Fondazione Eni Enrico Mattei

Valuing Farm Animal Genetic Resources by Means of Contingent Valuation and a Bio-Economic Model: The Case of the Pentro Horse

Gianni Cicia[1], Elisabetta D'Ercole[2] and Davide Marino[2]

NOTA DI LAVORO 108.2001

DECEMBER 2001

SUST – Sustainability Indicators and Environmental Evaluation

[1]Università degli Studi di Napoli "Federico II"
[2]Università degli Studi del Molise

Fondazione Eni Enrico Mattei
Corso Magenta, 63, 20123 Milano, tel. +39/02/52036934 – fax +39/02/52036946
E-mail: letter@feem.it
C.F. 97080600154

SUMMARY

This paper presents the results of a cost-benefit analysis of a conservation program for the Pentro horse. This horse breed has been reared for millennia in a Southern Italian wetland where it is now strongly tied to the traditions of the region, but presently faces extinction as only 150 horses have survived. Horse herds live in a wild state, characterising in a remarkable manner the landscape of the wetland. This results in a flow of social benefits that the market value of this breed fails to capture. The benefits from a conservation program for this currently unprotected local breed is estimated in a contingent valuation study, while a bio-economic model is used to estimate the costs associated with its in-situ conservation. The results show that this combined approach could be useful to support policy-making for conservation in regions with a long history of breeding domestic animals. Here the issue of allocating scarce funds to a large and growing number of economically not viable animal breeds facing extinction.

Keywords: Animal genetic resources, contingent valuation, bio-economic model, cost-benefit analysis, Pentro horse

NON TECHNICAL SUMMARY

A dichotomous choice contingent valuation approach is used in order to estimate the benefits of establishing a conservation program for the threatened Italian "Pentro" horse, which forms an important component of a wetland ecosystem and the "cultural" landscape. A bio-economic model is used to estimate the costs associated with conservation and a cost-benefit analysis is subsequently realised. The results not only show a large positive net present value associated with the proposed conservation activity but also show that this approach is a useful decision-support tool for policy makers allocating scarce funds to a growing number of animal breeds facing extinction.

CONTENTS

1.	Introduction	2
2.	Evaluating farm animal biodiversity: why and how	4
3.	The case study	9
4.	Conclusions	24
	References	25

1. Introduction

The profound changes that have taken place in agriculture in the past fifty years in both developed and developing countries have caused severe and undesirable impacts on the environment. Amongst these is what has been termed as the genetic erosion of crop plants and domesticated animals.

It is noteworthy that, even though an ample literature on plant genetic erosion exists, little research work has been carried out so far for farm animals, despite the fact that the data available indicates that the phenomenon is of considerable importance. According to FAO statistics, 20% of the world's farm animal recorded breeds face extinction, while 10% are already extinct. The extinct breeds in Europe and in North America represent about 18% of the total (Table 1). Currently, the countries in which the risk appears to be higher are the more industrialised ones. In Europe, 40% of the local breeds risk extinction, while in North America the incidence is 29%.

There are multiple reasons for the disappearance of these breeds, all of which can be traced back in some way, to the well-known failures of markets and institutions to provide optimal signals to atomistic decision-makers. With regards to Europe the causes are due to: 1) the selection of only a few, highly-productive breeds, a phenomenon that in recent years caused some concern not only amongst market operators, but also in the guiding principles of the recent trends in the European Common Agricultural Policy (CAP); 2) the substitution of animal labour with machines; 3) the growing trend of farmland abandonment that has

---

Università degli Studi del Molise. Paragraphs 2 and 3.4 are written by Gianni Cicia; 3.3, 3.5 and 3.6 by Elisabetta D'Ercole; 3.1 and 3.2 by Davide Marino; 1 and 4 are common.

afflicted many marginal areas in the interiors, where the majority of the populations of local breeds are concentrated.

In recent years, in order to cope with the increasing decline of agro-zoo-technical biodiversity, particularly with that of local breeds, there has been an increase in public awareness, which in turn stimulated attention for this matter amongst policy makers.

On a social level, there has been an increased awareness of the loss of environmental values related to the problem of genetic erosion, but there has also been an increase in demand for typical products derived from some local breeds facing extinction. A preliminary and incomplete census of typical products in Italy (Fanelli and Marino, 2001), revealed that products of animal origin (cheeses, animal based preparations) are approximately a thousand, more than 40% of the total of typical products.

As regards the action taken by policy makers, there has been an attempt by the European Union (EU) to provide incentives for breeds close to extinction by distributing subsidies to the breeders (particularly some measures of regulation 2078/92). In Italy, an EU regulation provides incentives for the rearing of 100 animal breeds, 27 of which are horse breeds. Nevertheless, it can be argued that the attention given to animal genetic resources (AnGR) in terms of action and amount of resources made available has been relatively small[1]. A recent study (Marino, 2001) showed that the safeguarding and valorisation of biodiversity counts for less than 0.5% of the total financial resources invested in the Italian regions in agro-environmental policy. In this context, many Italian AnGRs will be extinct in the near future if a stronger conservation policy is not adopted.

[1] According to recent data the farms financed by this measure were not more than 3000 with less than 33.000 LU (Livestock Units).

The present contribution illustrates the case of the Pentro horse. It is bred in Southern Italy for the production of meat and is currently facing extinction. At the present time, this horse in not included, in any conservation program even though it is an important element of the history and traditions of the land in which it lives and it, in a unique fashion, characterises the landscape in which it is reared in a wild state.

We will begin with the reasons that brought us to undertake the valuation of this animal genetic resource. Then we will present the estimates of the benefit derived from the conservation program by means of a contingent valuation (CV) survey. These benefits will be compared to an estimate of the costs of an in-situ conservation program by means of a bio-economic model. Finally, we will argue that a conservation policy for the Pentro horse is supported on the grounds of economic efficiency.

2. Evaluating farm animal biodiversity: why and how

There is no doubt that the erosion of farm AnGRs will eventually result in irreversible damage for both present and future generations, accompanied by the loss of potential market values and environmental functions (FAO, 2000; Hammond, 1999). But, the conservation of animals that are no longer economically convenient to rear under present market conditions involves a certain cost to the community. If this cost is not met, these populations are faced with the threat of extinction. Policy choices must be made to prescribe which and how many breeds to conserve, along with the management strategies to implement so as to achieve conservation, via either in-situ or ex-situ approaches.

In such a context, it is essential to evaluate the AnGRs from an economic perspective. The main objective of the economic valuation is to help policy makers identify the best level of economic efficiency amongst different management strategies. Policy makers are obliged to make choices based on economic priority because of the scarcity of resources at their disposal. This can be done by maximising the overall benefits while considering the competing uses to which the resource can be put (Barbier et al., 1997).

In the absence of adequate evaluation procedures, there is the risk of not being able to adequately internalise those environmental costs that originates from the loss of biodiversity, thus continuing along the well-known trail of economic and institutional failure.

AnGR valuation, however, is a very complex operation, in which various difficulties must be taken into account.

It is possible to distinguish four different components of the total economic value (TEV) of AnGRs facing extinction: 1) use value; 2) non-use value; 3) option value; 4) quasi-option value.

Use value is composed of three different parts: the value linked to the direct consumption of the animal; the value linked to its non-alimentary use; the value linked to its indirect use (Boyle e Bishop, 1988).

The first value is related to the consumption of the animal itself or of its derivates. This aspect plays an important role, especially in Europe, because many animal breeds facing extinction produce typical products that are in growing demand.

The second form of direct value derives from the pleasure that some people get in seeing the animal itself in the wild environment in which it lives. A growing number of consumers in developed countries appreciate agricultural tourism and rural tourism. They are pleased to see animal breeds during their recreational outings. In some situations, such as in the case in hand, the animal breed facing extinction strongly characterises the landscape.

The third form of use can be derived from the pleasure that some people get from reading magazines or by watching video programs that talk about naturalistic subjects such as domesticated animals.

The value of non-use of a domesticated animal facing extinction is also composed of different parts: nostalgic value; altruistic value; existence value.

The first element is related to the possibility that a given type of animal is associated with the cultural traditions of a given population, particularly at a time in which there is a strong revival of the traditions shaping the identity of populations in a given territory as is the current case in European countries. Many people are willing to pay in order to conserve an important element of their historical memory as part of their regional identity. For example, the breed of horses under study seems to have been raised in the same area for at least 2500 years, hence producing a strong identity link to the history of this region.

The second component expresses the pleasure that some people may experience in the knowledge that other individuals of current or future generations will enjoy the benefits derived from the existence of an animal facing the possibility of extinction.

The last component is linked to non-anthropocentric considerations; many people are willing to pay in order to save the animal breeds facing extinction because these animals have the right to exist regardless of their usefulness or uselessness to humans. While this component plays a key role in the case of wild species, the problem is more complex when related to domesticated animal breeds, which were selected by man himself in the past centuries, based on his own local and historical necessities. Consequently, once these necessities no longer exist, the benefits of rearing this specific breed are also eliminated.

Option value is tied to the uncertainty related to future demand. Consumers can be uncertain with regards to future demand of the animal breed under consideration. The case of typical products is a good example; many of these have been re-discovered by consumers in recent years. In the same way, consumers can be uncertain as to the possibility of visiting places in which this animal lives. The option value expresses the willingness to pay in order to preserve the option for future consumption.

Lastly, of the total economic value of an AnGR, the quasi-option value is the most difficult to pinpoint. A policy of non-intervention would extinguish a breed resulting in an irreversible choice. Such a choice would result in the certain loss of a specific animal breed and of a set of unique genes. In the near or far future these genes might be of importance in situations that we now cannot even begin to imagine. New scientific information may become available allowing us to evaluate the animal facing extinction in a completely different manner. This aspect of the problem is expressed in literature through the use of the quasi-option value (Knudsen and Scandizzo, 1999). It can be defined as the value arising from management flexibility in the face of uncertainty and dynamic information structures.

Several valuation methodologies have been suggested to estimate the different components of the TEV of AnGRs[2]. Unfortunately, there is no single methodology that enables to capture all four components (use, non-use, option and quasi-option value).

In our case study, we focused our attention on the Contingent Valuation Method, which gives the most complete estimation of the AnGR's TEV. This is a method for estimating non-market goods based on interviews. A hypothetical scenario is presented to the person being interviewed regarding the availability or absence of a given level of provision of a non-market good. The respondent is asked to quantify how much he/she would be willing to pay (willingness to accept) for what was presented in the scenario. The contingent valuation, therefore measures in a direct manner use, non-use and option value, while it does not capture the quasi-option value[3].

Even though it is agreed that the contingent valuation provides an underestimation of the total economic value of a genetic animal resource facing extinction, in this case study we argue that the components of use, non-use and of option can be particularly relevant and therefore are able to justify, in and of themselves, a conservation policy.

The benefits estimated by means of contingent valuation (or other methodologies) have to be compared with the cost of the conservation program. This side also of the valuation process is not straightforward. First we should choose amongst in-situ and ex-situ conservation programs, which are very different. In our case study, we chose an in-situ program because most of the potential value of the Pentro horse flows from use-value (part

---

[2] For a detailed survey of the methodologies for determining the economic value of farm animal genetic resources see Drucker, et al.(forthcoming).

