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Conference Scientific Report

Monday, September 21st

Plenary Session I: Ecosystems as natural assets
Professor Edward Barbier (University of Wyoming, USA)

Following the broadly definition provided by the Millennium Ecosystem Assessment, ecosystem services are the benefits provided by ecosystems to humans. Ecosystem services comprises a variety of benefits, which in economic terms could be classified as: goods, services, and cultural benefits. To model the natural resources as a special form of capital that can be depleted or accumulated is now common in economics. The review presented by **Edward Barbier** showed how such approach can be extended to ecosystems, implying that they are a form of natural asset that produce a flow of beneficial goods and services over time. Considering that the literature on ecological services implies that ecosystems are assets that produce a flow of beneficial goods and services over time, they are no different from any other asset in economy, and in principle, ecosystems services should be valued in a similar manner. In this sense, recent developments in landscape ecology suggest that the basic unit of most ecological processes is spatial and is synonymous with the land or natural landscape that defines the boundary of the system. In this case, Barbier found that it is possible to view ecological landscapes as natural assets that produce a flow of beneficial good and services over time. The resulting problem of converting natural landscape or maintaining it to provide ecosystem services was expressed in terms of an economic model of competition land use. Subsequently, three extensions to the natural asset model were developed in the review: 1) a examination case in which the value of an ecosystem service and the cost of maintaining this service vary with the spatial distance across the natural landscape of an ecosystem, 2) the implications to the model when the economy is opened to trade, and finally 3) the vulnerability of the ecosystem to collapse as land conversion proceeds.

One important result obtained is that correctly valuing nonmarket ecosystem services is essential for determining the optimal allocation of natural landscape among competing uses. Furthermore, for an ecological transition to occur, restoration must be technological feasible and that the value of a restored ecological landscape must be sufficient to justify the cost of restoration.

Although economists have been developing spatial models of natural resource management, the consideration of how the spatial heterogeneity of natural landscape influences the provision of ecological functions and their services is a relatively new area in economics. The next stage is to examine further how spatially heterogeneous landscapes influence the provision of ecosystem benefits. Another interesting final remark is that irreversible land conversion is now recognised as a major factor inhibiting the ability of an ecosystem to recover, of return, to its original state. Finally, the threat of ecological collapse has been studied extensively by ecologists, and economics need to become interested in how the threat of collapse affects the management of ecosystems as natural assets.

Parallel Session 1: University Research Sponsorship Programme (European Investment Bank)
Economic costs of climate related ecosystem services losses and the consequent macro-economic impacts

This special session referred to a project promoted by the EIB (European Investment Bank) University Research Sponsorship Programme and developed by the Ca' Foscari University of Venice.

Paulo Nunes' paper showed the results of one of the first studies aiming to assess the impacts driven from climate change on European forest ecosystem services and eventually on welfare. The study reports physical impacts on provisioning, regulating and cultural services for 34 European countries, grouped in four classes according to the latitude. The A2 IPCC scenario is considered as a benchmark and it is compared with the alternative IPCC storylines. The novelty of the hybrid approach consists of translating the physical impacts in economic terms through a partial equilibrium framework to assess the impact on welfare. This represents the starting point for the subsequent analysis carried out with a computable general equilibrium approach.

The same goal was pursued by the study presented by **Andrea Ghermandi**. In this case, the focus was on the link between climate change and biodiversity in order to define the modifications of freshwater ecosystems and thus provide an estimation of the related welfare changes. A meta-regression analysis was carried out collecting data over a number of sites across Europe, once again splitting them in four different clusters according to the latitude as a relevant explanatory variable. As in the case of Nunes' work, results were presented for the different IPCC storylines with future projections for 2050.

Fabio Eboli showed basic features, underlying methodology and typical results of a recursive-dynamic computable general equilibrium model developed with the purpose to address the issue of climate change impacts' assessment. Results for selected climate change impacts such as those on land loss because of sea level rise, change in crop productivity, change in energy and recreational demand and impacts on human health were presented. The speaker highlighted the strength of this approach that is the capacity to take into account of all adaptive economic mechanisms due to change in agents' behaviour following the price's signals. This gives a final assessment on welfare that may both smooth or increase the initial evaluation computed in partial equilibrium studies.

Francesco Bosello presented a paper on the development of the innovative methodology and preliminary results of the introduction of the change in ecosystem and biodiversity due to climate change assessed by Nunes' and Ghermandi's analyses in the computable general equilibrium model described by Eboli. More specifically, Bosello highlighted links and relevant economic drivers that allow assessing non use/existence values in a pure economic model that in principle only considers market values. Results are promising and should be used as a complement rather than as a substitute of the traditional techniques for non-market values.

Parallel Session 2: Payments for environmental services

This Session focused on Payments for Environmental Services (PES), both from a policy and a methodological view point.

The first paper presented by **Celia Harvey** offered an overall review of the effort provided by Conservation International in implementing pilot projects based on PES in several important natural areas, and with the involvement of local institutions and stakeholders. Few key lessons can be learned from such an extensive experience. Information on environmental services need to be centralized, in order to make it accessible to all those working on PES worldwide. Spatially explicit tools are needed, as to take into account spatial

heterogeneity in ES, and existing differences in the social environmental and economic contexts. Successful PES initiatives lay on the involvement of all relevant stakeholders and on long term financing. In this concern, the discussion was focused on the cost-effectiveness of PES schemes. Among the other, the key question was: what happens to PES initiatives when financing is over? At the moment it is still to early to provide an evaluation of the cost-effectiveness of PES schemes, but the rational of PES financing is to support the start-up phases and create favourable conditions as to PES to continue in autonomy thanks to the management capacities of local communities.

The second paper by **Ulf Narloch** presented a methodological proposal for designing Payments for Agricultural Services (PAS) mechanisms. The idea is to apply the PES framework for the sustainable use of plant and animal genetic resources at the farm level. Differences between wild and agro-biodiversity need to be addressed when deriving payments. Three types of PAS instruments are discussed: i) direct reward payments; ii) competitive tender approach; iii) market chain development. These are then compared in terms of effectiveness, economic efficiency and social equity. During the discussion the scale of the market failure in term of loss of farm genetic diversity was discussed, as well as the scale of the PAS mechanisms.

To third paper by **Luke Brander** presented a methodology to scale up ecosystem services estimates. The methodological proposal employs meta-analysis and GIS to the case of wetland areas in Europe. The discussion focused on the constraints that still affect value transfer exercise and on the how to ameliorate the robustness of results.

To conclude, the paper by **Pushpam Kumar** discussed the current capacity needs from India, to make the implementation of PES possible. The analysis shows that the capacity of India is high, but this is affected by a wide variation across regions that can represents an obstacle for PES mechanisms. The questions focused on the how to work with governments in order to enhance their capacity to apply PES schemes, as well as how to build capacity at the local/farm level.

