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BOOK OF ABSTRACTS

Session 1

Agro biodiversity and ecosystems

Rainfall Shocks, Resilience and the Dynamic Effects of Crop Biodiversity on the Productivity of Agro-ecosystems

by

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This paper investigates the dynamic effects of rainfall shocks on agro-ecosystems productivity. The analysis estimates a panel data model of cereal production in southern Italy. It documents the adverse effects of a reduction in rainfall on the agro-ecosystem productivity both in the short run and the long run. It investigates how increasing the level of spatial crop diversity can mitigate this negative impact. The empirical evidence shows how higher diversity supports resilience and maintains the system productivity under challenging climatic conditions.

Keywords: Agro-ecosystems, rainfall, productivity, crop biodiversity, Holling-resilience

Estimations of Soil Biota and Agricultural Production Interactions

by

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This paper studies the mutualism relationship linking soil biota and agricultural practices. It presents the point of view of biology and then proposes a point of view of econometric. I then review biological research findings on biodiversity and agro-ecosystems to show how it is a complex investigation at the scaling but also at the functional levels and how biologists and economists' investigations may not coincide in their expectations. I then propose a two-step econometric procedure that allow to estimate the magnitude of the mutualism relationship that links soil natural resources and the agricultural production. This procedure is conducted for different agro-ecosystems and consists in a first step in estimating the soil resource evolution with dynamic panel data and in a second step in estimating the magnitude of the role of this natural resource and of the chemical input uses in the production. Finally, it is shown that although investigation techniques may not coincide between economists and biologists, the results of this econometric procedure is relevant with biological considerations.

Keywords: agro-ecosystems, renewable resource, dynamic panel data.

Bees, coffee, and poverty: How alternative policy instruments and ownership structures affect technology choice?

by

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We investigate what role economic instruments can play in preserving biodiversity in developing countries, or in agroforestry management in coffee production, in particular. Most coffee producers live in poverty and manage agro-ecosystems in some of the world's most culturally and biologically diverse regions. What makes coffee farming an interesting case for biodiversity is the relatively recent finding that bees can augment pollination and boost coffee crop yields substantially. Despite the proved positive impacts of biodiversity on production in the long run, short term revenues from intense monoculture drive land use decisions. Our study investigates the possibility of multiple equilibria in adoption of technology (sun and shade grown coffee): all farmers adopt environmentally detrimental farming practices, or all farmers adopt sustainable practices, or both farming practices co-exist. We calibrate an empirical model to examine under what circumstances the multiplicity actually occurs. We then characterize the equilibria and carry out comparative statics analysis to investigate the impacts of alternative policy measures.

Prices and Species Diversity – Stochastic Efficiency Modelling

by

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In recent decades a significant amount of literature has been produced concerned with establishing a link between production efficiency and environmental efficiency with respect to quantitative modelling. This has been mainly addressed by focusing on the incorporation of undesirable outputs or the incorporation of environmentally detrimental inputs. However, while the debate with respect to linear programming based DEA modelling is already at an advanced stage the corresponding one with respect to stochastic frontier modelling still needs considerable efforts. This contribution focuses on the case of biodiversity and the appropriate incorporation in stochastic frontier models to achieve more realistic measures of production efficiency. We use the empirical example of tobacco production drawing from as well as affecting species diversity in the surrounding forests. We apply a shadow profit distance function approach as well as a fixed effects non-radial technique to reveal input specific allocative and output oriented technical efficiency measures as well as measures of environmental efficiency. We also consider functional consistency by imposing convexity on the translog profit function model. Based on a biologically defined species diversity index we incorporate biodiversity either as a desirable output or biodiversity loss as a detrimental input. Beside quantitative shadow price measures the main contribution of the work is the evidence that parametric scores of environmental efficiency are not sensitive to the modelling approach chosen but to the imposition of theoretical consistency on the estimation model. In contrast to earlier stochastic approaches on the producer level our approach can be applied by using any first or second order flexible functional form.

JEL Q12, Q32, Q57

Keywords: Environmental Efficiency, Species Diversity, Stochastic Frontier

Session 2
Optimal Conservation Programme Design

Managing Land Use and Land Cover Change in the biodiversity context with regard to Efficiency, Equality and Ecological Effectiveness

by

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The introduction of conservation-friendly farming measures is an important tool for biodiversity conservation. Recently, a debate has started whether this money is spent effectively, i.e. whether it successfully contributes to conserve biodiversity in agricultural landscapes. Several types of criticism have been raised that are adequately responded by environmental policies leading to spatially and temporally heterogeneous habitats. However existing policies for species conservation are still designed to support one conservation measure only by paying an equal amount of compensation to all land-users carrying out the
corresponding measure.
Regarding ecological findings we firstly point out in which cases environmental policies have
to be differentiated in space and time. Secondly, we analyse the necessary and sufficient conditions for transfer schemes to exist that are able to introduce a spatio-temporally heterogeneous land use and land cover type. Thirdly, we reveal that strategic considerations of
land-owners limit efficiency and fairness considerations of the policy makers when determining the ecologically accurate payment scheme. However – surprisingly – if policy makers seek to minimise their budget required for implementing the desired policy goal, this at the same time guarantees that the individual profits of the land-owners (when performing with the desired policy goal) are as equal as feasible.

Noah's non-concavity: On the existence of non-trivial interior solutions to the problem of cost-effective conservation planning

by

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The idea that species loss diminishes future information flows is a cornerstone of arguments for conservation planning. In his seminal work entitled "The Noah's Ark Problem", Weitzman [9] examines the problem of cost-effective conservation planning from a theoretical perspective accounting for the affect planning has on the expected size of the biosphere's informative potential. We extend Weitzman's analysis by examining how his conclusions are altered by the introduction of a conservation authority that considers the value of information contained in the biosphere. We extend that introducing non-quasi concave preferences for the information contained in each species substantially modifies the characterization of a cost-effective conservation plan. In particular, we find that a cost-effective plan generally includes partial funding for many species and funds no species completely. Our investigation is motivated by theoretical contributions to the information economics literature, a la Radner and Stiglitz [7], showing that the value function for information tends to exhibit increasing returns.

Farmers' participation in agri-environmental programs and impact on farm performance: an empirical analysis applied to Swedish agriculture

by

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Compensatory payments for agri-environmental measures related to arable and pasture land management constitute a significant share of the total direct payments to farmers' in many countries today. In Sweden, 25% of the direct payments to farmers are in form of agri-environmental payments. In this study, farmers' decision to participate in the programs, the level of participation (measured in hectares) and impact from participation on farm performance (measures by profitability) is analysed using data from Swedish farms for the years 1998-1999. Heterogeneity among farms/farmers, in terms of different levels of fixed inputs (such as land) and farm/farmer characteristics (such as managerial characteristics, location, type of farming etc), imply that the acreage devoted to agri-environmental programs

differ among farms. The average impact from program participation on farm performance is, as expected, positive and the results moreover suggest that the impact on profitability varies with the location of the farm.

