems, the climate change mitigation potential of Sahelian agroforestry systems is estimated.

Agroforestry: the way forward. Nair, R. (*University of Florida, USA; pknair@ufl.edu*).

During the past 3 decades, agroforestry has developed from a loosely defined concept to a science-based land-use discipline. Today there is global consensus that integration of trees into farms, ranches, and in other production landscapes, helps to promote social, economic, cultural, ecological, and environmental benefits. Development of the discipline to this level involved coordinated efforts by multidisciplinary teams of experts working in cohort with countless numbers of farmers the world over. While these accomplishments are creditable, the best results are perhaps yet to come. The way forward to energize the next wave of agroforestry will necessitate new approaches, making the best use of modern science and technology. However, for a complex human activity such as agroforestry, no scientific mantra alone can provide infallible and complete answers. The continuous replenishment and updating of the stockpile of our technical knowledge through deployment of cutting-edge science has to go hand in hand with effective transfer of such knowledge to practitioners. Thus, vigorous research efforts in concert with continuous feedback from on-field experience hold the key to success in this endeavor.

A global prognosis for tropical timber supply from farm land. Sinclair, F. (*World Agroforestry Centre, Kenya; f.sinclair@cgiar.org*), Robiglio, V. (*International Institute of Tropical Agriculture, Cameroon; v.robiglio@cgiar.org*), Ibrahim, M.; Somarriba, E. (*CATIE, Costa Rica; mibrahim@catie.ac.cr; esomarri@catie.ac.cr*); Singh, P. (*World Agroforestry Centre, India; v.p.singh@cgiar.org*); Chikamai, B. (*Kenya Forest Research Institute, Kenya; director@kefri.org*).

Recent estimates of the global extent of agroforestry suggest that nearly half of the world's agricultural land has more than 10% tree cover. While only some of these trees have timber value, they represent a vast but largely unquantified timber resource. In many tropical areas, where appropriate land and tree tenure have prevailed, decreasing access to often common property or state forests has led to more trees being retained on farms; therefore, the trend is for an increasing timber resources on farms, while in many places, forest timber resources decline. Farm timber, however, differs as a resource from that in forests, principally because trees are more dispersed and, in the smallholder sector, owned by a plethora of people, most of whom have little expertise in managing trees for timber or marketing the product. Here, we present a global analysis of the potential supply of tropical timber from farmland, based on case studies from Africa, Asia, and Latin America. Trends in timber supply from farmland and key issues surrounding farmers' abilities to manage and market this emerging timber resource are presented.

SP-8 Keep Asia Green: rehabilitating and restoring forest ecosystems in Asia

Organizers: Don Koo Lee *Seoul National University, Republic of Korea, leedk@snu.ac.kr;* Michael Kleine *IUFRO, Austria, kleine@iufro.org.*

Rehabilitating forests and extending tree cover in South Asia. Kant, P. (*Institute of Green Economy, India;, promode.kant@gmail.com*), Acharya, K. (*Department of Forest Research and Survey, Nepal; kpacharya1@hotmail.com*), Hossain, M. (*Institute of Forestry and Environmental Sciences, Chittagong University, Bangladesh; mkhossain2008@yahoo.com*).

South Asia covers a vast stretch of about 368 million hectares of land from the highest peaks of the Himalaya Mountains in the north to sea coasts in the south, from the deserts in the west to the rainforests in the east. Because of the diversity of landscapes