Parallel Session 3: Forest services and policy management

The session discussed various aspects of forest management. The first contribution, by **Roland Olschewski**, aimed to provide a global cost assessment for industrial forced afforestation reduction in tropical countries. The whole model defined a growth path for timber plants, specifically *Cordia Alliodora* (much used in many industrial sectors), from which timber volume was estimated; a pricing scheme for carbon sequestration credits; a pollination model for coffee plantations, where pollination services depended negatively on the plantations' forest distances; discount rate is set to 3%. Each model was run under three decreasing tree density scenarios: 400, 300 and 200 trees/ha. The model's results show a negative net present value for timber plantations alone, which shifts positive when taking into account the other aspects: the convenience of density reduction, anyway, appears only when accounting for pollination services, a less dense forest leading to better habitats for bees.

Artti Juutinen's article addressed the efficiency and coverage of public intervention in Finland. Sites which both had or had not participated in the TNV (Trading for Natural Value) program were analyzed under some indicators of efficacy, among which the richness in certain fungi and lichens (highly depending on decayed wood: the scope of the programme was indeed to obtain agreed lands to be used for anything but natural growth). A first striking result is that the TNV-included lands did not prove to provide higher environmental benefits on the defined species, resulting inefficient both in output and cost aspects. Site selection was then modeled under a budget-constrained maximization of species' number: TNV areas appear useful at low budget levels, but, after an intermediate part in which low-cost sites are preferred,

show a decreasing path, a higher budget share going to sites which were evaluated important but did not reach an agreement, suggesting more flexibility in auction procedure and management.

Thomas Sembres's presentation took into account dynamic land-use mechanisms in the analysis of tropical deforestation and its relation with timber plantations, using a cross-country analysis. Decreasing rents as a function of marketplace distance are described, and a simple maximizing behavior is assumed: land will be used for the most remunerative activity. It follows that timber plantation reduction (in order to fight deforestation) might result in such a loss of forest value that would increase agricultural rents, hence substituting forests with crops and paradoxically increasing deforestation. Econometric results did show coherence with this idea of land-use mechanism. Paula Horne's paper reports similar arguments, showing at last the double-dividend plausibility of both carbon sequestration and biodiversity conservation. Using the MOTTI growth/yield simulator and given economic models, three forest management alternatives were compared: business as usual, carbon stock increasing and passive (biodiversity conservative via decayed wood). Results depend highly on the discount rate, but the double-dividend perspective appears interesting both for public and private agents.

Parallel Session 4: Modelling ecosystem benefits

The first paper by **Anne Borge Johannesen** studied the role of non-marketed livestock values in a pastoral society in Norway. The size of the livestock herd may be an important insurance asset, and also the herd size provided other important non-marketed benefits related with cultural values and social status. A model was conducted to test whether such non-marketed values influences herdsmen's response to a hypothetical increase in the slaughter price. Results showed that: 1) herdsmen see large herds as a source of insurance against adverse conditions and as important to gain social status, 2) the insurance motive tend to reduce the slaughter response for owners of large herds, 3) no strong evidence were found about the effects of preferences for social status affecting the slaughter response.

The paper by **Estelle Midler** and colleagues studied the capacity of the Reduction of Emission from Deforestation and Degradation (REDD) scheme to curb deforestation in tropical countries. A stylized transfer model was conducted to describe the negotiation between developing countries over the allocation of the forest fund. The results showed that REDD scheme could induce preserve incentives. Although REDD is designed to counteract deforestation, it creates incentives for developing countries to negotiate greater baselines, allowing them potentially to increase their deforestation rates and obtain positive transfers. This result is related with the modelling choice; furthermore alternative system of transfer should be conducted.

The research conducted by **Anders Skonhoft** analyzed the economy and ecology of sheep farming at the farm level where two different categories of the animals (ewes and lambs) were included. The model developed was analyzed within a Nordic economic and biological system with distinct seasonal subdivision (outdoors grazing season and the indoors one). During the outdoors grazing season the animals face limiting grazing resources so that the weight gain of the lambs is determined by the per animal vegetation consumption. On the other hand, the number of grazing animals, lambs as well as ewes, determine the grazing pressure. The paper demonstrated the economic and ecological forces steering the slaughtering decision and hence the animal stocking-vegetation utilization trade-off factors.

Finally, the paper presented by **Ben Groom** and colleagues was focused in the problem of global environmental negotiations. They employed cooperative bargaining theory and Nash's rational threats idea to affront this issue. Results showed that it is important to begin thinking about global environmental problems as questions of cooperation over the production of join superplus. The most interesting result

were the observation that global contracts must be bases on the real characteristics and real contributions of the bargaining parties.

Parallel Session 5: Conservation of ecosystem services and human welfare issues

This session was addressing one of the main issues to enhance the conservation and sustainable use of biodiversity thought economic instruments; it is the analysis of the links and possible controversies between biodiversity conservation and human well-being.

Usually payments for environmental services concerned with the cost-effectiveness of their interventions, meanwhile recipients concerned with their own well-being. This different point of view could suppose a constraint. In this paper presented by **Ben Groom**, the authors demonstrated that poverty alleviation and environmental objectives need not be in conflict. They used the study case of the forest honey producers in the Central Menabe region on Madagascar and calibrated a model in which two different technologies of honey production were employed by households. One interesting results was that where households are technology constrained, the donor and recipient might be able to agree on cost effective payments which relax constraints.

The second paper by **Sheila Walsh** evaluated the successful of an integrated conservation-development program. This kind of program constitutes a common strategy used to reduce resource extraction and improve human welfare, but it is unclear whether these programs are successful. This study tests the effect of an agricultural subsidy on fishing and human welfare. In this study, data from a natural experiment in Kiribati, Central Pacific was taken. A first model of household fishing and agricultural production and consumption was tested. Contrary to predictions of this model and the programs aims, some households actually increased fishing and decreased agricultural labour. To explain these data, an alternative model that simply assumes fishermen may enjoy fishing was created. This model predicted an increase in fishing in response to the subsidy when households have a revealed preference for fishing prior to the subsidy, which was supported empirically. The research concluded that conservation-development strategies therefore need to consider heterogeneity in household behaviour and non-market benefits from traditional livelihoods.

The study conducted by **Will Turner** used current data on carbon values, human population, and poverty to examine the degree in which places where biodiversity most urgently requires the conservation of terrestrial habitats provide ecosystem services to human communities. Also estimated the value of natural habitats to the world's poor, including a scenario in which adequate mechanisms exist for beneficiaries to pay for the ecosystem services they receive. The spatial distributions showed that the top 25% of terrestrial area of highest biodiversity conservation priority provided more than half of the benefits nature can provide to improve the well-being of the poor. Their results suggest that the natural capital of the world's poor is critical for poverty alleviation. In this sense, biodiversity and ecosystem services must be explicit components of development strategies to take into account in the decision making process of Governments and aid agencies.