JEL classification: Land Use, Biodiversity Conversation

Fund raising for species protection in national parks: Limitations and opportunities of nature based tourism

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Conservation budgets are – in times of fiscal austerity – scarce, and many administrations of protected areas aim for different sources of funding besides the public budgets. Tourism to protected areas can help in opening up new sources of funding. Improving visitor infrastructure can attract more visitors to a protected area who are willing to pay for their recreation benefits. Directly, visitors spend money on parking and entry fees. Indirectly, increased awareness and education leads to higher WTP for species on the basis of non-use values. While budget-generating, tourism also brings ecologically negative impacts to a protected area. In this paper, we discuss these two-edged effects of tourism by means of bioeconomic model which frames the interaction of species, their (joint) habitat, and humans in a particular ecosystem. The implications of the endogenous conservation budget and its allocation towards endangered species are discussed analytically in a general context, suitable for complex species-habitat-visitor interactions, and underlined by a case study for the rock partridge population in the Mallnitz Tauern Valley (National Park Hohe Tauern, Austria). On the basis of our numerical example, realistic empirical parameters and a GIS model of the region, we identify policies that combine both higher visitor numbers and contribute to species protection in a cost-effective way. A policy-mix of visitor infrastructure improvements and habitat creation performs best in terms of combined effects regarding recreation, conservation and funding.

Session 3
Conflicts in biodiversity conservation: pests, invasive, and parasites.

A bugs life: competition among species towards the environment

by
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A model of different species competing for the same environment is presented, and possible explanations of peaceful coexistence or rather internecine conflicts are consequently derived. By means of a Lotka-Volterra dynamic system we describe the evolution of two populations
(bees and locusts) that differently approach the management of those natural resources they contend for, and thus make a simple parable of todays societies playing the current environmental scenario.

Keywords: Competing species; Lotka-Volterra dynamics; natural resource management.
JEL Classification: C61, Q34, Q57

The Biodiversity Optimization Problem with a Single Parasite and a Single Species

by
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A given preservation budget should be divided between two species: Palm and the parasite Ficus Religious, which needs the palm to survive. In this parasite framework we obtain an interior solution. This is in contrast to the well-known extreme solution result of Weitzman's (Econometrica 1998) libraries model in the Noah's Ark problem. Moreover, in the parasite model, at least half of the budget is invested in the Palm preservation.

Keywords: Biological Diversity Function, Libraries, Parasites, Linear Budget Constraint.

Pest Control in the Presence of Pest Suppression by Natural Enemies

by

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The control of pests by their natural enemies represents an important ecosystem service that maintains the stability of agroecosystems and has the potential to mitigate pest control costs both to private producers and to society. Extending the "economic threshold" concept, this paper proposes an "ecological economic threshold" for pesticide use that takes into account the implicit cost of injury to natural enemies. By explicitly accounting for natural pest suppression, the ecological economic threshold can potentially make pest management more cost-effective while reducing dependence on toxic insecticides. The threshold is illustrated via an intra-seasonal dynamic bioeconomic model of soybean aphid management in Michigan, USA. A dynamic programming model quantifies the economic value of natural suppression to optimal pest control. The results highlight the importance of assessing both pest and natural enemy populations in making insecticide application decisions and accounting for the opportunity cost of insecticide use due to its collateral damage effect on natural enemies. The paper offers a preliminary, lower bound estimate of the value of natural pest predation as inferred from the insecticide input replacement cost per acre for the area where the natural enemy complex can suppress pest population below the level at which it causes damage. A sensitivity analysis shows that numerical solutions for the ecological economic threshold are sensitive to biological parameters such as predation rate and net growth rate of pest population. We recommend that future research move beyond insecticide thresholds to develop guidelines for explicit management of habitat for the natural enemies of agricultural pests.

Beyond the Lamppost: Optimal Prevention and Control of the Brown Treesnake in Hawaii

by

Kimberly Burnett, Sean D'Evelyn, Brooks Kaiser, Porntawee Nantamanasikarn, James Roumasset

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The threat of invasive species stems from their ability to rapidly and irreversibly change ecosystems and the direct and indirect economic services that ecosystems provide. Each of several stages of invasion dictates different human response. In general, policy makers must determine the proper balance between "prevention" expenditures that lower the probability of new introductions and "control" expenditures that limit the growth rate and/or the species population. Optimal policy regarding invasive species will minimize the expected damages and costs of control within an ecosystem and will include full consideration of the cycle of prevention (or avoidance) and control (or removals) needed over time. Rarely, however, have policy makers or economists integrated prevention and control for optimal intertemporal allocation of resources. We illuminate theoretically how expenditure paths change in response to various biological and economic parameters, and solve for expenditures for every population level and each time period for the real-world case of the Brown Treesnake (BTS). We find that the conventional wisdom that "an ounce of prevention is worth a pound of cure" does not reveal the whole story. Depending on the interaction of biology and economics, the message may be much richer than this. In particular, the dynamics of prevention and control interact in such a way that it pays to increase control, even at the expense of foregone prevention expenditures, at very low populations.

Session 4
Agricultural Biodiversity and Economic Development

Open Panel Discussion

Hosted by the
International Food Policy Research Institute (IFPRI)

Panel:

Melinda Smale
International Food Policy Research Institute (IFPRI)

Leslie Lipper
Agriculture and Development Economics Division, FAO

Peter Hazell
Centre for Environmental Policy, Imperial College, London (Wye Campus)

Ruth Meinzen-Dick
International Food Policy Research Institute (IFPRI)

Mauricio Bellon
Diversity for Livelihoods Programme, International Plant Genetic Resources Institute (IPGRI)

Time:

August 29, 13:30-14:45

Discussion Themes:

1. What is agricultural biodiversity and its role in biodiversity management?
2. Are market development and sustainable management of agricultural biodiversity necessary antithetical?
3. What is the role of non-market institutions in sustainable management of agricultural biodiversity?
4. What are some of the major design and policy challenges involved in managing agricultural biodiversity sustainably?

Session 5

Advances in fishery bio-economic modelling

Defining viable recovery paths towards sustainable fisheries

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This paper develops a formal analysis of the recovery processes for a fishery, from undesired to desired levels of sustainable exploitation, using the theoretical frame-work of viability control. We define sustainability in terms of biological, economic and social constraints which need to be met for a viable fishery to exist. Biological constraints are based on the definition of a minimal resource stock to be preserved. Economic constraints relate to the existence of a minimum profit per vessel. Social constraints refer to the maintenance of a minimum size of the eet, and to the maximum speed at which eet adjustment can take place. Using eet size and fishing effort per vessel as control variables, we identify the states of this bioeconomic system for which sustainable exploitation is possible, i.e. for which all constraints are dynamically met. Such favorable states are called viable states. We then examine possible transition phases, from non-viable to viable states. We characterize recovery paths, with respect to the economic and social costs of limiting catches during the recovery period, and to the duration of this transition period. Sensitivity of each of the constraints to transition costs and time are analyzed. The analysis is applied to a single stock fishery; preliminary results of an empirical application to the bay of Biscay nephrops fishery are presented.

Keywords : sustainable fishing, recovery, fishery policies, bio-economic modelling.
JEL Classifications : Q22, C61

What do fishermen think about the SLOSS debate*

by
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Recently marine biologists and economists have shown increased interest in promoting marine protected areas as a possible insurance policy to help sustain marine ecosystems and possibly even over the long run increase harvest levels. Some interesting work has come out of expanding the spatial representation of traditional bioeconomic models by introducing a two-patch environment with one patch representing the fishing ground and the other the reserve. A particularly interesting paper following this approach is Sanchirico and Wilen (2001) (SW hereafter). SW analyze whether setting aside areas is likely to produce fishery benefits as well as conservation benefits, and under which conditions this would hold. In this paper we use an agent based model to replicate part of the analysis carried out by SW and extend it to analyze the effect of the spatial structure of MPAs in the results.