[3] Given the nature of the quasi-option value, estimating this value requires a model structured in the form of a stochastic dynamic programming problem (Artuso, 1996).

of the landscape) and nostalgic value (linkage with the territory) that cannot be captured by consumers if the conservation program is ex-situ.

Because the Pentro horse lives in a wild state in a small area, estimating the cost of an in-situ conservation program requires some hypothesis on the potential rate of growth of the Pentro horse. This rate is related to factors intrinsic to the horse species, but it is also related to the availability of feed for a greater horse population in the area where it presently lives. Moreover, in the estimation of costs, the impact on farmers' revenues and costs of the increased number of horses raised must be considered.

In this study, we have estimated the cost of the conservation program by means of a bio-economic model that takes into account both the ecological and economics aspects related to an in-situ conservation program.

3. The case study

3.1 The Pentro horse

The Pentro horse is an Italian breed whose population is endangered. There are presently 150 horses registered for assessment, all of which live in a wild state in Pantano della Zittola, a wetland area of 2,200 hectares of considerable naturalistic relevance located in the Molise Apennines, in Southern Italy. The importance of this area has been recognised both nationally and at the European level. In fact, it has been placed amongst the CORINE

BIOTOPES, the most important sites for the conservation of nature amongst the EU countries (Lucchese, 2000).

The Pantano della Zittola is one of the only two peat moss sites in the Apennines. It is very important because of its low altitude (800 m). This indicates that the area is a post-ice ages relict and this phenomenon contributed to the local preservation of some relict species that are elsewhere extinct, such as *Salix pentandra*, or different species of willow (*S. alba, S. trianda, S. caprea*) and of rush (*J. inflexus, J. articulatus*).

The Pantano della Zittola was inhabited in the pre-Roman era by Sanniti Pentri from which the name of the horse is derived. So, the origins of this animal are thought to be very old. The selection probably dates back to about five centuries and it may originate from a crossing between the aboriginal horses of the area and the Berber horses. The result is a horse that is able to adapt to a hostile environment, characterised by very harsh winters and aggressive predators, such as the wolf.

From the beginning of this century different attempts have been made to introduce more productive breeds. However, the introduced breeds had offspring that were not well fitted to the hostile local environment. At present the purpose of breeding the Pentro horse is mainly for the production of meat. While in the past, because of its rustic nature, transhumant herders used the horse to travel along the cattle-tracks. The tradition of transhumance, that is of the seasonal migration of cattle and sheep towards better grazing lands, is amongst the oldest of this region and is very relevant in the popular culture. Therefore, this horse is strongly associated with the ancient traditions and local identity of the Molise region.

Of the 250 horses presently in the Pantano della Zittola, the zoo-technologists recognised a homogeneous nucleus of about 150 horses belonging to the Pentro local breed. The rest of the population is primarily composed of the Breton Italian type (Cavallo Agricolo Italiano da Tiro Pesante Rapido) (Miraglia et al., 1999).

The causes of the risk of extinction of the Pentro are various. Besides the already mentioned lower production of meat compared to other breeds and the disappearance of the transhumance. However, the European Common Agricultural Policy also played an important role in starting the extinction process. While some support has been provided for the breeding of cattle, no financial or technical support has ever been in place for horse breeding. In fact, in the Pantano della Zittola the horse has been gradually disappearing and has gradually been replaced with cattle.

3.2 The bio-economic model

The Pentro horse lives in a natural wild state throughout the year, hence characterising the landscape in a remarkable way. During the hay harvest season, horses are excluded in large numbers from the plains so that hay can be collected. Hay is destined to consumption by dairy cows. A small amount of hay is given to the horses to sustain them when the plains are flooded during the winter season (about 3 months a year).

The colts are mainly sold at about 6 months of age for meat production during the months of October and November. This however is not always possible, because the spring birth period can be affected by climatic changes. The growth of the colt may be slower and as a result the ideal purchase weight may not be reached by autumn. In this case, the breeders are obliged to postpone the selling to the following year, when the colts are about 18 months old.

With only 150 horses, the Pentro horse falls into the FAO category of endangered animals. In order to reduce the probability of extinction to much lower levels, the population of the Pentro horse should increase up to 1,000 horses according to FAO guidelines.

The present research into the economic benefits and cost of conservation was conducted in parallel with animal production scientists of the Università degli Studi del Molise. This fact resulted of great synergic importance, especially for the derivation of conservation costs estimates and for the construction and calibration of a local horse population growth model. Some preliminary results from these studies (Miraglia, personal communication, 2001) would seem to indicate that the Pantano della Zittola is able to support a population of up to 2,000 horses. This density level would not only avoid conflict amongst the cattle breeders already present in the Pantano della Zittola, but it would also allow the possibility of incrementing the horse population in order to meet the FAO recommendations.

A growth model for the Pentro horse is presented below. This model was built to calculate the number of years necessary to reach the threshold of 1,000 horses and to calculate the costs linked to its conservation.

The number of horses per year n (Hor_n) is obtained from the sum, per year n, of mares ($HorR_n$), male colts ($RepM_n$) and female colts ($RepF_n$) destined to reproduction:

$$Hor_n = HorR_n + RepM_n + RepF_n$$

where

Hor_n = total number of horses present in year n

$HorR_n$ = number of mares in reproduction in year n

$RepM_n$ = number of male colts destined to reproduction

$RepF_n$ = number of female colts destined to reproduction

In particular:

$$\mathbf{HorR_n} = Hor_{n-1} - Hor_{ECn-1} + Col_{Fn-4}$$

where

Hor_{n-1} = number of horses present in year n-1

Hor_{ECn-1} = number of horses at the end of their career in year n-1

Col_F = number of female colts born in year n-4

$$\mathbf{RepM_n} = ColM_n - ColM_{esn}$$

where

$ColM_n$ = number of male colts born in year n

$ColM_{esn}$ = number of male colts not necessary for reproduction purposes

$$\mathbf{RepF_n} = ColF_n - HorEC_n$$

Where

$ColF_n$ = number of female colts born in year n

$HorEC_n$ = number of mares at the end of their career in year n

The main demographic parameters used for the growth model of the Pentro horse are derived from the information collected on horse-breeding techniques. These parameters are: the average production rate of the population, the sex ratio at birth, the reproductive sex ratio, the number of female colts destined to reproduction, the number of male colts destined to reproduction, the mare longevity and the average age at first delivery.

With regards to the average production rate of the population, the current value is estimated to be equal to 50%, and is derived from the ratio between the number of colts sellable and the number of mares. This parameter takes into consideration the number of colts born, the number of non-pregnant mares, the number of abortions, new-born mortality and mortality at weaning. The present value for the Pentro horse is quite low under a scenario developed with the current conditions. This is so because of the environmental harshness, the scarcity of feed and the presence of predators. However, under a scenario with the conservation program in place, which would improve the living conditions of these horses through adequate prophylaxis and provision of food supplements, this value is increased by up to 70%. The sex ratio at birth is considered equal to 50%.

The reproductive/sex ratio in a horse breed in its wild state is approximately equal to 40 mares for each stallion. In developing the growth model of this population, the ratio was considered much lower and equal to 20 mares per stallion, in order to reduce inbreeding.

Regarding both the male and female number of colts destined to reproduction, the frequency of substitution of the animals at the end of their career was considered so as to obtain an increasing trend of the population.

Finally, with regards to the longevity of the mare and the average age at the first delivery, both values are deduced from characteristics of the population and are respectively equal to 15 and 3.5 years.

Because of the actual horse-breeding situation, the size of this population could remain constant because each year the colts which are sold are those that exceed the replacement quota. Moreover, the unstable equilibrium determined by the relationship between the number of horses not sold and the replacement quota, is so fragile that the external factors (particularly the harsh winters and the prolonged drought periods), can create problems for the survival of the population.

Under the hypothesis scenario of including this horse in a conservation program we also assumed that breeders successfully increased the population size by eliminating, each year, only the animals at the end of their careers and the male colts' surplus destined to reproduction.

By implementing these demographic coefficients inside the growth model, we calculated the number of years necessary to reach the threshold of 1,000 horses. As can be seen from Figure 1, 14 years would be necessary to reach a population of 1,000 horses.

From the 15th year forward, the conservation program is considered completed and the breeders could potentially put over 500 colts a year on the market while maintaining the population in growth[4].

3.3 Costs of the conservation program

The costs of the conservation program for the Pentro horse were estimated based on the model illustrated above. Since the objective is the conservation of the breed by reaching 1,000 reared horses, the breeding costs to conserve this population were calculated as well as the foregone revenues from annual sales of horses enjoyed in the absence of the conservation program.

The questionnaire distributed to Pentro horse breeders enabled us to collect technical-economic information used to estimate the costs and profits related to rearing. The

4 Italy is a net importer of horse meat; despite the fact that the demand for such meat is relatively low (Istat, 2000).

questionnaire was thought out in such a way as to reveal the structural characteristics of the farms. The data collected on the farms was validated by animal production scientists who studied this population (Miraglia et al., 1999; Pietrolà, personal communication, 2001).

The breeding costs revealed were quite low because the horses are raised in a wild state. In fact, the breeding cost for the colts is only 3 Euros/year, while for the adult horse the cost rises to 82 Euros/year. If a conservation program is adopted, the breeding costs would rise, because intervention is required in order to improve the present breeding techniques. The costs are estimated at about 258 Euros/horse/year. In particular, the breeders would pay a rent to the municipality to guarantee access to grazing in the Pantano della Zittola (17 Euros/horse/year) and they should also pay for the prophylaxis (42 Euros/horse/year). Moreover, in order to avoid that the extra load of livestock impoverishes the Pantano della Zittola resource, a major alimentary supplement will be necessary, which adds an extra 116 Euros/horse/year. Finally, it is estimated that the manpower requested for this type of breeding is 83 Euros/horse/ year.

The estimate of lost revenues is based on the revenues that the breeder would have obtained if the conservation program were not activated. Assuming that the size of horse population remained constant over the years, the breeders would continue to sell 54 horses, 48 colts and 6 end-of-career horses each year. As was already highlighted, the age at which the colts are sold is influenced by the climatic conditions and this causes some variation in terms of costs and gains. In this case, it was hypothesised that 70% of the colts were sold at 6 months and 30% were sold the following year.

As the number of horses increases, the breeders have the possibility of selling the surplus colts (both male and female). The value of these new sales, net of the costs, is subtracted from the lost revenues and from the breeding costs sustained. A break-down of the resulting prediction in cost structure is summarised in Table 2, for a period of 14 years.

3.4 The estimation of the benefits from conservation

The economic benefits to be derived from the conservation of the Pentro horse were estimated from dichotomous choice contingent valuation survey data analysed assuming a random utility model (RUM). In order to increase the efficiency of the estimate of the model parameters, several authors suggested using a follow-up question. In other words, if the respondent answered No, (Yes) at a first bid, the respondent was also asked about their willingness to pay a higher (lower) amount. This method is referred to as "discrete-choice with follow-up". Under a particular set of estimation assumptions, called double-bound or interval-data estimation, it allows for a considerable increase in the efficiency of the estimate, but at the same time it may provide scope for some bias due to the various effects between the first and second response. For example, the element of surprise that the second response may generate could provoke feelings of resentment or acquiescence (Hanemann and Kanninen, 1999).