Parallel Session 6: Conservation practices

Ayumi Onuma's paper focused on the monetary and non-monetary benefits (e.g. employment and technology transfers) arising from bioprospecting in developing countries, namely the South. After introducing the theoretical framework to incorporate both kinds of benefits, the paper examines how the

behavior of intermediaries, often non-profit organizations who deal with collecting and identifying samples for R&D, affects bioprospecting. Furthermore, the effects of traditional knowledge on these benefits are also studied. The main conclusions are that, under the assumption of non-profit behavior of the intermediaries, sample fees and technology transfers are lower, while local employment and samples collected are higher than under the assumption of pro-profit behavior. Also, it is shown that traditional knowledge increases the amount of collected samples, benefiting only the North (pharmaceutical companies) by increasing profits. This result suggests that some measure of profit redistribution form North to South would be appropriate when traditional knowledge is used in bioprospecting.

The paper by **Mica Bennett** focused on the possibility that eco-certification could stop the destruction of jungle rubber's biodiversity services in Sundaland. This area, which includes Indonesia's Sumatra and Java islands, is considered a biodiversity hot spot both for the uniqueness of its species and the high degree of threat to them. One of the traditional agroforestry practices was jungle rubber: the co-existence between rubber trees and native plants allowed for people and species to derive livelihoods from the same land and supply the demanded raw rubber. Recently however, this practice is being hindered by a new trend: local farmers find it more profitable to grow simple, low diversity monoculture plantations, at the cost of damaging the eco-system's biodiversity services. The solution to reverse this trend and conserve biodiversity was found in eco-certification; however as currently designed it has obstacles that hinder its full implementation. The paper finishes with proposing some measures to test for reducing these obstacles.

James Vause presented a study regarding the design and use of biodiversity offsets, mainly intended to inform debate on the possible contribution of biodiversity offsets to conservation and sustainable development goals in England. Biodiversity offsets have attracted increasing interest as a mechanism for enhancing biodiversity in many countries. Today, threats to biodiversity are great and estimates predict that by 2030 the world's population will increase by 2.5 billion people, which won't be sustainable with current environmental standards. The study proposes the use tools form basic environmental economics, taking externalities into account, to forge in the form of offsets the optimum policy tool to conserve biodiversity. Also, details on where offsets should be used, how they should be implemented and suggestions for further research are provided. Furthermore, gaps in the current legislation are reviewed and identified as one of the main obstacles in the efficient introduction of biodiversity offsets.

Parallel Session 7: Formal testing in survey valuation methods

The main topic of the session has been a discussion about the reliability of Willingness To Pay estimations conducted via consumer surveys or experimental auctions.

The first paper, discussed by **Matleena Kniivilä**, discussed the relevance of questionnaires' framing in order to catch significant differences between the two different "consciences" of the interviewed person, id sunt: the consumer and the citizen, and the role of information on the same issue. The original sample consisted of 2400 people, aged 18 to 75 (non-respondents were further interviewed and showed no significant sociological differences w.r.t. respondents), which were divided into three homogeneous groups and asked to evaluate a bio-conservative programme (implicating additional taxation) against an economic development policy (tax-free). Three versions of the questionnaire were sent: a "consumer" one, asking for personal welfare statements, a "citizen-I" one, asking for social welfare, and a "citizen-II" one asking for social welfare as well but informing about the economic value of bio-losses. Simple spike models and logistic regression analysis showed both the relevance of questions' framing on mean WTP [citizen>consumer], PR(0-value) [cons>cit], and insecurity [cit>cons]; no significant effect was found for information.

In the second presentation, **Maria Loureiro** described the results of an experimental auction regarding a quasi-public good from the point of view of scope-sensitivity. Some consumer associations' affiliates, divided into two groups, were asked (against a 10$ payment) to participate to a 5-rounds long random n-th price auction: they were asked how much would they pay to change their endowment of 100gr regular ham with the same amount of ham but incorporating suitable housing conditions for pigs (1st group) or a "comprehensive animal welfare" policy (entirely including the other ham's peculiarities, 2nd group). A tobit model including sociological and economic attributes of participants was run, showing no significant differences between the two groups' stated WTP, hence failing the scope-sensitivity hypothesis. In order to exclude endowment effect biases, similar experiments have been run with a different scheme of simultaneous two-product bids, but the results were the same. Plausible explanations might include, in M. Loureiro's words, similar moral dimensions for the two products, difficult evaluation of their attributes, information saturation effects during the preliminary exposition to the participants, and free-riding behaviour.

Parallel Session 8: Biodiversity and agricultural systems

The first paper by **Angela Münch** explored possible interdependence between ecosystems and socio-economic and political aspects through an empirical examination of the interaction between biodiversity, land use, socio-economic factors, and political interferences in two different areas: Thuringia and Bavaria (Germany). One interesting result was that governmental interventions are significant; anyway more research is needed to explore the reasons. In this sense, results remain unclear and depend on the biodiversity indicator used and the method used, then, is important to choose indicators in a careful way.

Over the past three decades, about 26,000 protected areas (PAs) have been included in the European Natura 2000 network, covering about 20% of its territory. Because PAs are not "islands in the territory", its management must take into account their surroundings. In this concern, **Mattia Cai** analysed how the status of biodiversity in those Italian PAs included in the European Natura 2000 network were affected by land use changes in the surroundings areas (bio-geographic characteristics, landscapes attributes, and indicators of agricultural intensiveness were used). Results showed that wetlands are the most sensitive sites to land use change in the surroundings. Other interesting result was that the aspect of agriculture that had a negative influence on biodiversity was the homogenization of landscapes because of monocultures more than the intensiveness of farming per se.

Finally, due to the importance of biodiversity conservation and its role on agricultural systems, good management practices should take into account any possible impact on biodiversity due to crop rotation, application of chemical inputs, etc.

Biodiversity is a complex concept with several dimensions: genetic diversity, species diversity, functional diversity, etc. It is therefore crucial to identify proper indicators for each different dimension embedded by biodiversity. The research conducted by **Anni Huhtala** analyzed the production efficiency of both conventional and organic crops in terms of crop diversity (measured by the Shannon diversity index), here considered as an output of farms. The results show that organic farms on average have higher crop diversity than conventional farms. However higher crop diversity does not necessarily lead to an increase in the value of organic products. Further research is needed in specifying other possible environmental benefits indices which could be calculated on the basis of farm accountancy data available for regulators.