Keywords : fisheries, marine reserves, agent based models.
JEL codes: Q22, Q28

Viable management of a renewable resource with a quota market

by

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This paper deals with the sustainable management of a renewable resource based on individual and transferable quotas (ITQs). The aim of that paper is to determine the conditions under which a regulating agency can achieve through a quota market both ecological and economic objectives along time when agents are myopic, heterogeneous and non-compliant. To achieve this, a dynamic bio-economic model is build where the performance of the different quota (TAC) policies is evaluated with respect to the satisfaction at each time of a constraint of guaranteed harvesting. We show that this constraint induces intergenerational and intragenerational equity along with conservation of the stock. The viability kernel provides the analytical tool to handle such a feasibility problem. Thus indicators of maximal guaranteed catches, minimal resource state together with viable quota controls are displayed. Specific policies are analyzed, including conservative, sustainable yield and maximin strategies. An example illustrates the main analytical findings.

Keyword: Renewable resource; Sustainability; TAC; ITQs; Noncompliance; Viability kernel, maximin.
JEL Classification: Q01, Q32, O13, C61

Session 6

Contract Design and Uncertainty

Mechanism design for biodiversity conservation

by

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This paper deals with the design of voluntary incentive contracts to conserve biodiversity in the context of forested areas in developing countries. The aim of the environmental agency implementing the conservation program is to induce the landowners to set aside a part of their land from agriculture conversion, compensating them for the resulting profit loss. A principal-agent model under adverse selection is developed to analyse the e .ect of information asymmetry arising from the lack of information of the environmental agency about the type of land.

Green Auctions: A study of Mechanism Design with Externalities

by

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This paper uses a mechanism design approach to study the biodiversity improvement in a territory, where the government is the principal and the landholders are the agents. In particular, I analyze an optimal mechanism that considers a multidimensional bid which includes both the biodiversity improvement of the project and its cost. Additionally, this mechanism incorporates the externality (either positive or negative) that a biodiversity project causes in the surrounding agents who decided not to participate. Specifically, I assume that externalities enter in cost function of the non-participating landholders.

I show that, in the case of negative externalities, the government will implement a transfer function which is increasing in the landholder's efficiency level on market activities. On the other hand, in the case of a positive externality, paradoxically the government may be interested in the non-participation of the most efficient landholders.

Incentive Contracts for Natura 2000 Implementation: A Mixed Model of Adverse Selection and Moral Hazard

by
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The implementation of nature conservation policy in the EU is often based on contracts between public authorities and landowners. We model these contracts in the presence of adverse selection and moral hazard when the outcome is uncertain. The results show that agents, who have high probability to reach a higher level of conservation, should be offered a contract where transfers depend on the final outcome with a bonus for a high state. When conservation measures are correlated with forest management, we show that the contractual measures involve distorded tranfers. Finally, we analyze the payment mechanisms used in France and Denmark and show that these mechanisms result in overcompensation and underperformance since they do not take the problem of moral hazard and natural variability into account.
Keywords: Natura 2000, Forest, Contracts, Mixed model, Adverse selection, Moral hazard.
JEL Codes: D82, Q23, Q57.

Is Bioprospecting Contract an Efficient Market-based Policy Instrument for Biodiversity Conservation?

by
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Bioprospecting is among the most frequently cited solutions to the natural resource degradation and biodiversity loss, as it promotes the private investments in biodiversity conservation. In order to regulate the proliferated bioprospecting activities and protect the biological diversity in the source countries, the Convention on Biological Diversity established a legal framework for the reciprocal transfer of biological materials between the interested parties in bioprospecting activities. In effect, a remarkable increase in the number of bio-prospecting contracts emerged between the users, notable linked to the pharmaceutical industry (e.g. Glaxo), and suppliers, which most of the times are located on geographical areas where it is registered a high richness of biodiversity (e.g. forest of Costa Rica). This however, gave rise to a wide range of public debate on the nature of bioprospecting and its impact in conservation of biodiversity values. This paper aims at exploring the overall social welfare changes in the context of biocontracting from the perspective of economic efficiency. It takes account of all the interested parties involved in bioprospecting contracts so as to analyze the respective economic payoffs as well as the consequent impacts on the stocks of natural resources. Particular attention is given to the role of patenting system in moving biocontracting towards an efficient market-based policy instrument for biodiversity conservation.

Keywords: bioprospecting; biocontracting; policy instrument; biodiversity conservation
JEL classificaiton: D21, D23, D61, L14, Q57

Parallel Session 7
Spatial effects

Policy design and the optimal selection of forests in Flanders
by
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This paper analyses the current Flemish afforestation policy and shows that it is not optimal. An important step in improving the afforestation policy in Flanders is the selection of the optimal location of a cluster of new forests as a whole. For this reason, the regulator will select the location that maximises the net social benefits of the afforestation projects. The analysis of the optimal location can provide the regulator with objective criteria, which can be used to develop optimal regulations. It is also worthwhile to consider alternative policies, such as auctions for afforestations projects. To this effect, we investigate several policy options and test these in a real-life example for the creation of new forests in East Flanders.

Keywords: Afforestation / policy instruments / optimal location

Deforestation, Growth and Agglomeration Effects:
Evidence from Agriculture in the Brazilian Amazon
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The role of population growth and migration has been emphasized as a key variable to explain deforestation and land conversion in developing countries. The spatial distribution of human population and economic activities is remarkably uneven. At any geographical scale we find that different forms of agglomerations are pervasive. On the one hand, in central countries or regions, agglomeration is reflected in 'large varieties of cities. On the other, less developed regions faces a dynamic process where new agglomerations form and develop as a result of frontier expansion. The recent literature on spatial economics has emphasized the role of agglomeration and clustering of economic activities as fundamental causes of an enhanced level of local economic performance, creating externalities that cause firms to grow faster and larger than they otherwise would do. However, very little has been done to examine the presence of agglomeration economies on economic performance of agricultural activities. In this paper we empirically examine whether an initial level of agglomeration impacts the subsequent economic growth and deforestation rates in the Brazilian Amazon. The regression estimates indicate that there is a significant non-linear association between the initial intensity of agglomeration with both growth and land conversion in subsequent periods.

Catering for the species: reserve selection by habitat type, environmental quality and spatial aspects

by

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A reserve site selection model is presented that adds three criteria to the species presence criterion traditionally used in reserve site selection models. These restrictions reflect the assumption that a species is conserved in a reserve site if (i) the habitat type of the reserve site is appropriate for the species; (ii) environmental quality of the reserve site meets the species' environmental demands; and (iii) the amount of habitat area available within a radius depending on the species' home range meets the species' demand for habitat area. The model is demonstrated with a hypothetical data set of 500 reserve sites and 40 species to test its performance with an off-the-shelf commercial MIP solver. Although it may take a very long time to find a guaranteed optimal solution, reasonable results are found within approximately two hours. The model will be useful in cost-effectiveness analysis of nature conservation policies in heterogeneous or fragmented landscapes with problems of environmental pollution, as is the case in many European countries.

ERE categories: Biodiversity, Spatial Issues
Keywords: Reserve Site Selection, Biodiversity, Integer Programming, Optimisation

Session 8
Institutions and north-south relationships

Transaction costs of tracking and monitoring the flow of agricultural genetic resources

by

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Bert Visser

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This paper makes some initial assessments of the transaction costs of tracking and monitoring the flow of plant genetic resources for agriculture as as has been proposed within the context of the International Treaty on Plant Genetic Resources for Food and Agriculture (IT PGRFA). We discuss what tracking and monitoring could specifically involve and identify four scenarios for tracking according to both the degree of comprehensiveness of information and the level of institutional centralisation. Based on some estimates of the costs of these alternative options, it is argued that an economically viable tracking and monitoring system will have to exclude a standard genetic or (bio)chemical analysis of the biological resource, since the costs of such analysis will likely exceed the expected benefit-sharing level. More generally, some scenarios are, because of the implied transaction costs, are not likely to elicit sufficient interest from users and cooperation from governments, assuming that most providers will have to rely on governments for tracking and monitoring.