In order to contain this limit, the procedure called "one and one-half bound" was adopted in our study (Cooper et al., 1997). Using this format, the respondent is told that the amount to be paid can vary between a minimum and maximum value. After which, one of the two values is randomly chosen. If the value chosen is the minimum value, and the respondent answers positively, then the respondent is asked if he/she is willing to pay an amount equal to the maximum value of the interval. If on the other hand, the respondent answers negatively to the request for a minimum amount, there is no further request. In the case in which the maximum value of the interval is chosen, a similar procedure takes place: the WTP question is reiterated if it answers "No" at the first bid amount by proposing the lower one, while there is no follow-up in the case of an acceptance.

The bid amounts were set according to a C-optimal sequential design with two steps. (Kanninen, 1993). In other words, two interactive steps were carried out. In the first step, 252 respondents randomly underwent one of the following two intervals: median and 75th percentile of the willingness to pay distribution (WTP), or median and 25th percentile of the same distribution.

The percentiles used in the first step came from a pre-test conducted on 60 individuals.

The procedure used in the second stage was similar to that of the first stage, the only difference being the bids used: 25th, 50th and 75th were obtained from estimates of the distribution of the WTP that used data from the first stage.

One of the criticisms of the Contingent Valuation Method (CVM) is that the survey is conducted using a population that has little information on the subject to be studied (Spash and Hanley, 1995). This may result in a large discrepancy between the answers obtained from the interviews and the real value of the WTP. In order to avoid this bias, which may be caused by the lack of information on such a complex subject as biodiversity, the interviews were conducted by telephone. Before receiving the phone call for the interview, the respondents would have received a booklet that was sent by mail. This booklet described the problem of biodiversity and presented the case of the Pentro horse, highlighting the benefits and costs related to its conservation. The booklet also mentioned other domesticated animals and non-domesticated animal species facing extinction.

The survey took place in Molise, the region where the last specimen of the Pentro horse survives. The survey was organised in three phases: focus groups, pre-test and test.

The focus groups in the initial phase of the survey had the role of verifying the clarity of the questionnaire and booklet before beginning the pre-test phase. About twenty people from various professions, age groups and with different educational backgrounds formed each focus group. At the end of the interview, the participants expressed their feelings and made suggestions that were gathered in order to make changes in the drawing up of the booklet and questionnaire. In the focus groups, participants were also asked to quantify how much they would be willing to pay for the protection and conservation of the Pentro horse.

At the end of the focus group stage, the first booklets were sent out for the pre-test. The sample of respondents was selected randomly from the phone directories of the Molise region.

The people who had been mailed a booklet were contacted after a two-week period and if they were willing to participate, they were interviewed on the basis of the questionnaire.

The questionnaire was administered by telephone and is composed of three sections. The first section is an introduction used to establish an initial contact with the family to be interviewed and to verify their willingness to collaborate. The second section presents the payment scenario and lastly, in the third section, the respondent is requested to supply his/her socio-economic characteristics.

In the instances in which the respondent refused to collaborate, some explanation for such a choice was recorded. We were particularly interested in whether the family dran into the sample was indifferent to the extinction of the Pentro horse, or whether they just did not want to participate in any kind of survey.

The core of the interview was the payment scenario in which a proposal to ensure the protection of the Pentro horse was made (see appendix). A brief summary illustrating the present situation of the Pentro horse and the conditions necessary to ensure its survival was given and then the financial aspect of the protection program was introduced. In order to make up for the scarce public financial resources the families of the Molise region were requested to sponsor the Pentro horse project by means of a single donation. At the end of the interview, before enquiring about the socio-economic characteristics of the respondent, a series of debriefing questions were administered in order to check the consistency of the recorded answers and to verify the clarity of the information provided. The main objective of many of these questions was to deduce if the respondent was indifferent to the extinction of the Pentro horse. The above questions were coded in the data as zero bids (40 interviews). Those who refused to participate in the interview because of their lack of interest towards the extinction of the Pentro horse were also coded as zero bids (48 interviews). In total, 1,036 families were contacted; 48.6% of these answered the questionnaire and 36.6% preferred not to participate in the survey while 14.8% were not available (Table 3).

A mixture model was used to estimate the distribution of willingness to pay. In this way, we made the hypothesis that two distinct sub-populations were present in the Molisan population. One of these populations has a WTP equal to zero, while the other one has a WTP greater than zero. When an individual amongst the Molisan population is drawn out with a probability equal to γ, he/she is drawn out from the WTP distribution with a zero mass. Whereas with the probability equal to (1-γ), the individual is drawn out from the distribution with positive WTP (An and Ayala, 1996; Cicia and Scarpa, 2000).

Hence, the cumulative distribution function of the WTP has the following form:

$$\Pr(WTP < w) = \begin{cases} 0, & \text{if } w<0 \\ \gamma, & \text{if } w=0 \\ \gamma + (1-\gamma)F(w,\theta), & \text{if } w>0 \end{cases}$$

Where $F(w)$ is an absolutely continuous cumulative distribution.

Since the questionnaire was structured in such a way as to permit the recognition of those who were indifferent towards the extinction of the Pentro horse, the sample log likelihood function takes the following form:

$$\ln L(\gamma,\theta) = \sum_{i=1}^{N} \begin{Bmatrix} d_i^z \ln\gamma + \left(d_i^n - d_i^z\right)\ln\left[(1-\gamma)F\left(w^l,\theta\right)\right] + d_i^{yn}\ln\left[(1-\gamma)\left(F\left(w^h,\theta\right) - F\left(w^l,\theta\right)\right)\right] + \\ + d_i^y \ln\left[(1-\gamma)\left(1 - F\left(w^h,\theta\right)\right)\right] + d_i^{ny}\ln\left[(1-\gamma)\left(F\left(w^h,\theta\right) - F\left(w^l,\theta\right)\right)\right] \end{Bmatrix}$$

where d_i are the indicator variables, the superscript y implies the respondent answered yes to the higher request for payment (yes and yes-yes), yn the respondent answered yes-no, ny the respondent answered no-yes, n the respondent answered no to the lower request of money (no and no-no), z the individual interviewed is indifferent to the extinction of the Pentro horse. In general the indicator variables take on the value of 1 when the condition is true and 0 otherwise. However for the way we have written the log likelihood function the indicator variables n takes the value of 1 also when the individual is indifferent. The superscript h and l indicate the higher or lower request for payment.

In our case study $F(w,\theta) = \Phi(\alpha + \beta \ln BID)$, where $\Phi(\cdot)$ is the logistic cumulate distribution function.

3.5 Benefits of the conservation program

Data from a total of 552 completed questionnaires were used to estimate the parameters of the WTP distribution. 504 respondents accepted to participate in the interview while 48 refused to co-operate because of their indifference to the extinction of the Pentro horse.

The parameter estimates for the WTP distribution are shown in Table 4. The value of γ equal to 0.13, and it represents an estimate of that fraction of the population who are indifferent to the proposed conservation program for the Pentro horse.

Table 5 shows the estimates of mean and median WTP values, with their respective confidence intervals approximated using the Krinsky and Robb (1986) procedure.

The truncated mean value is 33 Euros while the median value is 19 Euros. Multiplying the mean and the median by the number of families living in Molise (117.138) we get an estimate of the aggregate value, which amounts to 3.8 million Euros for the mean and 2.2 million Euros for the median. While the first value is to be considered in a Kaldor-Hicks cost-benefit test, the second value may be important to local politicians, given the interest in median-voter behaviour in a referendum context (Deacon and Shapiro, 1975).

Both these results represent informative estimates of benefits that would be achieved by the conservation proposed in CVM scenario.

Table 6 shows the results of a second model estimated with covariates.

The number of observations for which the analysis was conducted was reduced to 417 because 17% of the sample (87 interviews) had to be excluded due to incomplete information regarding their income.

The socio-economic covariates that show significance include the degree of education, family income, knowledge of the Pentro horse prior to the interview (Horse), and the indicator variable for the respondent being a member of environmental associations (Environmentalist). The value of γ is equal to 5.5%. Table 7 shows the estimated mean and median values for this model.

Both the mean and median values are higher than those from the model estimated without covariates. The truncated mean is equal to 35 Euros and the median is equal to 24 Euros. The estimate for aggregated mean has a value of 4.1 million Euros and that for the aggregated median is 2.8 million Euros.

3.6 Results of the Cost Benefit Analysis

The comparison of costs and benefits of the conservation program for the Pentro horse must take into account that the latter are present value estimates, while the estimated costs refer to various moments in time across a 14-year time period.

In the context of CBA for environmental programs a particular attention is given to the discount rate through which the costs and benefits present values are computed. In this specific case study, the rate of choice is the discount rate suggested by government authorities to evaluate public investments. The present value of costs for the conservation program over the 14 years discounted at both 3.5% and 0% are shown in Table 8, while in Table 9 are presented the data supporting the CBA computed by considering different parameter estimates (mean and median) of the WTP distribution. It can be seen from the NPV that the benefits are always greater than the costs, even when the discount rate is equal to 0.

It is noteworthy that under our assumptions after the 14th year, once the threshold of 1,000 horses is reached, the population can increase without further external cost. This assumption would be true only in the case in which cattle breeding no longer received EU subsidies. In fact, from simulations done on business costs, it was shown that in absence of support for the cattle, or in the presence of identical financial support for the horses, the breeders of the Pentro horse in the area of the Pantano della Zittola would find it more convenient to rear horses as opposed to cattle. Once the conservation program has re-established a population no longer threatened by extinction, and in absence of market price distortions, the conservation of this horse breed is expected to be economically self-supporting and hence sustainable.

4. Conclusions

Despite the difficulties associated with the complexity of the economic valuation of AnGRs, the results of this study suggest that the integration of methods based on expressed preferences, such as the CVM, with bio-economic models can produce valuable information to assess the cost-benefit analysis of local conservation programs for breeds at risk of extinction.

Even though the CVM cannot account for some type of social values, such as quasi-option value, that in the valuation of AnGRs can play an important role, the overall exercise demonstrates that components, such as use, passive-use, and option values, have a relevance that alone may justify a conservation policy.

In our case study the estimated social benefits of the conservation of the Pentro horse breed exceeded the estimated social costs required to activate the program, as derived from the bio-economic model, even under a zero discount rate. This is of particular importance if we consider that there currently is no conservation program for this breed of horses.

In fact, we agree with Swanson (1999, pg. 119) when he states “once again the decline of the species is best viewed as the result of a fundamental investment decision”. It is therefore of particular importance for the public operator to be able to assess all the costs and benefits connected to the loss or conservation of biodiversity in the decision process, especially in Europe where the rate of AnGRs at risk of extinction is very high, while the financial resources made available by EU and local government for conservation programs are relatively small.

References

An, M.Y., Ayala, R. A., 1996. A mixture model of willingness to pay distributions, Mimeograph, available by FTP at "pub/man/papers/npecross.ps".

Artuso A., (1996). Creating linkages between valuation, conservation and sustainable development of genetic resources, Paper presented at the Symposium on the Economics of Valuation and Conservation of Genetic Resources for Agriculture, Centre for International Studies on Economic Growth, Università degli Studi Tor Vergata, Roma, 13-15 Maggio.