Parallel Session 9: Incentives and conservation

David N. Barton presented some methodological challenges concerning the role of economic instruments used in policy mixes for biodiversity conservation and ecosystem services provision. The paper argues that cost effectiveness analysis and non-market valuations are not sufficient approaches to assess the role of economic instruments in a policy mix, hence principles of "social-ecological-systems" (SES) are reviewed and discussed. For illustration purposes, two examples of economic instruments at different government levels are drawn: payment for ecosystem services at farm level and ecological fiscal transfers to municipal governments. The paper concludes by posing questions for further research.

The paper presented by **John Reid** discussed the use of financial incentives as a way to insure the development of greener energy and transportation infrastructure. Governments and development banks are the agents that have key roles in developing infrastructure as well as promoting environmental quality. And once these goals come into a conflict of interest, tools are needed for correct balancing. The main tools for infrastructure planning are economic feasibility studies and environmental assessments. Through proper long term planning and disclosure of detailed information, a project's sustainability can be improved. However, the paper argues that the most relevant urge banks can give to infrastructure developers in order to meet environmental standards is through financial incentives. Otherwise without them, any kind of improvement is meaningless.

Eduard T. Niesten's paper focused on incentives in marine conservation approaches. More specifically, the paper studies the design and the functioning of marine conservation interventions with various types of incentives. Three approaches were examined by analyzing large samples of data originating from a collection of case studies. Ordered form the most to the least direct in terms of how they channel incentives to choose sustainability, these three tools are: buyout of resource rights, conservation incentive agreements and alternative livelihood programs. The paper concludes that all approaches recognize the existence of opportunity costs of conservation that need to be offset somehow; that greater urgency calls for more direct incentives; and that many conservation projects combine elements of all three approaches.

Parallel Session 10: Tools for ecosystem services assessment relevant to corporate/business decision makers

The role of private actors in biodiversity conservation is extremely important, and major corporations' and businesses' compliance can sometimes play a crucial role in policies' effectiveness.

Sissel Waage's presentation addressed directly these themes, trying to give an answer to three key questions: why should businesses care about ecosystem services, what are the existing evaluation tools, and what are the emerging needs in such issues? The first answer is multiple: businesses do rely on environmental services in their activity, especially from an infrastructural point of view, but they also might consider environmental compliance as an investment option in market-based systems like carbon credits, or as risk-management practices both from the same infrastructural point of view and from a project cost-assessing one. Available tools comprehend a number of computer programs and workbooks, able to project different scenarios and to screen environmental default risks. Emerging needs include a precise R&D agenda, including proper understanding of ecosystems' inter-dynamics in order to facilitate a strategic, long-term perspective.

Joshua Bishop's contribution drew similar conclusions: environmental-friendly practices could represent a huge opportunity for businesses, being markets like eco-tourism and eco-agriculture in continuous

growth. Key structural interventions to be made appear to be certification (meaning an efficient information flow) and an organizational base to confer the benefits to whose who need them, the demand for these "new" products being concentrated mostly in developed urban contexts and some distributional issues being involved; the primary issue still remains to create and support a number of new potential customers, which might induce the formation of new markets with the implied new suppliers and competition mechanisms, and new market incentives due to different risks, even though the long-term stability of new agents' interest is still to be verified (both from demand and supply side).

Ferdinando Villa's exposition explained the basilar ideas behind the ARIES (ARtificial Intelligence for Ecosystem Services) project, which aims to become a key computer-based tool for environmental impact evaluation. The fundamental feature of the ARIES program is that it accounts, in addition to usual services' assessment, for services' flows, hence adopting for the first time a comprehensive dynamic perspective. The program will provide an intuitive graphical representation of the results, enabling the user to map on the screen level curves dividing geographic areas with respect to the potential impact suffered under a list of different aspects. Uncertainty measurement too is provided, the whole model's computations happening via statistical tools.

European Investment Bank and Ca' Foscari University of Venice Department of Economics Discussion Panel
Valuing Ecosystem Services: the Link Between Theory and Practice

In the BIOECON conference this year, the first discussion panel was jointly organized by the European Investment Bank and the Department of Economics of the Ca'Foscari University of Venice, dealing with issues regarding the role of economic valuation of ecosystem services and the identification of potential economic instruments to enhance the conservation and sustainable use of biodiversity. The key messages are delivered as follows.

Peter Carter (European Investment Bank - EIB) stated the important role of economic valuation of ecosystem services in helping financial institutions such as EIB to calculate the economic returns and financial returns for supporting public projects. Nonetheless, despite all the existing research efforts, it is still uncertain what type of pricing is appropriate, such as the case of carbon pricing. Therefore, more efforts should be imposed on the economic valuation studies and the resulting value estimates can help financial institutions to calculate the respective economic returns and to improve their financing activities on mainstream subjects, such as climate change.

Nicolas Kosoy (United Nations Environment Programme - UNEP) pointed out that the valuation of costs and benefits of ecosystem services and their interaction with stakeholders are the fundamental elements of a global assessment, which converts the natural assets to human welfare and brings the most valuable natural assets in the arena of the policymaking process. Besides, he also called attention to of the main obstacles and constraints that researchers have to face when assessing ecosystems, as well as when designing policies to sustain the traditional resources and alleviate poverty.

The paper by **Joshua Bishop** (International Union for Conservation of Nature - IUCN) covered issues regarding sustainable use of ecological resources, poverty reduction and social equity, which are the major objectives of IUCN. Among all others, IUCN has been actively involved in the Millennium Ecosystem Assessment as well as the development of a new program in climate change and the role of ecosystem on mitigation and adaption. Nonetheless, in either case, economics plays an essential role in assessing the biodiversity priority, calculating the economic rate of return, translating ecosystem services into business and leading financial institutions, e.g. EIB to integrate EGS into policy instrument design.

Sissel Waage (Business for Social Responsibility, USA) emphasized the fact that nature can be commercialized in market place. In other words, market is able to capture the value of nature despite its complexity. However, the important issues in biodiversity economics are that biodiversity has intrinsic value, and its value also involves efficiency and equity. Therefore, to commercialize nature, it is important to identify the magro mechanisms, addressing the power symmetry issue at the same time. The results are essential for major capital decisions, cooperating with social responsibilities regarding ecosystem and biodiversity conservations.

Tuesday, September 22

Plenary Session II: How useful have economists been to the cause of biodiversity conservation?
Professor Anil Markandya (University of Bath, UK)

Anil Markandya provided a critical overview of the contribution of the discipline of economics to biodiversity conservation.

The pursuit of economic objectives can be seen as the cause of much of today's environmental problems. However just as economic tools can cause biodiversity loss, so can they be used in the objective of environmental protection. This seminar therefore sought to provide an evaluation of the achievement of this objective, from the particular perspective of a critical overview of the use of economic tools as policy instruments in biodiversity conservation.