The economics of IPR for traditional knowledge - The importance of property rights

by

Mare Sarr and Tim Swanson

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This article investigates the issue of intellectual property rights in relation to traditional knowledge and bio-prospecting in the biological sector (pharmaceutical and biotechnology industry). We examine the case for protecting traditional knowledge with some form of property right and shed light on the importance of the placement of such right in the R& D industry, for both distributional and efficiency reasons.

Environmental Policy and Conflict in Heterogeneous Democracy: The impact of Mobility in a Probabilistic Voting Model

by

Joshua Gogo

This research program studies the impact of institutions on environmental policy design and implementation in southern democracies with fiscal federalism and geographical representation. It focuses on the democracies in which the government is actively involved in mineral exploitation as a major source of revenue, where some communities' livelihood is disrupted by mineral exploration activities. It employs a public choice approach to study the conflicting requirement for public good provision and environmental efficiency in a heterogeneous society. There is no unanimity in the unitary system legislature. Unitary majority rule over burdens the environment in mineral exploration, and minimizes abatement, with possibility of conflicts with local communities resulting from negative externality to local livelihood. On the other hand, decentralization of environmental policy in federalism leads to inefficiently low levels of resource exploitation, with possibility of state failure.

Heterogeneity is a source of policy reversal and instability, and also increases consumption inefficiency in a majoritarian unitary system. Ideological heterogeneity in majority leads to a minority control of policy if there exist homogeneity in externality suffering minorities. Mobility of population reduces the negative externality from natural resource exploitation, and in this model, may increase the size of government, and reduce the potential for conflict. Non-governmental organizations may play a critical role as swing-voters in preventing excessive resources exploitation that leads to poverty and conflic*t*. Mobility does not invariably reduce conflict, especially at higher levels of externality. High levels of mobility may increase likelihood of instability.

Keyword: Environment; Public choice; Conflict; Development; Resources; Externalities; mobility, migration, political economy

Session 9
Biodiversity Policy Implementation

Towards a biodiversity governance assessment tool
by
G. Brodnig and S. Bashi
UNDP

UNDP is managing a large and diverse portfolio of biodiversity conservation projects across the world, mainly in its role as one of the three Implementing Agencies for the Global Environment Facility. Most, if not all projects, evolve around policy reform and institutional capacity-building but only a few projects have incorporated approaches and tools for institutional/governance analaysis. This stands in sharp contrast with the fairly well treaded paths of biological or socio-economic assessments, which have become an integral part of most major biodiversity projects.

It is only recently that UNDP has developed a preliminary tool for protected area governance assessment, which is now being applied to a small set of field projects. Our paper reviews the conceptual and methodological underpinnings of this tool, in particular its emphasis on power as an explanatory variable for conservation outcomes. It then investigates the relevance of normative principles such as participation, transparency, rule of law ("good governance") in addressing power imbalances, and how they, in turn, impact on conservation institutions. The discussion of the assessment framework will be complemented by case material from conservation projects in Asia and the Pacific. The paper concludes with recommendations for fine-tuning existing approaches to institutional/governance analysis for biodiversity conservation.

Marine Biodiversity: An Economic Valuation
by
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A goods and services approach has been applied to determine the economic value of marine biodiversity in the UK. This paper presents the goods and services resulting from marine biodiversity in UK waters, detailing the habitats and species which provide them, and the likely impact of a decrease in biodiversity. Where possible a monetary value was assigned to each of the goods and services. Valuing the environment in monetary terms is still controversial, and the problems with this approach are recognised and discussed with particular reference to marine biodiversity. The monetary figures provided here are the best value estimates currently available, but they should only be used as indicators of value, and the strength of this monetary data lies in its capacity to raise awareness of the importance of marine biodiversity.

A decline in UK marine biodiversity could result in a varying, and at present unpredictable, change in the provision of all these goods and services. This could result in severe impacts on society and the economy, including reduced resilience and resistance to change, declining marine environmental health and water quality, reduced fisheries potential, loss of recreational opportunities, decreased employment, and reduced carbon uptake.

Keywords: Marine; biodiversity; goods and services; valuation

Cost-benefit analysis of different management approaches of Kakamega Forest in Kenya

by

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This paper applies cost-benefit analysis to evaluate the existing three management approaches of a tropical rainforest in Western Kenya. The forest covers an area of approximately 240 Km^2 and is the only lowland tropical rainforest in Kenya and it is world famous for its diversity of unique and numerous flora and fauna. However its survival is under immense threat since it is located in a densely populated area where local communities depend heavily on agriculture and forest extraction for their livelihoods. Currently, the forest is divided into three different parts that are managed through three distinct management approaches/regimes: an incentive-based approach of the Forest department (FD), a protectionist approach of the Kenya Wildlife Service (KWS) and a quasi private-approach of a local church mission, the Quakers (QCM). The results of the analysis show that holding ecosystem services constant across the three regimes, the net present benefits fail to offset the net present costs for all the regimes both at local and national level. The study highlights some important conclusions which could be considered in for designing conservation policies.

Regional changes in forestry value added and employ

by

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Biodiversity conservation in forests has been claimed to have had a negative impact on the regional development as it decreases logging opportunities, and thereby forestry revenue and employment. Conservation in Finland is geographically very unevenly distributed so that over three quarters of protected forest land is situated in Northern Finland. The purpose of this study is to analyse whether the districts with larger percentage of nature conservation areas have performed worse than others in terms of the development of forestry value added and employment over the study period 1975 - 2003. We used the shift and share analysis to differentiate the special features at district level from the national or structural trends of the economy. We clustered districts in quartiles according to their conservation percentage. The results show that even though forestry employment has decreased nationally due to mechanisation, the decrease has been largest in districts with highest conservation percentage. However, due to the bleak economic development of those districts the relative importance of forestry has increased since the mid 1970's.

Session 10
Biodiversity Policy Evaluation

Economic Importance of Forests to Local Users and the Implications for Natural Forest Management in Uganda

by

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Research on the economic value to local users of natural forests can provide useful information for policy makers and forest managers. How forests contribute to national economic development and poverty alleviation is important in how central government plans expenditure on their conservation. We examined key economic relationships between income and natural forest use in order to quantify the economic role of Uganda's natural forests in poverty reduction and sustainable economic development. A stratified random sample survey was employed representing forest users surrounding the four major forest types in Uganda. We measured net annual household income and consumption from forest and non-forest sources and found that across all forest types and income groups, households derived 20.2% of their overall income from forest with 75.6% of the value of goods harvested from forests consumed in the home. Amongst income groups, high income households appropriated a greater overall of the value of forest goods. These results indicate that imposing reductions in forest use on environmental grounds may increase poverty amongst local people; increasing household income will not necessarily reduce forest exploitation. Integrated conservation and development approaches assume a positive link between improving household welfare and sustainable use of natural resources, an issue that is contested in this study context. However ICD can potentially play important role in mitigating conflicts between protected areas and local people, but their impact on altering illegal behavior is dependent on proper targeting of high risk groups and adequate protection or enforcement of regulations. Improved coordination between forest management, protection and rural development activities is therefore essential.