Barbier, E.B., Acreman, M., Knowler, D., 1997. Economic valuation of wetlands. A guide for policy makers and planners. Ramsar Convention Bureau, IUCN, Gland, Switzerland.

Boyle, K.J., Bishop, R.C., 1988. Welfare Measurement Using Contingent Valuation: A comparison of techniques. American Journal of Agricultural Economics, 1: 20-28.

Cicia, G., Scarpa, R., 2000. Willingness to pay for rural landscape preservation: a case study in mediterranean Agriculture. Nota di lavoro 59. Fondazione Enrico Mattei.

Cooper J. C., Hanemann W.M., Signorello G., 1997. One-and-one Half Bound Dichotomous Choice Contingent Valuation, working paper n.12, November.

Deacon R. and Shapiro P. 1975. Private preference for collective goods revealed through voting on referenda, The American Economic Review, December, 65(5): 943-955.

Drucker, A., Gomez, V., Anderson, S., forthcoming. The Economic Valuation of farm animal genetic resources: a survey of available methods. Ecological Economics.

Fanelli, C., Marino, D., 2001. La biodiversità nella programmazione ambientale nazionale, Roma, INEA.

FAO, 2000. World Watch List for Domestic Animal Diversity, 3nd Edition, edit by Beate D. Scherf, Fao, Rome, October.

Hammond, K., 1999. Management of farm animal genetic resources. In Rege J.E.O. (ed), Economic valuation of animal genetic resources. Proceedings of an FAO/ILRI Workshop held at FAO Headquarters, Rome, Italy, 15-17 March 1999, ILRI, Nairobi, Kenya. 80 pp.

Hanemann, W.M., Kanninen, B., 1999. The statistical Analysis of Discrete-response CV data, Chapter 11. In: Mateman, I., Willis, K.G. (Editors) Valuing Environmental Preferences.

ISTAT, 2000. Macellazione e commercio con l'estero del bestiame vivo e delle carni nell'anno 1999.

Kanninen, B. J., 1993. Design of Sequential Experiments for Contingent Valuation Studies. Journal of Environmental Economics and Management, Vol. 25, n.1, S-1:S-11.

Knudsen, O. K., Scandizzo, P. L., 1999. The cost benefit analysis of biotechnology projects. Proceedongs of the ICABR Conference “The shape of the coming agricultural biotchnology transformation: strategic investment and policy approches from an economic perspective”. University of Rome “Tor Vergata”, June 17-18-19 May.

Krinsky, I., Robb, A., 1986. Approximating the Statistical Properties of Elasticities, Review of Economics and Statistics, 68, 715:19.

Lucchese, F., 2000. Studio della popolazione equina di Montenero Val Cocchiara: aspetti floristico vegetazionali. Proceedings of 2° Wokshop “*Nuove acquisizioni in materia di alimentazione, allevamento e allenamento del cavallo sportivo*”, Simposio satellite, Montenero Val Cocchiara, 14-15 Ottobre.

Marino, D., 2001. Le politiche agroambientali attivate dalle regioni attraverso l’analisi della spesa pubblica. Prime indicazioni. INEA.

Miraglia, N., Di Francia, A., Polidori, M., Lucchese, F., Gagliardi, D., Pietrolà, E., 1999. Preliminary study about the morphology of the “Pentro horse”: autochthonous popolation of Molise Region. Proceedings of the A.S.P.A. XIII congress, Piacenza, June 21-24.

Spash, C.L., Hanley, N., 1995. Preferences, information and biodiversity preservation. Ecological Economics, 12:191-208.

Swanson. T. 1999. The underlying causes of biodiversity decline: an economic analysis, IUCN, Gland, Switzerland.

Appendix: Payment scenario

Until now the Pentro horse was reared by private breeders mainly for meat production, but the crisis of the equine meat markets resulted in a drastic reduction in the number of horses breed so much so that the population is now of about 150 horses.

According to the FAO criteria regarding animals facing extinction in order to guarantee the survival of the Pentro horse breed 1000 horses must be breed

A project is presently being studied whose objective is to provide incentives for this breed so as to avoid its substitution by other more profitable species and its extinction.

Public funding for the conservation of the species facing extinction does exist. This funding is to be used for all the Molisan breeds facing extinction, not only for the Pentro horse. The funds available are not enough to guarantee the survival of 1000 horses. It becomes therefore inevitable to have to integrate the public resources with other funds.

A hypothesis that is being considered is to have all the Molisan families participate in sponsoring the project.

In other words, the Pentro horse can be saved if all the Molisan families make a donation with in the next year, and only for the next year. The value of the donation should be set between X1 Lire and X2 Lire per family in order to reach the final objective

Summarizing, there are two possible alternatives to consider:

ALTERNATIVE A: Your family along with all the Molisan families do not make a donation. The "Pentro horse" protection project is not carried out. The "Pentro horse" could become extinct.

ALTERNATIVE B: Your family together with all the Molisan families make a donation. The "Pentro horse" protection program is carried out. The Pentro horse is saved from extinction.

As was mentioned above, the donation could oscillate between X1 and X2 Lira.

If the donation necessary to save the Pentro horse from extinction would amount to X1 Lira, would you be willing to contribute?

Table 1
Proportion of the world's breeds recorded in each risk status category in the global databank for farm animal genetic resources by region

Region	Breeds not at risk (%)	Breeds at Risk (%)	Extinct Breeds (%)	Unknown Breeds (%)
Europe	31	40	18	11
North America	20	29	18	33
South and Central America	41	19	8	32
Africa	49	12	5	34
Asia and the Pacific	49	12	5	34
Near East	42	7	4	47
World	39	20	10	32

Source: FAO (2000)

Table 2

Conservation cost per lost income, production cost and new sale

years	Lost Incomes	Production Costs	New Sale	Conservation Cost
0	20 820	38 734	11 572	47 982
1	20 820	42 298	14 578	48 540
2	20 820	44 211	15 238	49 794
3	20 820	46 029	15 864	50 985
4	20 820	53 799	18 542	56 076
5	20 820	66 252	25 650	61 422
6	20 820	76 713	29 700	67 833
7	20 820	87 217	33 766	74 270
8	20 820	99 616	38 567	81 869
9	20 820	117 824	45 616	93 027
10	20 820	138 782	53 730	105 872
11	20 820	162 369	62 862	120 327
12	20 820	189 116	73 217	136 718
13	20 820	220 898	85 522	156 196
14	20 820	258 427	100 052	179 195

Values in EURO

Table 3
Why you do not want to be interviewed?

	N.	%
I am not interested in surveys, in general	96	25.3
I am not interested in Pentro horse's conservation	48	12.7
I am too old	109	28.8
I am illiterate	8	2.1
I have not received the booklet	114	30.1
I do not speak Italian	4	1.1
Total	379	100.0

Table 4
Estimates of parameters

variable	*coefficient*	*t-Statistics*
Alfa	4.04	13.31
Beta	-1.27	-13.22
Gamma	0.13	10.27
N° observ. = 552	Loglik = -745.00	Average Loglik = -1.35

Table 5
Parameters of the WTP distribution

	Parameter	Estimate	Aggregate
IC$_{0.05}$ (truncated mean at 103 Euro)	Lower bound	30	3 464 942
	Median	33	3 872 582
	Upper bound	37	4 280 223
IC$_{0.05}$ (median)	Lower bound	17	1 936 198
	Median	19	2 225 372
	Upper bound	22	2 550 603

Values in EURO

Table 6
Estimates of parameters

variable	coefficient	t-Statistics
Constant	3 765	9.08
Environmentalist	0.933	1.88
Income	0.017	2.96
Education	0.685	3.03
Horse	0.353	1.62
Indifferent	0.055	5.59
Logbid	-1.515	-12.46
N° observ. = 417	Loglik = -491.51	Average Loglik = -1.18

Table 7
Parameters of the WTP distribution with covariates

	Parameter	Estimate	Aggregate
IC$_{0.05}$ (truncated mean at 103 Euro)	Lower bound	31	3 652 949
	Median	35	4 095 730
	Upper bound	39	4 538 512
IC$_{0.05}$ (median)	Lower bound	21	2 452 477
	Median	24	2 792 589
	Upper bound	27	3 168 456

Values in EURO

Table 8

Conservation Total Costs at 3.5% and 0% discount rate

	3.5%	0%
New sales	451 498	624 476
Lost Income	248 183	312 300
Production cost	1 193 759	1 642 284
Conservation Cost	990 444	1 330 108

Values in EURO

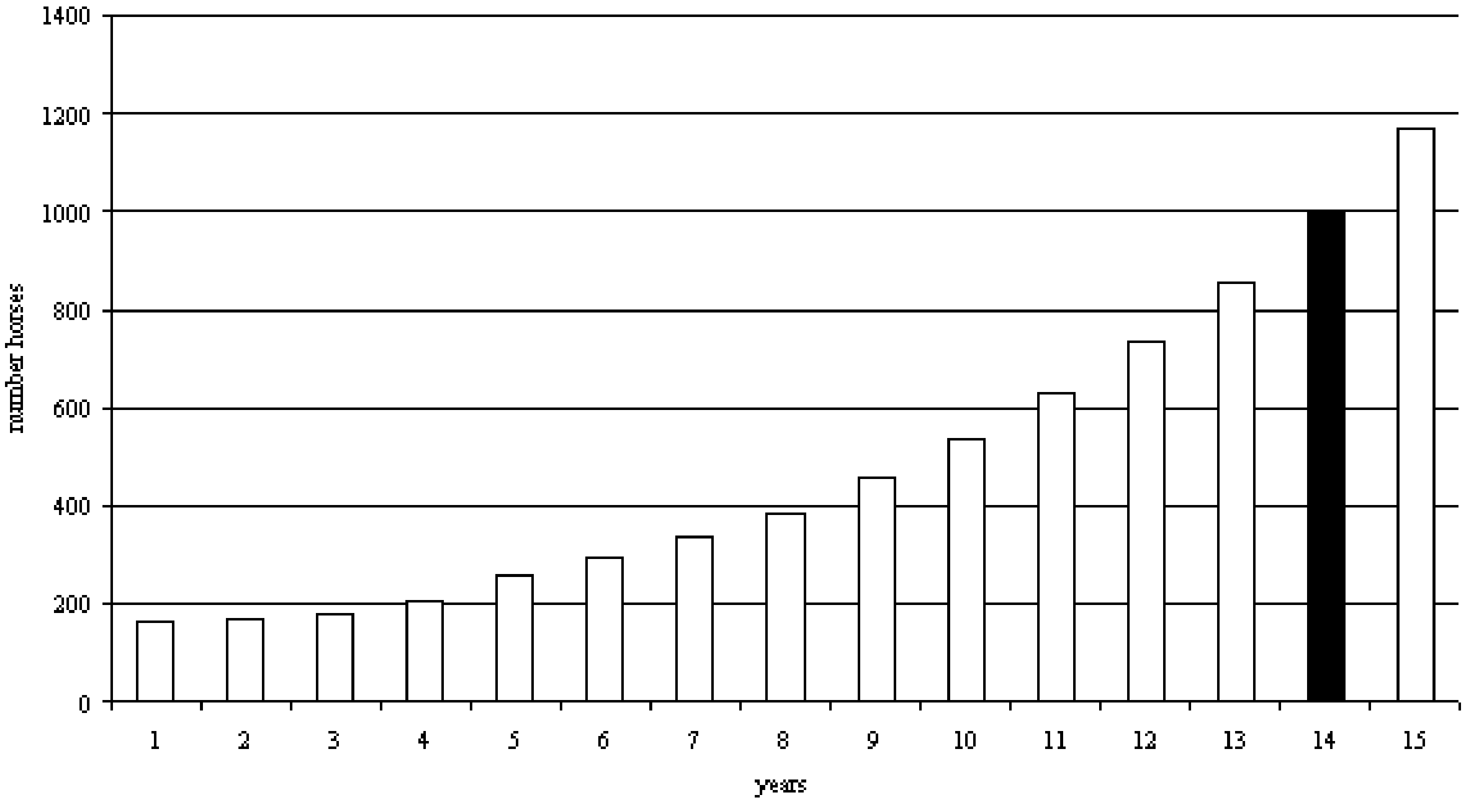
Table 9

Cost Benefit Analysis

	base model		covariates model	
Discount rate 3.5%	mean	median	mean	median
Total Benefits	3 872 582	2 225 372	4 095 730	2 792 589
Total Costs	990 444	990 444	990 444	990 444
Net Present Value	2 882 138	1 234 928	3 105 286	1 802 145
Benefit to Cost ratio	3.91	2.25	4.14	2.82
Discount rate 0%				
Total Benefits	3 872 582	2 225 372	4 095 730	2 792 589
Total Costs	1 330 108	1 330 108	1 330 108	1 330 108
Net Present Value	2 542 474	895 264	2 765 622	1 462 481
Benefit to Cost ratio	2.91	1.67	3.08	2.10