Four approaches were identified through which economics can contribute to biodiversity conservation: the valuation approach, the complexity paradigm, the ecosystem approach and the institutional approach. The ecosystem approach is that of the Millennium Ecosystem Assessment, which links biodiversity, biological resources and human welfare through the central organizing principle of ecosystem services. Some published research was discussed in terms of the value of ecosystem services, at the levels of aggregation of global, regional and local studies.

At a global level, current research highlights that loss of ecosystem services will imply the loss of all economic activity, with inevitably large welfare effects which can themselves be seen as underestimates or lower bounds only. At a regional level, an existing EU study (Cost Of Policy Inaction, COPI) estimates the value of losses if present trends continue unabated until 2030; while large, such estimates do not necessarily justify higher expenditures, since the extent to which such expenditures can reduce these predicted losses which has yet to be demonstrated. At the local level, values may be high but are still not always enough to make a strong case for conservation. There also exists evidence in individual country studies that "good practice" in the extraction of environmental resources matters. However, changing existing practices is a difficult task. The replacement costs calculations of the Catskill Watersheds in terms of the filtration of the New York City water supply was cited as a success story.

The influence of the valuation of ecosystem services in EU policy decisions was discussed. Unfortunately, there seems to be as yet no major influences, with little use of economic assessments in the movements toward broad targets of biodiversity conservation, at either developed or developing country levels. There exist some successful examples of the use of estimates in the policy process, but much still needs to be done in this respect. There exist several examples of the use of market-based instruments in terms of

both their use and their limitations in biodiversity conservation. In particular, Payments for Ecosystem Services (PES) was discussed.

So how useful have economists actually been to the cause of biodiversity conservation? The discipline has in fact shown that there exists a significant value of biodiversity that is not always captured in market transactions. However, despite increasing studies, there is a bottleneck in the application to public sector decision making. In addition, there is a lack of focus on variability and resilience. Most importantly, there is a lack of focus on "poor" countries, which in fact have the most biodiversity. The discipline has added to the literature on ecosystem functions, though most targets are still set based on ecological and not economic parameters. There is an impressive contribution to the links between institutional failures and biodiversity loss, but action to correct these failures still remains rare. The contribution in terms of the development of market-based instruments is promising. In summary, within the last twenty five years, economists have made a contribution to biodiversity conservation, but they are "able to do more", and "should try harder".

Parallel Session 11: Costs and benefits of conservation

This Session offered a review of the costs and benefits of conservation, with the contribution of four papers.

The first presentation by **Aaron Bruner** reviewed the up-to-date literature providing estimates of the costs and benefits of conservation in order to provide an answer to the central question: do benefits outwait costs? Overall, the reply is positive: benefits outwait costs. Still few methodological and policy issues need to be carefully addressed. From a methodological perspective, analysts must be careful with extrapolations and compare comparable values. Forma policy perspective, what is crucial is to make protection an attractive choice to policy-makers. Credible mechanisms for beneficiaries to share costs must be designed; as well as introducing clear mandates for actions.

The second paper by **Daniel Rondeau** provided an economic measure of the economic losses associated with land use restrictions, and a field implementation of a Provision Point Mechanism in the WTA domain and compare its performance against an open–ended payment vehicle. Conclusions are that the amount of compensation required is equivalent to as much as one year of income. This far exceeds the imputed value of direct use. However, further analysis is necessary to understand the determinants of variation across P.A. The PPM shows that it is possible to significantly reduce the number of outliers in WTA CV. As hypothesized, the PPM brings "discipline" to the valuation exercise, also reducing to variance of the WTA distribution. Although the PPM is not incentive compatible, it may offer a viable way to implement WTA scenarios when it is the appropriate welfare setting.

The third paper by **Salvatore Di Falco** presented a micro-level analysis on adaptation to climate change (CC) and food protection in the Nile Basin, Ethiopia, based on 1000 households survey data. The analysis identifies main determinants of adaptation to CC decisions and food production, among household characteristics, formal and informal institutional support, agro-ecological settings and climatic variables. Results indicate that, informal and formal institutional support, provision of information on future climatic conditions, and current level of climatic variables affect adoption of yield enhancing adaptation strategies. This shows the need to provide appropriate and timely information on future climate changes to farmers in order to alert them to take appropriate averting actions.

To conclude, **Ian Bateman** presented the results of a four year project in Sumatra, combining economic and ecological model to define efficient and self-sustained programme for inducing conservation in palm oil plantations. Unparalleled access to financial records combined with a highly intensive ecological data gathering allowed to develop spatially explicit cost effectiveness models for optimising conservation efforts. This was integrated with an additional study on the price of premium potential of conservation-grade palm oil to yield insights into the optimal design of schemes for delivering within existing plantations. The presenter concluded that there is considerable potential for enhancing biodiversity, including some Red List species, through the adoption of conservation se-aside policies in palm oil plantation and that her exists the economic demand and administrative mechanism to implement such policies.

Parallel Session 12: Modelling and valuation of alien species, bioprospecting and technological change

The first paper by **Paul Mwebaze** and colleagues was conducted in Seychelles with the aim to assess the value of impacts of invasive alien species (IAS) on biodiversity, natural resources, and the national economy. Cost-benefit analysis of IAS management and tools from environmental economics such as total economic value principles and contingent valuation approach were used in the study. Authors found that Seychelles currently spends some US$0.79/person-year on quarantine measures targeting IAS at the border. The results indicated that: 1) biological invasions are causing significant economic impact in Seychelles, 2) comparing the benefits from eradication with the cost involved gives a benefit-cost radio greater than unity, indicating that the policy of eradication is economically justified, 3) the policy of prevention would be the most cost-effective strategy, 4) future research is required, particularly for prevention policies.

The next paper by **Liu** and colleagues used a model of land use conversion to describe the fundamental causes of over-exploitation of a wild medicinal plant named liquorice in Xinjiang (NW China). The results showed that the local authority in control of land use is making land allocations which pre-determine the choices of all others involved in the system. The fundamental decision to convert land to other land uses means that stocks of the biological resource must decline. Under this open access regime, local communities are not eligible to protect their land and properly manage their natural resources because of the vague and non-transparent system of property rights.

The research conducted by **Tapio Palokangas** examined the political equilibrium where the interest groups representing the member states or their regions lobby the Government over biodiversity management. The author considered biodiversity management in three different situations: 1) without lobbying and political contributions, 2) with direct regulation of land use, and 3) with subsidies to the conservation of land. The comparison of these situations reveals whether the Government authority is adequate. Among others results, the author demonstrated that with a higher level of centralization, the welfare effect through biodiversity can be internalized more easily. In that case, regions had more incentives to transfer land from production into conservation.