Keywords: Uganda, forest income, forest use, livelihoods, poverty alleviation, forest policy, forest management, ICD effectiveness

Determinants of Collaborative Conservation Costs of *Coffea arabica*'s Wild Populations in Montane Rainforest of Southwestern Ethiopia

by

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The study empirically identified the determinants of participation in collaborative conservation of wild *Coffea arabica* populations in the montane rainforest of Ethiopia. Specifically, the study estimated cost of collaborative *in situ* conservation at household level, and identified its determinants. The study was conducted in Gimbo district of Southwestern Ethiopia. Descriptive and econometric analyses were employed based on cross-sectional data collected from 99 sampled households and secondary data from FARM Africa. Treatment effect model was estimated using two-stage least squares method to identify the determinants of participation and cost of conservation at household level. The study depicted that variation in conservation costs of collaborative strategy is explained significantly by resource endowment variables of the households and their participation in conservation. Zoning of collaborative conservation area with strictly protected core zone for gene pool preservation and buffer zone for sustainable utilization enable the local communities to share both the responsibilities to conserve biodiversity and benefits from conservation. It may also minimize conservation costs and increase effectiveness of the strategy.

Keywords: collaborative conservation, *in situ*, wild populations, biodiversity, costs, sustainable conservation, *Coffea arabica*, rainforest.

The Sloping Lands Conversion Programme of the Peoples Republic of China, or `Grain for Green'. Impacts on income, income distribution and poverty alleviation.

by

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This paper investigates the impact of the Chinese Government's Sloping Lands Conversion Programme (SLCP), or `Grain for Green' policy. The primary objectives of the programme are to reduce environmental costs in river basins e.g. flooding, erosion and sedimentation of watercourses, and to alleviate rural poverty. To meet these objectives relatively generous yet temporary compensation is given to farmers for reforesting currently cultivated land on steep hillsides. Certainly there has been much reforestation under the SLCP, but what has been the impact of the programme on participants? We employ programme evaluation methods (e.g. Heckman et al 1997, Blundell and Costa-Dias 2000) to estimate the impact of the SLCP upon household incomes and poverty alleviation, while correcting for the selection bias that plagues previous analyses. We use a variety of matching difference in differences methods (Heckman 1997, Abadie 2005, Athey and Imbens\ 2003) to estimate average and quantile treatment effects, each of which accommodates the potential for heterogeneous household responses to interventions as predicted by theory and witnessed in rural China and beyond (e.g. Chen and Ravallion 2003, Key et al 2000). Given this heterogeneity, and the dispute surrounding the appropriate measure of poverty in China, we estimate the impact on poverty alleviation for a wide range of poverty lines. Lastly, in light of concern that the impact of the programme, like the compensation, will be merely temporary, we use the results of our analysis to say something about the sustainability of the programme once compensation ceases.

Session 11
Biodiversity Regulation: compliance and instrument choice

Dynamic Model of Regulatory Compliance in Fisheries: The Case of Mesh Size

by

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This paper employs a dynamic model for crimes that involve time and punishment to analyze the use of nets with illegal mesh size under two management regimes: competitive and regulated open access fishery. The model is based on the consideration that the illegal net is used repeatedly until detection; the net decreases the expected weight recruitment of catchable fish; and lowers the average cost of harvest. We find that under the competitive fishery, the equilibrium stock and harvest are lower if the fishers use the illegal mesh size. However, under regulated open access, the size of the equilibrium stock depends on the ratio of the elasticity of catchability coefficient to the elasticity of the hazard rate. Furthermore, under some condition, the fine for violation should be higher under open access relative to the competitive fishery for any given level of violation.

Keywords: Crime; Dynamic Model; Fishery; Regulation.

Fisheries Management Under Uncertainty Using non linear fees

by

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This paper considers non-linear taxation to regulate fisheries. It compares that instrument with quantity control and linear taxation. Traditionally the question of how to regulate fisheries has been posed as a choice between price and quantity control. A numerical example, concerned with demersal fisheries, indicates that non-linear taxation might be superior to quantity control. When cost uncertainty is involved, it can also prove more efficient than the price instrument.

JEL classification: D82, H21, Q22.
Keywords: fisheries management, uncertainty, non-linear taxation, dynamic optimisation.

Can voluntary eco-labeling replace trade bans in the case of GMOs?

by

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Genetically modified (GM) food has raised both health-risk fears and environmental concerns. This has led some countries to ban the trade in such food triggering a great deal of controversy among countries. In this paper we ask under what conditions will voluntary labelling of GM-free food be at least as good as a trade ban with respect to a domestic welfare measure? And, under what conditions can providing labels for GM-free food be protectionist?

Our main finding is that the merits of a product labelling policy depend crucially on the way food products are differentiated. If they are poorly differentiated from the beginning, a labelling policy will probably not function as good as a trade ban does; while if they are already well differentiated, a labelling policy is likely the optimal policy for the importing country. Finally, a labelling policy is likely not protectionist. In fact, if products are poorly differentiated from the beginning, foreign firms will probably increase their pro–t even if they do not choose to label their products.

Black markets and trade bans: can bans reduce illegal production?

by

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This paper provides a simple general equilibrium model in which both legal and illegal markets exist interdependently. We investigate, first of all, the effects of raising the confiscation efforts directed at the illegal markets and laundering on production of illegal goods, and also the effects of controlling the legal supply of legal supply of those goods. In addition, we examine the effects on the profits of illegal producers and launderers. Based on these results, it is shown that a ban does not minimise the illegal production, and that it can maximise it under conditions where laundering is not present. However, when laundering is possible, a small enough legal supply will be shown to be more harmful than the situation under a trade ban. But if the legal supply is large enough, lifting the ban and supplying the goods legally will reduce illegal production. Finally, we show that legal supply is a useful policy instrument in the sense that it can generate a policy mix be which efforts to eliminate laundering will always result in reduced illegal production and reduced profits from illegal business.

Keywords : endangered species, black market, confiscation effort, trade ban.

JEL classification: H20, Q20, Q30.

Session 12
Management of farm-biodiversity: empirical advances

On Management of Natural Rangelands : A case study of commercial farms in Southern Namibia

by

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In Namibia range degradation is a permanent concern among scientists, national land planers and local land users. Information identifying elements of sustainable land use or influencing sustainable management of natural rangelands is sought, especially in the actual context of land redistribution. This paper makes a first contribution to this issue in which it seeks to investigate land users' strategies and practices in their ecological context. At first a qualitative analysis was carried on to deliver information on the variety of management practices existing. Second we use the paradigm of high-reliability as a rational underlying farmers' strategies. Accordingly we develop an optimization model with two objectives: income maximization and range condition optimization. It enables us to make a link between various practices and range degradation and value the trade-offs occurring between both objectives. The method is used for a case study analysis in southern Namibia where farmers ranch on entirely natural rangeland under conditions of erratic rainfall and thus extremely variable biomass resource availability. In the small area, farmers strategies vary greatly in the nature of farmers reactions to opportunities such as high rainfall events and threats such as droughts. The modelling exercise reveals that strategies change as the nature of trade-offs between income and range condition decreases. In addition the value of the trade-off delivers information on the value the farmer is ready to 'invest' in order to maintain his range in good condition. This is the result of an economic strategy and might also be influenced by a series of additional social factors which we discuss briefly.

Market Involvement and Crop Biodiversity in a Developing Economy: Bananas in Uganda

by

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This paper sheds some light on the relationship between crop biodiversity on farms and market using cross-sectional data of banana growing households in Uganda. The reciprocity of the relationship between diversity on-farm and the involvement of farmers in banana markets is estimated using a two-stage estimation approach. Market involvement is analyzed both in terms of 1) the decision to participate in banana markets (as either a net seller or a net buyer), and 2) the composition of participation, measured by the number of varieties sold at farm-gate. The results suggest that diversity on household farms constitutes a necessary condition for both market participation in banana markets and diversity at farm-gate. Hence, greater diversity on-farm, as a cumulative stock of attributes, can increase cash flows to households (i.e. private benefits) through diversified production and sales without compromising *in-situ* conservation efforts. However, the presence of diversity on farm does not guarantee participation and its composition. That is, the reciprocal causation in the relationship is not statistically significant suggesting that diversity on farm is not a sufficient condition for market participation and its composition.