Values in EURO

Fig. 1. Model population of the Pentro horse



NOTE DI LAVORO DELLA FONDAZIONE ENI ENRICO MATTEI

Fondazione Eni Enrico Mattei Working Papers Series

Our working papers are available on the Internet at the following addresses:

***Server WWW*: WWW.FEEM.IT**

***Anonymous FTP*: FTP.FEEM.IT**

To order any of these papers, please fill out the form at the end of the list.

CLIM	1.2000	*Claudia KEMFERT:* The Impacts of Emissions Trading on World Economies. Contemplation of baseline emissions paths and a ceiling on emissions trading
CLIM	2.2000	*Pascal FAVARD*: Does Productive Capital Affect the Order of Resource Exploitation?
CLIM	3.2000	*Robert T. DEACON* (xxxix): The Political Economy of Environment-Development Relationships: A Preliminary Framework
SUST	4.2000	*Piet RIETVELD and Roberto ROSON:* Joint Costs in Network Services: the Two-way Problem in the Case of Unbalanced Transport Markets
CLIM	5.2000	*Robert S. PINDYCK* (xxxix): Irreversibilities and the Timing of Environmental Policy
MGMT	6.2000	*Domenico SINISCALCO, Stefania BORGHINI, Marcella FANTINI and Federica RANGHIERI* (xl): The Response of Companies to Information-Based Environmental Policies
SUST	7.2000	*Guy D. GARROD, Riccardo SCARPA and Ken G. WILLIS:* Estimating the Benefits of Traffic Calming on Through Routes: A Choice Experiment Approach
CLIM	8.2000	*ZhongXiang ZHANG*: Estimating the Size of the Potential Market for the Kyoto Flexibility Mechanisms
VOL	9.2000	*Jean-Christophe PEREAU and Tarik TAZDAIT* (xli): Partial and Global Cooperation with Unilateral Commitment in the Presence of Global Environmental Problems
KNOW	10.2000	*Giacomo CALZOLARI and Giovanni IMMORDINO:* Hormone Beefs, Chloridric Chicken and International Trade: Can Scientific Uncertainty be an Informational Barrier to Trade?
CLIM	11.2000	*Laura MARSILIANI and Thomas I. RENSTRÖM* (xxxvi): Imperfect Competition, Labour Market Distortions, and the Double Dividend Hypothesis
KNOW	12.2000	*Patrizia BUSSOLI* : An Empirical Analysis of Technological Convergence Process and RJVs in Europe at the Firm Level
KNOW	13.2000	*Luigi BENFRATELLO and Alessandro SEMBENELLI*: Research Joint Ventures and Firm Level Performance
KNOW	14.2000	*Nicholas S. VONORTAS*: US Policy towards Research Joint Ventures
ETA	15.2000	*Y.H. FARZIN*: The Effects of Emissions Standards on Industry in the Short Run and Long Run
ETA	16.2000	*Francis BLOCH and Stéphane ROTTIER* (xli): Agenda Control in Coalition Formation
CLIM	17.2000	*Giovanni IMMORDINO:* Looking for a Guide to Protect the Environment: the Development of the Precautionary Principle
CLIM	18.2000	*Hans W. GOTTINGER*: Negotiation and Optimality in an Economic Model of Global Climate Change
VOL	19.2000	*Paola MILIZIA and Marialuisa TAMBORRA:* Juridical Framework of Voluntary Agreements in Italy and Policy Relevance at the Local Level
CLIM	20.2000	*Richard S.J. TOL, Wietze LISE and Bob van der ZWAAN* (xli): Technology Diffusion and the Stability of Climate Coalitions
CLIM	21.2000	*Pietro TEATINI and Giuseppe GAMBOLATI* (xlii): The Impact of Climate Change, Sea-Storm Events and Land Subsidence in the Adriatic
CLIM	22.2000	*Emiliano RAMIERI* (xlii): An Overview of the Vulnerability of Venice to the Impacts of Climate Change and Sea Level Rise
PRIV	23.2000	*Bernardo BORTOLOTTI, Marcella FANTINI and Carlo SCARPA*: Why do Governments Sell Privatised Companies Abroad?
ETA	24.2000	*Carlo CARRARO and Gilbert E. METCALF*: Behavioral and Distributional Effects of Environmental Policy: Introduction
ETA	25.2000	*Santiago J. RUBIO and Juana AZNAR*: Sustainable Growth and Environmental Policies
KNOW	26.2000	*Francesca RECANATINI and Randi RYTERMAN*: Disorganisation or Self-Organisation?
KNOW	27.2000	*Giorgio BARBA NAVARETTI and David TARR:* International Knowledge Flows and Economic Performance. An Introductory Survey of the Evidence
SUST	28.2000	*Francesca CODA CANATI:* Secondary Raw Materials Market Creation: Waste Stock Exchange
KNOW	29.2000	*Giorgio BRUNELLO and Simona COMI*: Education and Earnings Growth. Evidence from 11 European Countries
CLIM	30.2000	*Michael GRUBB:* The Kyoto Protocol: an Economic Appraisal
CLIM	31.2000	*Gérard MONDELLO and Mabel TIDBALL* (xxxix): Environmental Liability and Technology Choice: A Duopolistic Analysis

KNOW	32.2000	*Alberto PETRUCCI and Edmund PHELPS:* Capital Subsidies Versus Labour Subsidies: A Trade-Off between Capital and Employment?
VOL	33.2000	*Petr ŠAUER, Antonín DVOŘÁK and Petr FIALA:* Negotiation between Authority and Polluters – Model for Support of Decision Making in Environmental Policy: Principles and Experimental Case Test
SUST	34.2000	*Riccardo SCARPA, George W. HUTCHINSON and Sue M. CHILTON:* Reliability of Benefit Value Transfers from Contingent Valuation Data with Forest-Specific Attributes
CLIM	35.2000	*Allen PERRY* (xlii): Impact of Climate Change on Tourism in the Mediterranean: Adaptive Responses
CLIM	36.2000	*Laura MARSILIANI and T.I. RENGSTRÖM* (xxxvi): Inequality, Environmental Protection and Growth
CLIM	37.2000	*Massimiliano MONTINI* (xlii): Italian Policies and Measures to Respond to Climate Change
CLIM	38.2000	*Horst STERR, Richard KLEIN and Stefan REESE* (xlii): Climate Change and Coastal Zones. An Overview of the State-of-the-Art on Regional and Local Vulnerability Assessment
CLIM	39.2000	*Tullio SCOVAZZI* (xlii): Ideas Behind the New or Updated Mediterranean Legal Instruments
CLIM	40.2000	*Dimitrios GEORGAS* (xlii): Assessment of Climatic Change Impacts on Coastal Zones in the Mediterranean. UNEP's Vulnerability Assessments Methodology and Evidence from Case Studies
SUST	41.2000	*Herath M. GUNATILAKE and Ujjayant CHAKRAVORTY:* Forest Resource Extraction by Local Communities: A Comparative Dynamic Analysis
PRIV	42.2000	*Giancarlo SPAGNOLO:* Optimal Leniency Programs
CLIM	43.2000	*Paolo BUONANNO, Carlo CARRARO, Efrem CASTELNUOVO and Marzio GALEOTTI*: Emission Trading Restrictions with Endogenous Technological Change
CLIM	44.2000	*Alan S. MANNE and Richard G. RICHELS:* A Multi-Gas Approach to Climate Policy – with and without GWPs
WAT	45.2000	*Ujjayant CHAKRAVORTY and Chieko UMETSU*: Basinwide Water Management: A Spatial Model
CLIM	46.2000	*Don FULLERTON, Inkee HONG and Gilbert E. METCALF* (xl): A Tax on Output of the Polluting Industry is not a Tax on Pollution: The Importance of Hitting the Target
PRIV	47.2000	*Axel GAUTIER and Dimitri PAOLINI*: Delegation and Information Revelation
ETA	48.2000	*Andreas PAPANDREOU:* Externality, Convexity and Institutions
ETA	49.2000	*Cesare DOSI and Michele MORETTO:* The Timing of Adoption of Cleaner Technologies: Private Costs and Public Incentives
ETA	50.2000	*Michele MORETTO and Roberto TAMBORINI:* Liquidity: What can a "Hausbank" do that Other Lenders Cannot Do?
PRIV	51.2000	*Michele MORETTO and Paola VALBONESI*: Option to Revoke and Regulation of Local Utilities
PRIV	52.2000	*Giancarlo SPAGNOLO*: Self-Defeating Antitrust Laws
PRIV	53.2000	*William L. MEGGINSON and Maria K. BOUTCHKOVA:* The Impact of Privatisation on Capital Market Development and Individual Share Ownership
KNOW	54.2000	*Giorgio BARBA NAVARETTI, Marzio GALEOTTI and Andrea MATTOZZI*: Moving Skills from Hands to Heads: Import of Technology and Export Performance
ETA	55.2000	*Elisabetta STRAZZERA, Riccardo SCARPA, Pinuccia CALIA, Guy GARROD and Ken WILLIS:* Modelling Zero Bids in Contingent Valuation Surveys
CLIM	56.2000	*Paola CONCONI*: Can Green Lobbies Replace a World Environmental Organisation?
VOL	57.2000	*Paola CONCONI and Carlo PERRONI* (xli) : Issue Linkage and Issue Tie-in in Multilateral Negotiations
ETA	58.2000	*Fernando JARAMILLO, Hubert KEMPF and Fabien MOIZEAU* (xli): Conspicuous Consumption, Social Status and Clubs
SUST	59.2000	*Gianni CICIA and Riccardo SCARPA:* Willingness to Pay for Rural Landscape Preservation: A Case Study in Mediterranean Agriculture
CLIM	60.2000	*Josef JANSSEN*: Will Joint Implementation Survive International Emissions Trading? Distinguishing the Kyoto Mechanisms
CLIM	61.2000	*Carlo CARRARO:* Costs, Structure and Equity of International Regimes for Climate Change Mitigation
KNOW	62.2000	*Alberto BUCCI:* On Scale Effects, Market Power and Growth when Human and Technological Capital are Complements
KNOW	63.2000	*Alberto BUCCI and H.C. SAGLAM:* Growth Maximising Patent Lifetime
WAT	64.2000	*Michele MORETTO and Paolo ROSATO*: The Value of Licences for Recreational Resources Use
WAT	65.2000	*Edi DEFRANCESCO and Paolo ROSATO:* Recreation Management in Venice Lagoon
KNOW	66.2000	*Carlo DELL'ARINGA and Claudio LUCIFORA*: Inside the Black Box: Labour Market Institutions, Wage Formation and Unemployment in Italy
CLIM	67.2000	*Erkki KOSKELA, Markku OLLIKAINEN and Mikko PUHAKKA:* Renewable Resources in an Overlapping Generations Economy without Capital
CLIM	68.2000	*A. Lans BOVENBERG and Lawrence H. GOULDER* (xl): Neutralising the Adverse Industry Impacts of CO2 Abatement Policies: What Does it Cost?
KNOW	69.2000	*Ioanna KASTELLI:* Science and Technology Policy in Greece. Policy Initiatives for R&D Cooperation
CLIM	70.2000	*Katrin MILLOCK:* Contracts for Clean Development – The Role of Technology Transfers
VOL	71.2000	*Alberto CAVALIERE and Fabio FRONTOSO SILVESTRI* (xliii): Voluntary Agreements as Information Sharing Devices: Competition and Welfare Effects