Finally, **Dunkan Knowler** and colleagues analysed the conditions determining the social and private optimal number of nurseries through a model. Also, they explored a policy intervention in form of a tax that could induce horticultural nursery firms to internalize the risk of potential invasion and its associated cost. The study was focussed on the US and Canadian horticultural industry, particularly in a well known invasive alien species in North America named purple loosestrife (*Lythrum salicaia*). An interesting result is that as the share of the exotic plant sales in total profit increases, the size of the tax rises and the

socially optimal number of nurseries falls. Furthermore, their simulations suggest that a high license fee to control to the risk and damages of a potential invasion would reduce the number of nurseries.

Parallel Session 13: Marine and coastal ecosystems

During Session 13 of the BIOECON Conference 2009, four papers were presented discussing the economic values of coastal and marine ecosystems.

The first speaker, **Rady Talaat Tawfik**, presented the results of a primary valuation study aiming at eliciting visitors' preferences for conservation of the coral reefs in the Ras Mohammad National Park. The authors of the paper investigated the differences between contingent valuation and choice experiment methods and the contributions of the attributes of alternative management scenarios and characteristics of individuals to elucidate choice behaviour and provide policy guidance. The second and fourth speakers, Andrea Ghermandi and Nalini Rao, presented two examples of application of meta-analysis to the valuation of the benefits of costal ecosystems.

Andrea Ghermandi presented the results of a meta-analysis of primary valuation studies focusing on the recreation and passive values of coastal areas worldwide. The study investigates a large dataset of valuation studies and applies GIS techniques in order to identify the main drivers of values and explore the distribution of cultural values of coastal ecosystems worldwide.

Nalini Rao presented a study utilizing meta-regression to characterize the value of shoreline and coastal protection ecosystem services worldwide. The analysis focuses on ecosystem types such as mangroves, coral reefs and coastal wetlands and includes services such as storm protection, subsistence fishing and fuel-wood collection.

Adriana Ressurreiçào presented the results of a contingent valuation study aimed at the economic valuation of marine biodiversity. The study analyzes the results from four case-study sites in Europe and finds positive willingness to pay for preservation of the current levels of marine biodiversity. Respondents' willingness to pay for the preservation of charismatic taxa such as mammals and fish is statistically higher than for the preservation of algae, birds, and invertebrates, but less than what a priori expectations would suggest.

Parallel Session 14: Conservation, game theory and lab experiments

The topic of this session has been the use of game theory and experiments in evaluating environmental behaviours.

Fikret Adaman's presentation showed a multiple-stage game description of industry/fisheries interactions for the Uluabat Lake Basin in Turkey. The players involved are three: fishers, industries and government: industries are supposed to pollute the lake and offer to fishers to hire them as a compensation; remaining fishers, then, evaluate the opportunity of running a public action against the firms, which may or may not bring the government to set a maximum pollution level (Turkish governments have showed to react easily to public actions). As a fact, no collective action has taken place yet in the considered region. Based on a large number of surveys and clustering respondents in different ways, the study showed the high importance of conditional participators, the probability of success being perceived as high among fishers; indeed, all fishers are considered identical in the model, and hence some organizational problems might arise.

Marian Weber's paper showed the results of a laboratory experiment, which aim was to evaluate different market structures' outputs while considering an hypothetical cap-and-trade market system for environmental disturbance permits. 48 experimental sessions involving 12 people each were carried out, asking the players to play either as forest or energy industries, their actions involving a three periods long forest exploitation plan. Different types of institutions were tested: tender auction, call market and double auction; cap setting was supposed to be either rigid or flexible (meaning that it adapted to the players' expectations on fires and their actual number). Banking as well was allowed in some experiments, allowing saving Tradeable Disturbance Permits for later use. The results showed that the double auction mechanism outperformed other institutions, that flexibility in permit allocation reduced the effectiveness of environmental policies, and that a banking option reduced the energy sector's performance (which showed a significant positive learning-by-doing effect).

Devesh Rustagi's study aimed to explain the causes of human cooperation and commitment in public policies. The underlying idea is that social composition and tendencies do affect output for voluntary programs. The study was run in Ethiopia, and focused on the Participatory Forest Management programme. A survey among the Forest User Societies (the responsible for participation) was conducted, and the questionnaire was proposed in two versions: one unconditional of others' choices and one other conditioned to hypothetical actions by other FUSs. The policy's output was calculated in PCT (Potential Crop Trees) per hectare: regression analyses showed the significant contribution of the many behavioural types (conditional co-operators, free riders, absolute co-operators) on both output and monitoring cost; an important additional result is that conditional co-operators are not stable over time, their actions depending highly on the observed behaviours by other participants.

Daan van Soest's contribution showed the results of a series of experiments regarding cooperative behaviour among fishers. Fishers in the Bies-Houtakker fishery were involved in a game structure that mimics Voluntary Contribution Mechanisms, the group's payoff increasing when less fish was caught (no communication was allowed). At the end of each round, a number of trouts equal to the amount caught the period before was re-introduced at the beginning of the following round. The very same game has been then tested on students and fishers, but in an academic context: they were asked to state their actions in a lab experiment; the same experiment was tested again on fishers on the field (the pond). Cooperative behaviour did not appear in the field experiment (in order not to consider a bad-luck effect, the researchers also looked at fishers' effort, measured in throws/minute), and fishers behaved more cooperatively in the lab than students did; in addition, while taking the test on the pond, fishers increased their cooperation statements; a dynamic version of the very same game (which emulates population growth) was then performed, again showing no signs of cooperation. The conclusion of the paper is that it is fishing itself as an action that drives the agents not to participate.

Parallel Session 15: Valuing biodiversity in developing countries

The paper by **Charles Palmer** aimed to predict and study the emergence of co-management in protected areas, namely the involvement of local communities in sharing the management of protected areas as well as the benefits from them. This phenomenon represents an innovation in protected area policy as opposed to the "fence & fines" method (where areas are protected at the expense of local communities) where attempts to block local land use can even be fruitless ("paper tigers"). The paper develops a game-theoretical framework to model the community-park interaction in order to try and understand the roles of co-management interventions. At a second moment, the model is tested on a set of panel data from a co-management policy implemented in the Lore Lindu National Park in Indonesia. The results mainly

support the model predictions, although in some cases, mixed evidence is found, possibly due to the fact that some data proxies correlate with several model parameters.

Mike Christie discussed the importance of biodiversity for people in developing countries. As argued in his paper, local people in poor countries are heavily dependent on a wide range of ecosystem services, which in turn are supported by biodiversity. These services include the use of natural resources as food, fuel, medicine and building material. Economic valuation of biodiversity enables the quantification of the benefits these ecosystem services provide to the local population. The paper's main aim is to evaluate monetary and non-monetary techniques for assessing the importance of people in developing countries think about the natural environment is different than those in developed countries; people in developing countries tend to have much closer ties to their natural environment; low levels of literacy and education imply that most people will have little or no scientific understanding of their natural environment.