Private farmers compensation and viability of protected areas: The case of Nairobi National Park and Kitengela dispersal corridor

by

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Nairobi National Park is unable to incorporate the spatial and temporal dynamics of many migratory mammals that rely on the area as a dry season refuge because of its small size. During the wet season, wildlife must be able to migrate to the south into the Kitengela dispersal area. This area is privately owned and in a fast process of land use change that affects the structure and function of the dispersal corridors, jeopardizing the ecological sustainability of the Park. Private land holders in Kitengela are the ones who share most of the costs to keep open the dispersal areas, but do not receive any compensation or revenue from the large amount of benefits derived from tourism in the Park. Here we present an analysis of the willingness to pay of Nairobi and Kitengela residents for a new land management scheme in the dispersal area in which local pastoralists leave their land open to wildlife and not engage in fencing, land subdivision or poaching activities, receiving a monetary compensation for the incremental costs derived of the use of their properties as a wildlife dispersal area. The results of the study suggest that the financial support of urban residents' might exceeds the economic losses caused by wildlife and different financial schemes could be implemented to ensure payments in perpetuity.
Keywords: Nairobi National Park, Kitengela, dispersal corridors, valuation, conservation.

Estimating Mexican farmers' valuation of Milpa diversity and genetically modified maize: A choice experiment approach

by

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A *milpa* is a traditional intercropping system of maize, bean, and squash. *Milp*as are repositories of agrobiodiversity in México, not only rich in inter- and infra-crop species diversity, but also in landraces of maize, which are building blocks for future improvements in this globally important staple crop. Even though they are still widely cultivated across México, sustainability of *milpa* cultivation is threatened by farmers' integration into labour and output markets and recently, by the flow of transgenic constructs from genetically modified (GM) maize varieties to landraces in *milp*as. In this paper a choice experiment is employed to investigate farmer valuation of agrobiodiversity in traditional *milpa* systems and the option to cultivate GM maize varieties in *milp*as. Data are collected from 414 farm households across three states of México, and analysed using random parameter logit model with interactions, which can detect for unobserved, as well as observed sources of heterogeneity in the sample. The results reveal that there is considerable heterogeneity in farmers' preferences for *milpa* diversity and GM maize across and within the three states. The location and characteristics of farmers who value *milpa* diversity the most, as well as those of farmers who value the option to cultivate GM maize the most are identified. These findings have policy implications in terms of designing least cost on farm conservation programmes for traditional *milp*as, as well as for understanding the potential in adoption of GM maize in México.
Keywords: genetically modified maize, choice experiment method
JEL Classification: Q12, Q18, Q24, Q26

Session 13
DIVERSITAS Session: Biodiversity science for human well-being

Trust, Trustworthiness and Cooperation: Social Capital and Community Resource Management

by

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Social capital is considered one of the main determinants of community resource management success. Trust and trustworthiness are important measures of social capital. We combine experimental and household survey data from five rural villages in India to analyze (i) how these measures are correlated with socio–cultural community characteristics, and (ii) how social capital affects community resource management.

Keywords: Social capital, sustainable development, water scarcity, participatory development programs, economic experiments, trust games.

JEL codes: O12, O19, Q01, Q25

Natural vs. financial insurance in the management of public-good ecosystems

by

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In the face of uncertainty, ecosystems can provide insurance to risk averse users of these systems. We employ a conceptual ecological-economic model to analyze the allocation of (endogenous) risk and environmental quality by risk averse decision makers, who can decide upon ecosystem management and who have access to financial insurance, and study the implications for optimal ecosystem management and policy design. We show that while an improved access to financial insurance leads to lower ecosystem quality, the effect on the free-rider problem and on welfare is determined by ecosystem properties. If financial insurance becomes more accessible, (i) the extent of optimal regulation may decrease or increase, depending on the relative size of private and external effects of management effort on biodiversity; (ii) the welfare loss due to free-riding may decrease or increase, depending on how biodiversity in uences ecosystem service provision; and (iii) in the absence of environmental regulation, welfare may decrease or increase, depending on both the relative size of private and external effects of management effort on biodiversity and on how biodiversity in uences ecosystem service provision; it decreases, if the external effect is large and if higher biodiversity greatly decreases the variance of ecosystem services.

Locally Perceived Values of Biological Diversity in Indonesia: A Choice Experiment Approach

by

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Knowledge on preferences for ecosystem services at the rainforest margin can facilitate the development of economically sound conservation strategies as claimed by the Convention on Biological Diversity. A choice experiment was successfully employed in a tropical rainforest area around the Lore Lindu National Park, Indonesia to estimate values for rattan availability, water supply for irrigation, population size of anoa as well as different ways of cocoa cultivation along a shade tree gradient. While on average a willingness to contribute to the maintenance of the resource base was found for the first three attributes, respondents had preferences for more intensive ways of cocoa cultivation. Applying an ecosystem service approach facilitated the valuation of functional benefits of biodiversity. By using design features like a self-explicated status-quo alternative and the use of visualizations we successfully adjusted the design to a complex rural so-called developing country setting. Interactions with socio-demographic variables provide a more distinct view on the choice behaviour of respondents.

Keywords: Ecosystem services, Biodiversity choice experiment, Environmental valuation, Rainforest, Indonesia

Economics of Biodiversity and Productivity in Intensive Agricultural Systems

by

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This paper explores the economic effects of biodiversity loss on marketable agricultural output in the context of intensive agricultural systems, where due to specialisation and ecological simplification such systems require an increasing level of artificial capital inputs. A theoretical bio-economic model is used to derive a hypothesis regarding the effect of the state of biodiversity on the optimal supply of crop output both in the longer run and in the transitional path towards the steady state equilibrium. The hypothesised positive relationship between biodiversity stock and optimal levels of crop output is empirically tested using a stochastic production frontier approach that controls for any potential inefficiency deviation from the crop output frontier. The empirical approach is based on data from a panel of UK specialised cereal farms for the period 1989-2000. The result supports the theoretical hypothesis. This is reflected by the empirical finding that, once the relevant set of labour and capital inputs are controlled for, increases in biodiversity can lead to a continual outward shift in the output frontier (although at a decreasing rate). This may indicate that agricultural transition towards biodiversity conservation is consistent with the increase in the supply of crop output in already biodiversity poor modern agricultural landscapes.

Keywords: Agrobiodiversity, technical change, agricultural transition, sustainable intensive agriculture

Session 14
Chinese forestry policy evaluation

Estimating Non-Market Environmental Benefits of the Conversion of Cropland to Forest and Grassland Program: a choice modeling approach

by

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The non-market values of the environmental benefits derived from the Conversion of Cropland to Forest and Grassland Program (also known as the Grain for Green Program and the Sloped Land Conversion Program) in the Loess Plateau region of North West China were estimated using choice modeling both on-site in Xi'an and Ansai and off-site in Beijing. Separate choice models were estimated for the three sites and the results compared. Significant differences were found between the implicit price estimates derived from the multinomial logit (MNL) model and the random parameter logit (RPL) model for some environmental attributes. Based on the results from the RPL models, the average willingness to pay per respondent household in Beijing was CNY 882.56 (USD 109.44) each year for the environmental improvements on the Loess Plateau provided by the Program, a payment level significantly higher than the comparable estimates of CNY 342.56 (USD 42.48) in Xi'an and CNY 388.08 (USD 48.12) in Ansai.