VOL	72.2000	*Na Li DAWSON and Kathleen SEGERSON* (xliii): Voluntary Agreements with Industries: Participation Incentives with Industry-wide Targets
VOL	73.2000	*Patricia M. BAILEY* (xliii): The Application of Competition Law and Policy to Environmental Agreements in an Oligopolistic Market
VOL	74.2000	*Joanna POYAGO-THEOTOKY* (xliii): Voluntary Approaches and the Organisation of Environmental R&D
VOL	75.2000	*Scott C. MATULICH, Murat SEVER and Fred INABA* (xliii): Cooperative Bargaining to Internalise Open Access Externalities: Implications of the American Fisheries Act
VOL	76.2000	*Allen BLACKMAN and James BOYD* (xliii): Tailored Regulation: Will Voluntary Site-Specific Environmental Performance Standards Improve Welfare?
VOL	77.2000	*Vincenzo DENICOLO'* (xliii): A Signaling Model of Environmental Overcompliance
VOL	78.2000	*Markus A. LEHMANN* (xliii): Voluntary Environmental Agreements and Competition Policy. The Case of Germany's Private System for Packaging Waste Recycling
VOL	79.2000	*Hans H.B. VEDDER* (xliii): Voluntary Agreements and Competition Law
VOL	80.2000	*Thomas P. LYON and John W. MAXWELL* (xliii): Self-Regulation, Taxation and Public Voluntary Environmental Agreements
VOL	81.2000	*Paola MANZINI and Marco MARIOTTI* (xliii): A Bargaining Model of Voluntary Environmental Agreements
VOL	82.2000	*Alain NADAI and Benoit MOREL* (xliii): Product Ecolabelling, Competition and the Environment
CLIM	83.2000	*Simone BORGHESI*: Income Inequality and the Environmental Kuznets Curve
KNOW	84.2000	*Giorgio BRUNELLO and Massimo GIANNINI:* Stratified or Comprehensive? The Economic Efficiency of School Design
KNOW	85.2000	*Giorgio BRUNELLO, Simona COMI and Claudio LUCIFORA:* The College Wage Gap in 10 European Countries: Evidence from Two Cohorts?
ETA	86.2000	*Michael FINUS*: Game Theory and International Environmental Co-operation: A Survey with an Application to the Kyoto-Protocol
CLIM	87.2000	*Clare GOODESS, Jean PALUTIKOF and Maureen AGNEW* (xlii): Climate Change Scenarios for the Mediterranean: A Basis for Regional Impact Assessment
CLIM	88.2000	*Ian COXHEAD*: Tax Reform and the Environment in Developing Economies: Is a Double Dividend Possible?
SUST	89.2000	*Peter BARTELMUS and André VESPER* (xliv): Green Accounting and Material Flow Analysis. Alternatives or Complements?
SUST	90.2000	*Mark DE HAAN and Steven J. KEUNING* (xliv): The NAMEA as Validation Instrument for Environmental Macroeconomics
SUST	91.2000	*Jochen JESINGHAUS* (xliv): On the Art of Aggregating Apples & Oranges
SUST	92.2000	*Jan KOLAR* (xliv)*:* Land Cover Accounting in the Czech Republic
SUST	93.2000	*Anil MARKANDYA, Alistair HUNT and Pamela MASON* (xliv): Valuing Damages for Green Accounting Purposes: The GARP II Approach
SUST	94.2000	*Anil MARKANDYA, Pamela MASON and Marialuisa TAMBORRA* (xliv): Green National Accounting: Synthesising and Extending the Welfare Based and Sustainability-standard Based Approaches
SUST	95.2000	*Martin O'CONNOR* (xliv): Towards a Typology of "Environmentally-Adjusted" National Sustainability Indicators: Key Concepts and Policy Application
SUST	96.2000	*Anton STEURER* (xliv): Towards an Environmental Accounting Framework for the EU
SUST	97.2000	*Cesare COSTANTINO, Federico FALCITELLI and Angelica TUDINI* (xliv): New Developments in Environmental Accounting at Istat
CLIM	98.2000	*Stefan BAYER and Claudia KEMFERT:* Reaching National Kyoto-Targets in Germany by Maintaining a Sustainable Development
CLIM	99.2000	*ZhongXiang ZHANG:* An Assessment of the EU Proposal for Ceilings on the Use of Kyoto Flexibility Mechanisms
KNOW	100.2000	*Maria Rosa BATTAGGION and Patrizia BUSSOLI*: Italian Policy towards Cooperation in R&D
KNOW	101.2000	*Giorgio BARBA NAVARETTI, Patrizia BUSSOLI, Georg VON GRAEVENITZ and David ULPH:* Information Sharing, Research Coordination and Membership of Research Joint Ventures
WAT	102.2000	*Cesare DOSI and William K. EASTER:* Water Scarcity: Institutional Change, Water Markets and Privatisation
WAT	103.2000	*Cesare DOSI and Naomi ZEITOUNI:* Controlling Groundwater Pollution from Agricultural Nonpoint Sources: An Overview of Policy Instruments
KNOW	104.2000	*Alberto PETRUCCI:* On Debt Neutrality in the Savers-Spenders Theory of Fiscal Policy
SUST	105.2000	*Roberto ROSON and Stefano SORIANI:* Intermodality and the Changing Role of Nodes in Transport Networks
CLIM	106.2000	*Alain BOUSQUET and Pascal FAVARD*: Does S. Kuznets' Belief Question the Environmental Kuznets Curves?
CLIM	107.2000	*Ottavio JANNI:* EU Biodiversity Conservation in Tropical Countries

VOL	108.2000	*Katrin MILLOCK and François SALANIE:* Collective Environmental Agreements: An Analysis of the Problems of Free-Riding and Collusion
VOL	109.2000	*Katrin MILLOCK:* The Combined Use of Taxation and Voluntary Agreements for Energy Policy
VOL	110.2000	*Markus A. LEHMANN:* The Impact of Voluntary Environmental Agreements on Firms' Incentives for Technology Adoption
SUST	1.2001	*Inge MAYERES and Stef PROOST*: Should Diesel Cars in Europe be Discouraged?
SUST	2.2001	*Paola DORIA and Davide PETTENELLA*: The Decision Making Process in Defining and Protecting Critical Natural Capital
CLIM	3.2001	*Alberto PENCH*: Green Tax Reforms in a Computable General Equilibrium Model for Italy
CLIM	4.2001	*Maurizio BUSSOLO and Dino PINELLI*: Green Taxes: Environment, Employment and Growth
CLIM	5.2001	*Marco STAMPINI*: Tax Reforms and Environmental Policies for Italy
ETA	6.2001	*Walid OUESLATI*: Environmental Fiscal Policy in an Endogenous Growth Model with Human Capital
CLIM	7.2001	*Umberto CIORBA, Alessandro LANZA and Francesco PAULI:* Kyoto Commitment and Emission Trading: a European Union Perspective
MGMT	8.2001	*Brian SLACK* (xlv): Globalisation in Maritime Transportation: Competition, uncertainty and implications for port development strategy
VOL	9.2001	*Giulia PESARO:* Environmental Voluntary Agreements: A New Model of Co-operation Between Public and Economic Actors
VOL	10.2001	*Cathrine HAGEM*: Climate Policy, Asymmetric Information and Firm Survival
ETA	11.2001	*Sergio CURRARINI and Marco MARINI*: A Sequential Approach to the Characteristic Function and the Core in Games with Externalities
ETA	12.2001	*Gaetano BLOISE, Sergio CURRARINI and Nicholas KIKIDIS*: Inflation and Welfare in an OLG Economy with a Privately Provided Public Good
KNOW	13.2001	*Paolo SURICO:* Globalisation and Trade: A "New Economic Geography" Perspective
ETA	14.2001	*Valentina BOSETTI and Vincenzina MESSINA:* Quasi Option Value and Irreversible Choices
CLIM	15.2001	*Guy* ENGELEN (xlii): Desertification and Land Degradation in Mediterranean Areas: from Science to Integrated Policy Making
SUST	16.2001	*Julie Catherine SORS:* Measuring Progress Towards Sustainable Development in Venice: A Comparative Assessment of Methods and Approaches
SUST	17.2001	*Julie Catherine SORS:* Public Participation in Local Agenda 21: A Review of Traditional and Innovative Tools
CLIM	18.2001	*Johan ALBRECHT and Niko GOBBIN*: Schumpeter and the Rise of Modern Environmentalism
VOL	19.2001	*Rinaldo BRAU, Carlo CARRARO and Giulio GOLFETTO* (xliii): Participation Incentives and the Design of Voluntary Agreements
ETA	20.2001	*Paola ROTA*: Dynamic Labour Demand with Lumpy and Kinked Adjustment Costs
ETA	21.2001	*Paola ROTA*: Empirical Representation of Firms' Employment Decisions by an (S,s) Rule
ETA	22.2001	*Paola ROTA*: What Do We Gain by Being Discrete? An Introduction to the Econometrics of Discrete Decision Processes
PRIV	23.2001	*Stefano BOSI, Guillaume GIRMANS and Michel GUILLARD:* Optimal Privatisation Design and Financial Markets
KNOW	24.2001	*Giorgio BRUNELLO, Claudio LUPI, Patrizia ORDINE, and Maria Luisa PARISI*: Beyond National Institutions: Labour Taxes and Regional Unemployment in Italy
ETA	25.2001	*Klaus CONRAD:* Locational Competition under Environmental Regulation when Input Prices and Productivity Differ
PRIV	26.2001	*Bernardo BORTOLOTTI, Juliet D'SOUZA, Marcella FANTINI and William L. MEGGINSON:* Sources of Performance Improvement in Privatised Firms: A Clinical Study of the Global Telecommunications Industry
CLIM	27.2001	*Frédéric BROCHIER and Emiliano RAMIERI:* Climate Change Impacts on the Mediterranean Coastal Zones
ETA	28.2001	*Nunzio CAPPUCCIO and Michele MORETTO:* Comments on the Investment-Uncertainty Relationship in a Real Option Model
KNOW	29.2001	*Giorgio BRUNELLO*: Absolute Risk Aversion and the Returns to Education
CLIM	30.2001	*ZhongXiang ZHANG:* Meeting the Kyoto Targets: The Importance of Developing Country Participation
ETA	31.2001	*Jonathan D. KAPLAN, Richard E. HOWITT and Y. Hossein FARZIN*: An Information-Theoretical Analysis of Budget-Constrained Nonpoint Source Pollution Control
MGMT	32.2001	*Roberta SALOMONE and Giulia GALLUCCIO:* Environmental Issues and Financial Reporting Trends
Coalition Theory Network	33.2001	*Shlomo WEBER and Hans WIESMETH:* From Autarky to Free Trade: The Impact on Environment
ETA	34.2001	*Margarita GENIUS and Elisabetta STRAZZERA*: Model Selection and Tests for Non Nested Contingent Valuation Models: An Assessment of Methods