In her paper, **Sonja. S. Teelucksingh** discussed the main characteristics of developing countries that can influence the biodiversity valuation process. Since rural communities in developing countries are heavily reliant on ecosystem goods and services, thus their relation with the environment differs greatly from the common understanding people form developed countries have. Moreover, the notion of "developing countries" itself is found inadequate: simple categorization based on geographical criteria has little relevance when compared to other factors such as poverty, literacy, gender issues, migration, vulnerability to external environmental and economic forces, etc. The paper addresses all these issues and tries to classify "developing countries" into more homogeneous subgroups. Particular attention is given to Small Island Developing States (SIDS): while being mainly studied for touristic purposes in the past, this paper analyzes benefits gained from biodiversity by rural communities, seen from their point of view.

Parallel Session 16: Forest ecosystems

The session has been completely devoted to forest ecosystem, covering topics from the investigation of economic methodologies to the forest management schemes in practice. The first paper presented by **Keith Lawrence** showed a good example of how International NGOs, such as Conservation International, apply economic methodologies to forest ecosystem management in practice. Their approach focused on exploring whether economic growth, equity and conservation goals can be achieved simultaneously, in two biodiversity-rich landscapes, the Atlantic Forest region of Brazil and the Papua and Papua Barat (PPB) provinces of Indonesia. By comparing the cost-benefit analysis results from a "Business as Usual (BaU)" scenario and a "Green Economy" scenario, the paper came up with a promising conclusion that both economic development and conservation goals may be achieved in biodiversity-rich landscapes, even where there were strong economic pressures.

The second paper presented by **Helen Ding** explored an empirical econometric analysis of the casual relationship between Biodiversity and forest ecosystem goods services in Europe. In particular, the work draws attention on the dynamic changes of biodiversity and its potential influence on the flows of ecosystem goods and services that European forests can provide under different IPCC climate change scenarios. Moreover, two types of biodiversity indicator are developed, namely synthetic biodiversity indicator and composite biodiversity indicator, to tackle the quantitative and qualitative changes of forest ecosystem and biodiversity in the future. Despite their work was still at a preliminary stage, it showed some interesting results, for example, the synthetic biodiversity indicator, did show statistical significance in explaining the value of forest provisioning services.

Finally, **Kiriaki Remoundou** presented a choice experiment study implemented in Athens, examining

whether the institution responsible for funds collection and provision of the good under evaluation affects respondents true willingness to pay for the restoration of the national park and the forest of Parnitha. The assumption behind the experiment design was that ignoring institutional framework in a valuation study might bias the final WTP estimates. In fact, their results suggested that the institutional body responsible for the implementation of the restoration project did not affect individuals' valuation.

Parallel Session 17: The role of stakeholder perspective, public/social preferences in valuation

The three contributions of this parallel session are examples of different study cases in which the perceptions of stakeholder groups were taken into account to improve appropriate policies for the ecosystem services management and biodiversity conservation. Two of the contributions were focussed on wetlands (urban and commercials), meanwhile the other one was focussed on the impact on the landscape of agri-environment schemes. Alls these systems are considered as important ecosystems providing diverse ecosystem services to sustain human life.

The first paper by **Ananthakrishnan Ramanathan** examined the economic value of Kol wetland (India), which is facing a serious threat of degradation because of the increase in: population, and in the demand for land for industrial and residential purposes. Contingent valuation approach was used to assess the perceptions and preferences of the stakeholders about the improvement of Kol Wetland. The estimated WTP of the stakeholders indicates the urban households' concern for the improved conservation and management of the wetland. The findings can motivate policy makers to adopt a better and holistic approach for improved conservation and management of the wetland.

Considering that the preferences for landscapes are complex, dependent on the characteristics of the landscapes and of the individual observer, and due to the importance of agri-environment schemes in maintaining and restoring biodiversity in agricultural areas, the paper by **Diane Burgess** and colleagues assessed the impact on landscape of agri-environment schemes. The study was focused on four potential landscapes that could occur in the Less Favoured Areas of Northern Ireland under different policy scenarios. The results showed that overall a statistically significant preference order existed for the landscapes. Furthermore, the findings of the study demonstrate that preferences are influenced by socio-economic, cultural factors of respondents, environmental attitudes, and how they view their relationship with nature.

Finally, in their paper, **Arianne de Blaeij** and colleagues investigated the opinion of the Dutch population with respect to commercial wetlands, understood as constructions with a multifunctional aim. For this purpose, a combination of two different approaches was used: the contingent valuation method to obtain an aggregate willingness to pay value for multifunctional commercial wetlands and the analytical hierarchical process to decompose the aggregated value into partial willingness to pay values for the separate functions of commercial wetlands. The results showed that about half of the Dutch population was willing to pay extra for the construction of commercial wetlands. Another interesting result was that according to the Dutch population, the most interesting functions of a commercial wetland were the water treatment and water storage functions.

Parallel Session 18: Forest Ecosystems

This session dealt with both macro- and microeconomic aspects of forest management under different perspectives. **Solenn Leplay**'s work adopted a macroeconomic point of view: using FAO and World Bank databases, she analysed via a log-linear regression model the main determinants of deforestation (rural

population, GDP, external debt, protected areas, export values) in a sample of 56 countries, split into three groups depending on their forestall endowment: Low Endowment (LE, 10-30% coverage), Medium Endowment (ME, 30-50%) and High Endowment (HE, 50%+). The empirical results show significant impacts of most of the regressors in LE and ME countries, while the HE ones show less model-adaptation.

The study by **Erkki Mantymaa** adopted, on the contrary, a micro perspective, focusing on the drivers of landowners' participation to and compensation claims in the Trading in Natural Values (TNV) programme in Finland (in particular, the Satakunta region). Organizational data were furnished directly by the TNV, redacted by the regional Forest Centre, while private data have been achieved by a survey to the whole sample of Satakunta's landowners (65% response rate). Two models were then estimated, a Probit "Participation Model" and a linear "Compensation Model" (corrected by Heckman's two step procedure): the results show a significant positive effect of the landowners' attitudes towards forests (either from an ecological or financial point of view) on PR(programme participation), an opposite (i.e. negative) effect of environmental preferences on accepted compensation and a positive effect on the latter of public authorities' ecological value claims, suggesting strategic behaviour by landowners.