Keywords: land use change, choice modelling, environmental benefits, China

Assessing the Case for Compensation for Collective Households Affected by the NFPP

by

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In 1998, following serious flooding and landslides around the Yangtse and Yellow Rivers, the Chinese government implemented the largest scale watershed protection programme in the world. One of the elements, the Natural Forest Protection Programme (NFPP), involves a ban on harvesting timber from the majority of forested land in 17 Chinese provinces, for an indefinite period of time. By limiting rights to the uses of land, the NFPP has generated public benefits, but also imposed losses on rural. This paper estimates the size of these losses and considers whether regulatory takings have occurred, for which the households should be compensated. We consider whether the programme is viewed by the communities as a locally optimal regulation which increases net social welfare by preventing activities that generate negative externalities, or as a regulatory taking, for which compensation should be paid. In order to create the appropriate incentives, compensation should be paid when individuals provide public goods that increase social welfare, and should not be paid when the government prevents them from doing things that decrease net social welfare. We estimate the welfare losses experienced by the households using stated preference techniques, and then use a Double-Hurdle model to estimate whether perceived reductions in negative externalities from timber harvesting offset those losses significantly. We find that the NFPP has reduced negative externalities from timber harvesting, and that this has had a significant positive effect on the welfare of local households. Therefore, we conclude that the presence of market failure meant that overharvesting of timber was taking place previously and that the programme acted to correct that. This implies that the NFPP constitutes a non-compensable regulation rather than a regulatory taking.

Qualitative assessment of the sustainability of the Sloping Land Conversion Programme in China and implications for tenure reform

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In 1999, the Chinese government implemented the Sloping Lands Conversion Program (SLCP) which provides compensation to participating households for reforesting cultivated sloped land in the upper reaches of the major river basins with either commercial or purely ecological trees. The stated aims of the SLCP were to curtail environmental degradation and its consequences and to reduce the extent of rural poverty. However, the limited horizon of the compensation (lasting up to 8 years) has given rise to concerns over the sustainability of the program once the compensation stops. Uncertainties remain over what will happen at the end of the current program under each of the three possible future policy scenarios: the subsidies could simply stop, the programme could be renewed in its current form, or a new and different land set aside programme may emerge. This paper provides an analysis of the long term sustainability of the SLCP under each of these three exit scenarios. The analysis uses household level data of farmers collected in Guizhou and Ningxia provinces. To asses the sustainability under the first two possible post-SLCP scenarios we analyse farmers' stated labour and land allocation intentions using a bivariate probit model. In the second part of this paper, we use a choice experiment in order to investigate the sustainability of SLCP's ecological benefits in the third policy post-SLCP scenario, namely when the programme is renewed in an altered form. Broader conclusions over the sustainability of land set aside programmes and payment for ecosystem services schemes are drawn.

Community Governed Forest Tenure Reform: Determinants, Outcomes and Implication for Future Policy Reform

by
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This paper examines the formation of new forest tenure system, analyzes the driving forces behind the newly formed tenure structure, and assesses impacts of the reform on forest productivity, investment and farmers welfare. The analysis covers a sample of 10 counties, 30 townships, 60 villages and 600 rural households, surveyed in Fujian Province. The targeted duration will be 2000-2005, a period in which the reform is being carried out. A two step analyses are carried out to examine (1) the choices of tenure types by village communities, and the determinant factors; (2) impacts of the tenure reform on farmers' behavior and performance in forest management. The analytical results provide insights on optimal tenure arrangement in rural forest economy, and shed light on direction of future reform to remove remaining policy constraints for conservation and development in collective forest areas.

Session 15
Management of biodiversity: theoretical advances

Managing multiple-fishery pools: property right regimes and market structures

by

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Well-defined and enforceable property rights are seen as a prerequisite for optimal resource management. However, the interaction effects between renewable resource pools with different ownership structures are often not well recognized. In this paper we introduce these interaction effects in the optimal fishery management theory. Various property right regimes and market structures for fisheries are analyzed. Furthermore, we investigate the effect of changing the carrying capacity of the lakes for the different agents. We show that an increase in the carrying capacity has an ambiguous result on the optimal catch. Another outcome is the possibility that in the steady state more fish is caught under a monopoly structure when compared to a Nash-Cournot structure and that it is also sold at a lower price. Finally, a private owner may initially refrain from catching fish causing the other lake to be emptied and thereby creating a monopoly.

Keywords: fisheries, market structures, property rights, renewable resources
JEL Classifications: L1, P14, Q22

Pricing the ecosystem and taxing ecosystem services: A general equilibrium approach

by

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In an integrated dynamic general equilibrium model of the economy and the ecosystem humans and wildlife species compete for land and prey biomass. We introduce a competitive allocation mechanism in both submodels such that economic prices and ecosystem prices guide the allocation in the economy and in the ecosystem, respectively. It is shown that efficiency restoring resource policies need to account for ecosystem prices and that economic prices for land and biomass, respectively, exceed their ecosystem counterpart.

JEL classification: H21, Q28
Keywords: land, biomass, ecosystem services

Session 16
Plant and genetic resource policy implementation

"The worth of a wildflower": Precautionary perspectives on the environmental risk of GMOs

by
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How much is a wildflower worth? Inspired by "The worth of a songbird" by Funtowicz and Ravetz (1994) we use the value of a wildflower as symbol of the complexity of evaluating environmental qualities and risks. We critically discuss the application of cost-benefit analysis in evaluating environmental impacts of adoption of genetically modified organisms (GMOs). We argue that cost-benefit analysis should be supplemented with other methods, such as processes for assessing uncertainty, accommodation of scientific disagreements, and integration of stakeholders' interests and perspectives. A more inclusive perspective is to develop precautionary approaches that recognize the multidimensional nature of environmental qualities and risks, such as irreplaceability, irreversibility, uncertainty and complexity. Precautionary approaches can contribute to develop a stronger environmental responsibility within the framework of rational self-interest.

Keywords: cost-benefit analysis, environmental risk, environmental value, genetically modified organisms, precautionary principle, scientific uncertainty.

Policy Induced Emergence of Monoculture and its Impact on Agricultural Resource base: A Case of Land and Water Degradation in Indian Punjab

by
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The Punjab model of agricultural growth is cited as a success story in economic literature and other regions within India or in other developing countries may follow the same path. This model based on the creation of monoculture of rice in summer season and wheat in the winter season has resulted in serious land and water problems and depleted soil health and water resources are emerging as the crucial constraints to the future growth of agriculture in the state. The first lesson that follows from Punjab's experience is that the monocultures do have the potential to over utilize and degrade a crucial natural resource or a set of resources essential for sustainable growth of agriculture in that region. There fore while planning for agricultural growth in new areas, a prior assessment of the long run effects of monoculture is must and the monocultures should be allowed to the extent up to which these does not degrade a resource or a set of resources beyond their permissible limits. Even the planning for diversification in the problematic regions like Punjab need utmost care as diversification policies can lead to another type of monoculture. Secondly an effort should be made to match the cropping system with soil capabilities, sustainable water availability and other resource endowments. The large scale soil and groundwater surveys which were either not feasible or cost prohibitive in the past, can be undertaken by remote sensing techniques at much lower cost and are feasible too. Thirdly, the uses of crucial recourses require economic and legal regulation long run optimization of their use. There fore the regulation of the recourses needs to be institutionalized by establishing appropriate institutions.