NRM	35.2001	*Carlo GIUPPONI*: The Substitution of Hazardous Molecules in Production Processes: The Atrazine Case Study in Italian Agriculture
KNOW	36.2001	*Raffaele PACI and Francesco PIGLIARU*: Technological Diffusion, Spatial Spillovers and Regional Convergence in Europe
PRIV	37.2001	*Bernardo BORTOLOTTI:* Privatisation, Large Shareholders, and Sequential Auctions of Shares
CLIM	38.2001	*Barbara BUCHNER*: What Really Happened in The Hague? Report on the COP6, Part I, 13-25 November 2000, The Hague, The Netherlands
PRIV	39.2001	*Giacomo CALZOLARI and Carlo SCARPA*: Regulation at Home, Competition Abroad: A Theoretical Framework
KNOW	40.2001	*Giorgio BRUNELLO*: On the Complementarity between Education and Training in Europe
Coalition Theory Network	41.2001	*Alain DESDOIGTS and Fabien MOIZEAU* (xlvi): Multiple Politico-Economic Regimes, Inequality and Growth
Coalition Theory Network	42.2001	*Parkash CHANDER and Henry TULKENS* (xlvi): Limits to Climate Change
Coalition Theory Network	43.2001	*Michael FINUS and Bianca RUNDSHAGEN* (xlvi): Endogenous Coalition Formation in Global Pollution Control
Coalition Theory Network	44.2001	*Wietze LISE, Richard S.J. TOL and Bob van der ZWAAN* (xlvi): Negotiating Climate Change as a Social Situation
NRM	45.2001	*Mohamad R. KHAWLIE* (xlvii): The Impacts of Climate Change on Water Resources of Lebanon-Eastern Mediterranean
NRM	46.2001	*Mutasem EL-FADEL and E. BOU-ZEID* (xlvii): Climate Change and Water Resources in the Middle East: Vulnerability, Socio-Economic Impacts and Adaptation
NRM	47.2001	*Eva IGLESIAS, Alberto GARRIDO and Almudena GOMEZ* (xlvii): An Economic Drought Management Index to Evaluate Water Institutions' Performance Under Uncertainty and Climate Change
CLIM	48.2001	*Wietze LISE and Richard S.J. TOL* (xlvii): Impact of Climate on Tourist Demand
CLIM	49.2001	*Francesco BOSELLO, Barbara BUCHNER, Carlo CARRARO and Davide RAGGI*: Can Equity Enhance Efficiency? Lessons from the Kyoto Protocol
SUST	50.2001	*Roberto ROSON* (xlviii): Carbon Leakage in a Small Open Economy with Capital Mobility
SUST	51.2001	*Edwin WOERDMAN* (xlviii): Developing a European Carbon Trading Market: Will Permit Allocation Distort Competition and Lead to State Aid?
SUST	52.2001	*Richard N. COOPER* (xlviii): The Kyoto Protocol: A Flawed Concept
SUST	53.2001	*Kari KANGAS* (xlviii): Trade Liberalisation, Changing Forest Management and Roundwood Trade in Europe
SUST	54.2001	*Xueqin ZHU and Ekko VAN IERLAND* (xlviii): Effects of the Enlargement of EU on Trade and the Environment
SUST	55.2001	*M. Ozgur KAYALICA and Sajal LAHIRI* (xlviii): Strategic Environmental Policies in the Presence of Foreign Direct Investment
SUST	56.2001	*Savas ALPAY* (xlviii): Can Environmental Regulations be Compatible with Higher International Competitiveness? Some New Theoretical Insights
SUST	57.2001	*Roldan MURADIAN, Martin O'CONNOR, Joan MARTINEZ-ALER* (xlviii): Embodied Pollution in Trade: Estimating the "Environmental Load Displacement" of Industrialised Countries
SUST	58.2001	*Matthew R. AUER and Rafael REUVENY* (xlviii): Foreign Aid and Direct Investment: Key Players in the Environmental Restoration of Central and Eastern Europe
SUST	59.2001	*Onno J. KUIK and Frans H. OOSTERHUIS* (xlviii): Lessons from the Southern Enlargement of the EU for the Environmental Dimensions of Eastern Enlargement, in particular for Poland
ETA	60.2001	*Carlo CARRARO, Alessandra POME and Domenico SINISCALCO* (xlix): Science vs. Profit in Research: Lessons from the Human Genome Project
CLIM	61.2001	*Efrem CASTELNUOVO, Michele MORETTO and Sergio VERGALLI:* Global Warming, Uncertainty and Endogenous Technical Change: Implications for Kyoto
PRIV	62.2001	*Gian Luigi ALBANO, Fabrizio GERMANO and Stefano LOVO:* On Some Collusive and Signaling Equilibria in Ascending Auctions for Multiple Objects
CLIM	63.2001	*Elbert DIJKGRAAF and Herman R.J. VOLLEBERGH:* A Note on Testing for Environmental Kuznets Curves with Panel Data
CLIM	64.2001	*Paolo BUONANNO, Carlo CARRARO and Marzio GALEOTTI*: Endogenous Induced Technical Change and the Costs of Kyoto
CLIM	65.2001	*Guido CAZZAVILLAN and Ignazio MUSU* (l): Transitional Dynamics and Uniqueness of the Balanced-Growth Path in a Simple Model of Endogenous Growth with an Environmental Asset
CLIM	66.2001	*Giovanni BAIOCCHI and Salvatore DI FALCO* (l): Investigating the Shape of the EKC: A Nonparametric Approach

CLIM	67.2001	*Marzio GALEOTTI, Alessandro LANZA and Francesco PAULI* (l): Desperately Seeking (Environmental) Kuznets: A New Look at the Evidence
CLIM	68.2001	*Alexey VIKHLYAEV* (xlviii): The Use of Trade Measures for Environmental Purposes – Globally and in the EU Context
NRM	69.2001	*Gary D. LIBECAP and Zeynep K. HANSEN* (li): U.S. Land Policy, Property Rights, and the Dust Bowl of the 1930s
NRM	70.2001	*Lee J. ALSTON, Gary D. LIBECAP and Bernardo MUELLER* (li): Land Reform Policies, The Sources of Violent Conflict and Implications for Deforestation in the Brazilian Amazon
CLIM	71.2001	*Claudia KEMFERT*: Economy-Energy-Climate Interaction – The Model WIAGEM -
SUST	72.2001	*Paulo A.L.D. NUNES and Yohanes E. RIYANTO*: Policy Instruments for Creating Markets for Bodiversity: Certification and Ecolabeling
SUST	73.2001	*Paulo A.L.D. NUNES and Erik SCHOKKAERT* (lii): Warm Glow and Embedding in Contingent Valuation
SUST	74.2001	*Paulo A.L.D. NUNES, Jeroen C.J.M. van den BERGH and Peter NIJKAMP* (lii): Ecological-Economic Analysis and Valuation of Biodiversity
VOL	75.2001	*Johan EYCKMANS and Henry TULKENS* (li): Simulating Coalitionally Stable Burden Sharing Agreements for the Climate Change Problem
PRIV	76.2001	*Axel GAUTIER and Florian HEIDER*: What Do Internal Capital Markets Do? Redistribution vs. Incentives
PRIV	77.2001	*Bernardo BORTOLOTTI, Marcella FANTINI and Domenico SINISCALCO*: Privatisation around the World: New Evidence from Panel Data
ETA	78.2001	*Toke S. AIDT and Jayasri DUTTA* (li): Transitional Politics. Emerging Incentive-based Instruments in Environmental Regulation
ETA	79.2001	*Alberto PETRUCCI*: Consumption Taxation and Endogenous Growth in a Model with New Generations
ETA	80.2001	*Pierre LASSERRE and Antoine SOUBEYRAN* (li): A Ricardian Model of the Tragedy of the Commons
ETA	81.2001	*Pierre COURTOIS, Jean Christophe PÉREAU and Tarik TAZDAÏT*: An Evolutionary Approach to the Climate Change Negotiation Game
NRM	82.2001	*Christophe BONTEMPS, Stéphane COUTURE and Pascal FAVARD:* Is the Irrigation Water Demand Really Convex?
NRM	83.2001	*Unai PASCUAL and Edward BARBIER*: A Model of Optimal Labour and Soil Use with Shifting Cultivation
CLIM	84.2001	*Jesper JENSEN and Martin Hvidt THELLE*: What are the Gains from a Multi-Gas Strategy?
CLIM	85.2001	*Maurizio MICHELINI* (liii): IPCC "Summary for Policymakers" in TAR. Do its results give a scientific support always adequate to the urgencies of Kyoto negotiations?
CLIM	86.2001	*Claudia KEMFERT* (liii): Economic Impact Assessment of Alternative Climate Policy Strategies
CLIM	87.2001	*Cesare DOSI and Michele MORETTO:* Global Warming and Financial Umbrellas
ETA	88.2001	*Elena BONTEMPI, Alessandra DEL BOCA, Alessandra FRANZOSI, Marzio GALEOTTI and Paola ROTA:* Capital Heterogeneity: Does it Matter? Fundamental Q and Investment on a Panel of Italian Firms
ETA	89.2001	*Efrem CASTELNUOVO and Paolo SURICO*: Model Uncertainty, Optimal Monetary Policy and the Preferences of the Fed
CLIM	90.2001	*Umberto CIORBA, Alessandro LANZA and Francesco PAULI*: Kyoto Protocol and Emission Trading: Does the US Make a Difference?
CLIM	91.2001	*ZhongXiang ZHANG and Lucas ASSUNCAO:* Domestic Climate Policies and the WTO
SUST	92.2001	*Anna ALBERINI, Alan KRUPNICK, Maureen CROPPER, Nathalie SIMON and Joseph COOK* (lii): The Willingness to Pay for Mortality Risk Reductions: A Comparison of the United States and Canada
SUST	93.2001	*Riccardo SCARPA, Guy D. GARROD and Kenneth G. WILLIS* (lii): Valuing Local Public Goods with Advanced Stated Preference Models: Traffic Calming Schemes in Northern England
CLIM	94.2001	*Ming CHEN and Larry KARP*: Environmental Indices for the Chinese Grain Sector
CLIM	95.2001	*Larry KARP and Jiangfeng ZHANG*: Controlling a Stock Pollutant with Endogenous Investment and Asymmetric Information
ETA	96.2001	*Michele MORETTO and Gianpaolo ROSSINI*: On the Opportunity Cost of Nontradable Stock Options
SUST	97.2001	*Elisabetta STRAZZERA, Margarita GENIUS, Riccardo SCARPA and George HUTCHINSON*: The Effect of Protest Votes on the Estimates of Willingness to Pay for Use Values of Recreational Sites
NRM	98.2001	*Frédéric BROCHIER, Carlo GIUPPONI and Alberto LONGO*: Integrated Coastal Zone Management in the Venice Area – Perspectives of Development for the Rural Island of Sant'Erasmo
NRM	99.2001	*Frédéric BROCHIER, Carlo GIUPPONI and Julie SORS*: Integrated Coastal Management in the Venice Area – Potentials of the Integrated Participatory Management Approach
NRM	100.2001	*Frédéric BROCHIER and Carlo GIUPPONI*: Integrated Coastal Zone Management in the Venice Area – A Methodological Framework
PRIV	101.2001	*Enrico C. PEROTTI and Luc LAEVEN*: Confidence Building in Emerging Stock Markets
CLIM	102.2001	*Barbara BUCHNER, Carlo CARRARO and Igor CERSOSIMO*: On the Consequences of the U.S. Withdrawal from the Kyoto/Bonn Protocol