Aline Chiabai's presentation adopted again a macroeconomic perspective. The key aspect of this work is about the monetization of forest services (defined as provisioning, regulating, supporting and cultural). Data clustering has been conducted w.r.t. geographic (12 world regions) and biological criteria (6 biomes); biodiversity is described by forest size and species' number; two land uses are defined: natural (which does not supply wood forest products) and managed (not allowing for passive use). The aim is to monetize both market and non-market values for forests' marginal value (hypothesised linear in forest size) according to the CASES scenarios. Potential gains from biodiversity conservation are then computed, showing the relevance of the results (even though the model framing highly influence these results, e.g. valuation problems when accounting for WTP might arise in comparing developed and developing countries).

Parallel Session 19: Biodiversity and climate change

Elena Ojea's paper presented a new methodological approach for estimating the cost of adaptation to climate change impacts on ecosystems. Countries usually lack adequate estimates of the costs to be incurred when adapting to climate change, especially when large ecosystems are in question. This paper tries to develop a detailed methodology which also includes various options, such as identifying exactly what areas may need intervening, what kind of adaption would be most appropriate and what are the positive and negative effects. A detailed illustration of the methodology is presented through a case study of ecosystem shifts in India.

Angel Bujosa Bestard's paper investigated the role of temperature and other environmental factors on coastal tourism destinations choices in Spain. Through a discrete choice model based on expected utility theory, variables describing coastal characteristics and temperature are used to explain observed patterns in interprovincial domestic trips. A generalization of the standard logit model is used to estimate trade-offs between temperature and attractiveness in terms of probability of choosing a specific destination. Finally, the model is used to explore the consequences of various climate change scenarios on the main tourist destinations.

The paper presented by **Jonah Busch** discussed climate change and the cost of conserving biodiversity in Madagascar. The island's unparallel biological diversity is at risk because of deforestation: one tenth of the original forested area remains today, while the deforestation rate though the years 1990-2005 was twice the world's average. The paper presents the cost of ensuring the minimum viable area of stable forest habitat for 72 endemic plant species under successively greater levels of climate change.

Furthermore, it identifies four categories of species, requiring four successively more expensive levels of management action to maintain minimum viable habitat areas. Lastly, the paper argues that ruff climate change induces the society to choose between spending more to secure the same number of species, or securing fewer species at the same cost.

Parallel Session 20: Biodiversity and agricultural systems

Agricultural systems provide habitat for an important part of European biodiversity, but the intensification of agricultural practices in the last decades, are supposing the decline of many species of plants, insects, and birds. The creation of protected areas constitute an inadequate measure in agricultural systems duet to the land ownership is usually private. In these cases, other policy measures must be developed. In the study presented by **Vincent Martinet** an ecological-economic model was used to analyze the links between agricultural land use and biological conservation objectives in a dynamic framework. They related the conservation inventive policy (total cost of the grassland subsidy) to the ecological outcome (persistence probability for the species). The findings highlight that the benefit function is a S-shaped curve in which the higher the subsidy level, the higher the survival probability. Furthermore, the higher the price fluctuations, the less efficient a given subsidy level.

The second paper, presented by **Simon Drummond** about conserving biodiversity in production landscapes, discussed the impact of threatened species in conservation planning and the idea of base the biodiversity conservation policies on threatened species, considering that these species could not necessary represent biodiversity, and also their populations are in danger or in a critical point. The study was conducted in East Kalimantan (Indonesia). The research implications of the study highlight that ignoring the contribution of unprotected areas in biodiversity conservation may be overestimating the cost of conservation by up to 20 times, 2) we can now account for differing contributions of multiple land use to biodiversity conservation, 3) need for a new conceptual framework for conservation planning that has general applicability in production landscapes.

Finally, in the paper presented by **Giulia Macagno,** a methodology was developed to evaluate the magnitude of the impacts of agricultural activities on the status of biodiversity inside protected areas included in the Natura 2000 framework. A set of composite indicators were created. Subsequently, and econometric model was developed to describe species diversity as a function of site geographic location, physical characteristics, level of institutional protection and agricultural pressure. Results confirmed that species diversity tends to be higher in site in which the pressure from agricultural activities happens to be lower. Nonetheless, this does not imply that a tighter protection would necessary result in an increased species diversity, since the interaction of several activities (such as uses of pesticides, grazing, cultivation, abandonment of pastoral systems), each having a negative impact when individually considered, has been found to exert a positive impact on this indicator. It is concluded that biodiversity protection policies need to be focused on avoiding the most negative impacts enhancing the positive interactions among activities rather than forbidding the implementation of the negative ones.

Conservation International Discussion Panel
Applying Economic Instruments to Enable People to Conserve Biodiversity and Ecosystem Services

Claude Gascon (Conservation Intenational, USA) opened the discussion on those global initiatives in the academic-researching fields that employ economic tools in the name of ecosystem conservation. The

BIOECON conference itself is among such initiatives trying to change the world. Yet this change is not occurring fast enough: there is still the need for a sound discussion on how changes in personal and societal behaviors, aimed toward conserving and increasing biodiversity, can bring benefits to all stakeholders.

Eduard T. Niesten (Conservation Intenational, USA) presented a short, but detailed, video about Conservation International's incentive agreements in Columbia. It showed the programs' history, the problems encountered and the results obtained. In his speech afterwards, he discussed how incentive agreements were among the most efficient way to conserve biodiversity: making conservation one of the top priorities of local communities in return for periodic benefits, such as direct financing for tools, equipment, resources and education. These long-term plans insure that local people have an incentive to conserve the ecosystem in return for benefits that greatly improve their lives. His discussion ended by adding that since the programs in Columbia have proven to be such a success, a national-level program has been started recently in Ecuador.

The following presentation was given by **John Reid** (Conservation Strategy Fund) on the theory versus practice in the case of Tres Picos State Park in Brazil. The park provides free hydrological services to approximately 1.7 million users, and now the park's future funding is in question. Finding a way to allocate the cost of maintaining the park is what the local government is interested in, but the question is who exactly, and to what degree, should pay for this cost? He concludes with a few remarks on the case, and similar cases in general: the transparent basis for the payments if more important than efficiency; valuation research may not always be needed; it's cheaper to monitor a proxy for the service than the service itself; and using existing payment vehicles as opposed to new ones lowers transaction costs (in the Tres Picos case, there was no need for a new tax, but a marginal increase in the usual water bill was sufficient).

Lastly, **Jennifer Morris** (Conservation International, USA) gave a short review of the key lessons learned over time on ecosystem investment funds. First of all, she argued that there is no one "silver bullet": many different solutions can usually be employed to address a given real-world problem. Furthermore, being these problems complex in nature, they require complex solutions. Secondly, she warned that sometimes new innovations can blind the rational: the basics should never be forgotten since they represent ideas that have been proven and re-proven useful over time. And finally, short-term funding leads only to short-term results, which can be appropriate for some cases, but if we are interested in long-term improvements, they can be achieved only through long-term funding.