Marketing Underutilized Crops for Biodiversity: The Case of African Garden Egg *(Solanum aethiopicu*m) in Ghana

by

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NTNU

The African garden egg is one of the most important vegetables in Ghana and West Africa. This crop that is particularly diverse in Ghana is not only consumed on a daily basis by rural and urban families but also represents the main source of income for many rural households in the country. Despite its importance, there is limited knowledge and research investment on the crop. Why is this the case? The objectives of this study are to: 1) show why garden egg is an underutilized plant species; 2) analyze constraints affecting the Ghanaian marketing channel of garden egg; and 3) identify potential solutions to overcome these constraints. We conduct a farm and market chain study of garden egg using an economic conceptual framework by Gruère et al (2006). This conceptual framework was specifically developed to characterize and evaluate marketing constraints of underutilized crops. We propose some marketing strategies to better exploit the economic potential of the crop and at the same time maintain its contribution to crop biodiversity in Ghana. Specific interventions should target: 1) poor shelf life of the fruits; 2) improved post-harvest handling; 3) development of quality standards. Any public or private intervention in this direction would likely result in multiplied effects for the rural income and for future crop biodiversity.

The role of crop genetic diversity in coping with agricultural production shocks: Insights from eastern Ethiopia

by

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In this paper we explore how agricultural households in the Hararghe region of eastern Ethiopia manage their crop genetic resources to cope with drought, a prevalent source of agricultural production shocks, focusing in particular on the implications of cultivating modern versus landrace crop varieties for sorghum, an important crop for food security. We use a unique dataset from eastern Ethiopia, an area rich in crop genetic diversity, but with low and variable agricultural productivity and high rates of poverty. The study area is a center of origin and domestication for sorghum, and about three quarters of the farms are growing landrace varieties of sorghum rather than improved varieties. Rapidly maturing improved varieties of sorghum have been developed and disseminated in the area, and these were developed as a means of coping with low and variable rainfall.

This paper looks at reasons for why improved varieties are adopted and the implications for farm level resilience to drought and choice of coping strategy when such shocks occur. The dataset combines rich crop and physical data on plant varieties (independent field work was used to validate that plant varieties had mutually exclusive forms and structures) with rich household-level wellbeing data (including income, assets and debts from both farm and off-farm sources) during a shock year. In the year that the data were collected (2002-2003 production season) eastern Ethiopia experienced a major drought with widespread crop failure ensuing. Use of a shock year is important, because households use a variety of methods to cope with the shock, with varying implications for resource damage and extraction.

Session 17
Biodiversity Valuation:
Methodological and Policy Contributions

Including Scenario Uncertainty in Stated Preference Valuation: A Choice Experiment on Marine Recreational Resources

by

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Environmental valuation with stated preference surveys typically assumes that respondents have a high degree of belief in the hypothetical valuation scenarios. However, the public may be aware that environmental policies are uncertain and therefore consider valuation scenarios with no explicit reference to this uncertainty as unrealistic. As part of a choice experiment on marine recreational resources in the Gulf of California (Mexico), we explored the results of valuation surveys that contained either no information on scenario uncertainty, or different types of information on uncertainty. Our results suggest that including information on the uncertainty of the valuation scenarios impacts estimates of implicit prices and welfare measures. We conclude that including such information in stated preference surveys may reduce model noise and enhance the validity of willingness to pay estimates.

Keywords: stated preference; uncertainty; choice experiments; validity; survey design

Assessing management options for weed control with demanders and non-demanders in a choice experiment

by

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The yellow floating heart is a water weed causing nuisance problems in Swedish watercourses. An economic analysis of this is required where various management options are considered. The benefits of a management program are to a large extent recreational. Using a choice experiment we estimate the benefits of a weed management program and perform a cost-benefit analysis of different management programs. In order to be able to distinguish between those who have a demand for a program from those who do not, we introduce a way to distinguish demanders from non-demanders in the choice experiments. The advantage of our suggested approach is that we can more clearly distinguish between conditional and unconditional willingness to pay. In the empirical study we find that a share of the respondents are non-demanders. The demander willingness to pay still justifies cutting the weed in certain places in the lake, given that we use a simple cost-benefit rule.

Keywords: Choice experiments, invasive species, non-demanders, bivariate probit
JEL-classification: Q25, Q26, Q51

Considering the role of the minimum viable population (MVP) and the existence of close substitutes in scope tests

by

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Validation of contingent valuation (CV) exercises for environmental goods has traditionally been done with scope tests, although wild species valuations have been controversial and often did not pass such scope tests. The current study complements previous efforts made to explain scope test failures. We explicitly examine the role of the minimum viable population (MVP) and the uniqueness of the environmental good being valued. In this study we value a recovery program for the common murre in Northern Spain. Our results show that when no information is provided about the existence of close substitutes of the species being valued, the WTP estimates are not sensitive to the size of the good being recovered. However, when information is provided about the existence of other close substitutes of the same species, the mean WTP value drops significantly for the program aiming to recover a larger amount of pairs. These results, showing a failure of the scope test, are discussed and contrasted with previous studies.

Keywords: contingent valuation, endangered species, MVP, scope test.

Visitor attitudes and valuation of species protection – Differences across species, policies and visitors

by

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Protected Areas have diverse, and sometimes conflicting, purposes and aims, such as conservation of endangered species and ecosystems as well as recreation and education of visitors. Thus, any park administration tries to find a balance between conservation and nature-based tourism, ideally based on different attitudes and values for preservation of species held by visitors and the general public. In a contingent valuation survey we focus on park visitors' attitudes towards the protection of two species differing in endangerment and popularity. The rock partridge serves as an example of an unimpressive but ecologically valuable species, while the alpine ibex illustrates a species of high popularity but low degree of endangerment. We investigate the willingness to pay for a change in the species population size resulting from different conservation measures, and the acceptance of these measures, potentially restricting visitor opportunities. As a policy conclusion, we find that protection should not be limited to ecological (and legal) concerns but it has to take account the visitors' reactions to policies, both in ecological and economic terms. In the best case, an accepted conservation measure could be (at least partly) financed from contributions by preservation aware visitors.

Keywords: species conservation, willingness to pay, Contingent Valuation.
JEL codes: C13; Q26; R52

Session 18
Habitat management

Commons as insurance: safety nets or poverty traps?

by
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Common property resources are often used by households of developing countries as insurance in case of economic stress. The aim of this paper is to consider the potential poverty-trap implications of this use. If the capacity of the resource is small, or if the population in need of insurance is too large, the households are trapped in CPR extraction activity and cannot get more than their subsistence requirement. In this context, the introduction of an insurance scheme could be an exit to the poverty trap and relax pressure on the resource.

Keywords : Commons, Insurance, Poverty trap.

A Bioeconomic Model of Community Incentives for Wildlife Management before and after CAMPFIRE

by
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This paper formulates a bioeconomic model to analyze community incentives for wildlife management under benefit-sharing programs like the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) in Zimbabwe. Two agents influence the wildlife stock: a parks agency determines hunting quotas, and a local community chooses to either aid or discourage outside poachers. Wildlife generates revenues from hunting licenses and tourism; it also intrudes on local agriculture. We consider two benefit-sharing regimes: shares of wildlife tourism rents and shares of hunting licenses. Resource sharing does not necessarily improve community welfare or incentives for wildlife conservation. Results depend on the exact design of the benefit shares, the size of the benefits compared with agricultural losses, and the way in which the parks agency sets hunting licenses.

Keywords : bioeconomic, CAMPFIRE, community, poaching, wildlife, benefit sharing
JEL Classification: H41, Q20

Natural resource harvesting when growth and stock observations are uncertain'.

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