SUST	103.2001	*Riccardo SCARPA, Simon ANDERSON, Adam DRUCKER and Veronica GOMEZ*: Valuing Genetic Resources in Courtyard Economies: The Case of Creole Pig in Yucatan
SUST	104.2001	*Riccardo SCARPA, E. RUTO, P. KRISTJANSON and M. RADENY*: Valuing Genetic Resources in African Livestock: An Empirical Comparison of Stated and Revealed Preference Value Estimates
SUST	105.2001	*Clemens B.A. WOLLNY*: The Need to Conserve Farm Animal Genetic Resources Through Community-Based Management in Africa: Should Policy Makers be Concerned?
SUST	106.2001	*J.T. KARUGIA, O.A. MWAI, R. KAITHO, Adam G. DRUCKER, C.B.A. WOLLNY and J.E.O. REGE:* Economic Analysis of Crossbreeding Programmes in Sub-Saharan Africa: A Conceptual Framework and Kenyan Case Study
SUST	107.2001	*W. AYALEW, J.M. KING, E. BURNS and B. RISCHKOWSKY*: Economic Evaluation of Smallholder Subsistence Livestock Production: Lessons from an Ethiopian Goat Development Program
SUST	108.2001	*Gianni CICIA, Elisabetta D'ERCOLE and Davide MARINO*: Valuing Farm Animal Genetic Resources by Means of Contingent Valuation and a Bio-Economic Model: The Case of the Pentro Horse

(xxxvi) This paper was presented at the Second EFIEA Policy Workshop on "Integrating Climate Policies in the European Environment. Costs and Opportunities", organised by the Fondazione Eni Enrico Mattei on behalf of the European Forum on Integrated Environmental Assessment, Milan, March 4-6, 1999
(xxxvii) This paper was presented at the Fourth Meeting of the Coalition Theory Network organised by the Fondazione Eni Enrico Mattei, CORE of Louvain-la-Neuve and GREQAM of Marseille, Aix-en-Provence, January 8-9, 1999
(xxxviii) This paper was presented at the International Conference on "Trade and Competition in the WTO and Beyond" organised by the Fondazione Eni Enrico Mattei and the Department of International Studies of the University of Padua, Venice, December 4-5, 1998
(xxxix) This paper was presented at the 3rd Toulouse Conference on Environment and Resource Economics, organised by Fondazione Eni Enrico Mattei, IDEI and INRA and sponsored by MATE on "Environment, Energy Uses and Climate Change", Toulouse, June 14-16, 1999
(xl) This paper was presented at the conference on "Distributional and Behavioral Effects of Environmental Policy" jointly organised by the National Bureau of Economic Research and Fondazione Eni Enrico Mattei, Milan, June 11-12, 1999
(xli) This paper was presented at the Fifth Meeting of the Coalition Theory Network organised by the Fondazione Eni Enrico Mattei and the CODE, Universitat Autonoma de Barcelona, Barcelona January 21-22, 2000
(xlii) This paper was presented at the International Workshop on "Climate Change and Mediterranean Coastal Systems: Regional Scenarios and Vulnerability Assessment" organised by the Fondazione Eni Enrico Mattei in co-operation with the Istituto Veneto di Scienze, Lettere ed Arti, Venice, December 9-10, 1999.
(xliii)This paper was presented at the International Workshop on "Voluntary Approaches, Competition and Competitiveness" organised by the Fondazione Eni Enrico Mattei within the research activities of the CAVA Network, Milan, May 25-26,2000.
(xliv) This paper was presented at the International Workshop on "Green National Accounting in Europe: Comparison of Methods and Experiences" organised by the Fondazione Eni Enrico Mattei within the Concerted Action of Environmental Valuation in Europe (EVE), Milan, March 4-7, 2000
(xlv) This paper was presented at the International Workshop on "New Ports and Urban and Regional Development. The Dynamics of Sustainability" organised by the Fondazione Eni Enrico Mattei, Venice, May 5-6, 2000.
(xlvi) This paper was presented at the Sixth Meeting of the Coalition Theory Network organised by the Fondazione Eni Enrico Mattei and the CORE, Université Catholique de Louvain, Louvain-la-Neuve, Belgium, January 26-27, 2001
(xlvii) This paper was presented at the RICAMARE Workshop "Socioeconomic Assessments of Climate Change in the Mediterranean: Impact, Adaptation and Mitigation Co-benefits", organised by the Fondazione Eni Enrico Mattei, Milan, February 9-10, 2001
(xlviii) This paper was presented at the International Workshop "Trade and the Environment in the Perspective of the EU Enlargement ", organised by the Fondazione Eni Enrico Mattei, Milan, May 17-18, 2001

(xlix) This paper was presented at the International Conference "Knowledge as an Economic Good", organised by Fondazione Eni Enrico Mattei and The Beijer International Institute of Environmental Economics, Palermo, April 20-21, 2001
(l) This paper was presented at the Workshop "Growth, Environmental Policies and + Sustainability" organised by the Fondazione Eni Enrico Mattei, Venice, June 1, 2001
(li) This paper was presented at the Fourth Toulouse Conference on Environment and Resource Economics on "Property Rights, Institutions and Management of Environmental and Natural Resources", organised by Fondazione Eni Enrico Mattei, IDEI and INRA and sponsored by MATE, Toulouse, May 3-4, 2001
(lii) This paper was presented at the International Conference on "Economic Valuation of Environmental Goods", organised by Fondazione Eni Enrico Mattei in cooperation with CORILA, Venice, May 11, 2001
(liii) This paper was circulated at the International Conference on "Climate Policy – Do We Need a New Approach?", jointly organised by Fondazione Eni Enrico Mattei, Stanford University and Venice International University, Isola di San Servolo, Venice, September 6-8, 2001

2000 SERIES

MGMT	*Corporate Sustainable Management* (Editor: Andrea Marsanich)
CLIM	*Climate Change Modelling and Policy* (Editor: Marzio Galeotti)
PRIV	*Privatisation, Antitrust, Regulation* (Editor: Bernardo Bortolotti)
KNOW	*Knowledge, Technology, Human Capital* (Editor: Dino Pinelli)
WAT	*Water and Natural Resources Management* (Editor: Carlo Giupponi)
SUST	*Sustainability Indicators and Impact Assessment* (Editor: Marialuisa Tamborra)
VOL	*Task Force on Voluntary Agreements* (Editor: Rinaldo Brau)
ETA	*Economic Theory and Applications* (Editor: Carlo Carraro)

2001 SERIES

MGMT	*Corporate Sustainable Management* (Editor: Andrea Marsanich)
CLIM	*Climate Change Modelling and Policy* (Editor: Marzio Galeotti)
PRIV	*Privatisation, Antitrust, Regulation* (Editor: Bernardo Bortolotti)
KNOW	*Knowledge, Technology, Human Capital* (Editor: Dino Pinelli)
NRM	*Natural Resources Management* (Editor: Carlo Giupponi)
SUST	*Sustainability Indicators and Environmental Evaluation* (Editor: Marialuisa Tamborra)
VOL	*Voluntary and International Agreements* (Editor: Carlo Carraro)
ETA	*Economic Theory and Applications* (Editor: Carlo Carraro)

SUBSCRIPTION TO "NOTE DI LAVORO"

Starting from January 1998 Fondazione Eni Enrico Mattei issues a Periodic E-mail "Note di Lavoro" Bulletin listing the titles and the abstracts of its most recent Working Papers.
All the "Note di Lavoro" listed in the Bulletin are available on the Internet and are downloadable from Feem's web site "www.feem.it".
If you wish to receive hard copies you may choose from the payment options listed in the following table (*minimum order: 10 papers*)*.
*Orders for individual papers should clearly indicate the "Nota di Lavoro" number and can therefore be issued for published papers only.
All orders must be sent by fax to:
"Publications Office" - Fondazione Eni Enrico Mattei: Fax +39+2+52036946

PAYMENT OPTIONS

How many papers?	*What's the price?*	*How to pay?*
10 or more*	US$ 4.00 each ITL 7,000 each	By Credit card or Bank transfer
Annual subscription (approx. 100 papers/year)	US$ 250.00 ITL 425,000	By Credit card or Bank transfer

***Please fill out the Working Paper Subscription Form indicating your preferences**
(Periodic E-mail "Note di Lavoro" Bulletin, Annual subscription, Order for individual papers - minimum 10*)!
✄..

WORKING PAPER SUBSCRIPTION FORM

Name:____

Affiliation(if applicable):____

Address: ____
____
____

Phone: ______________________ Fax: _________________________ E-mail: _______________________

I wish to: Amount due:

☐ receive the Periodic E-mail Working Papers Bulletin

☐ place a full annual subscription for 2001 (US$ 250.00/ITL 425,000) _________________

☐ order no......individual papers (minimum 10 papers at US$ 4.00/ITL 7,000 each)* _________________

Total _________________

I will pay by:

☐ VISA ☐ American Express Card No. __________________ Expiration Date: ____________________

Signature: ____________________

Bank transfer in US$ (or Italian Lire in Italy) to Fondazione Eni Enrico Mattei - account no. 39341-56 - SWIFT ARTIITM2 - ABI 03512 - CAB 01614 - Credito Artigiano - Corso Magenta 59, 20123 Milano, Italy.
Copy of the bank transfer should be faxed along with the order.
Please return this duly completed form to:
"Publications Office" - Fondazione Eni Enrico Mattei - Corso Magenta, 63 - 20123 Milano, Italy