

Tisdell, Clem

Working Paper

Socioeconomic causes of loss of animal genetic diversity: Analysis and assessment

Nota di Lavoro, No. 109.2001

Provided in Cooperation with:

Fondazione Eni Enrico Mattei (FEEM)

Suggested Citation: Tisdell, Clem (2001) : Socioeconomic causes of loss of animal genetic diversity: Analysis and assessment, Nota di Lavoro, No. 109.2001, Fondazione Eni Enrico Mattei (FEEM), Milano

This Version is available at:

<https://hdl.handle.net/10419/155271>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



Fondazione Eni Enrico Mattei

**Socioeconomic Causes of Loss of
Animal Genetic Diversity:
Analysis and Assessment**

Clem Tisdell*

NOTA DI LAVORO 109.2001

DECEMBER 2001

SUST – Sustainability Indicators and Environmental Evaluation
--

*School of Economics, The University of Queensland,
Brisbane, Australia

This paper can be downloaded without charge at:

The Fondazione Eni Enrico Mattei Note di Lavoro Series Index:
http://www.feem.it/web/attiv/_attiv.html

Social Science Research Network Electronic Paper Collection:
<http://papers.ssrn.com/abstract=XXXXXX>

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

The number of breeds of domesticated animals, especially livestock, have declined rapidly. The proximate causes and processes involved in loss of breeds are outlined. The path-dependent effect and Swanson's dominance-effect are discussed in relation to breed selection. While these help to explain genetic erosion, they need to be supplemented to provide a further explanation of biodiversity loss. It is shown that the extension of markets and economic globalisation have contributed significantly to genetic loss of breeds. In addition, the decoupling of animal husbandry from surrounding natural environmental conditions is further eroding the stock of genetic resources, particularly industrialised intensive animal husbandry. Recent trends in animal husbandry raise very serious sustainability issues, apart from animal welfare concerns.

Keywords: Biodiversity loss, breed selection, economic globalisation, intensive agriculture, market extension, path dependence.

JEL: Q200

NON TECHNICAL SUMMARY

The proximate causes and processes involved in the rapid loss of domesticated animal breeds are outlined. The path-dependent effect and Swanson's dominance-effect are discussed in relation to breed selection. While these help to explain genetic erosion, they need to be supplemented to provide a further explanation of biodiversity loss. It is shown that the extension of markets and economic globalisation have contributed significantly to such losses. In addition, the decoupling of animal husbandry from surrounding natural environmental conditions is further eroding the stock of genetic resources, particularly in industrialised intensive animal husbandry. Recent trends in husbandry raise serious sustainability issues.

CONTENTS

1.	Introduction	1
2.	A review of proximate causes of breed losses and the processes involved	4
3.	The Swanson dominance-effect and breed loss	6
4.	Market extension and economic globalisation as a source of biodiversity loss	10
5.	Decoupling of breeds and animal husbandry from local natural environments	15
6.	Concluding remarks	17
	References	20

1. Introduction

This article focuses on the socioeconomic factors and processes that have contributed to the loss of genetic diversity of domesticated animals, particularly livestock. These are animals that primarily have, or used to have, direct use value for humankind and contrast with much wildlife possessing mainly non-use values. Nevertheless, it is possible for some breeds of livestock, especially if rare or endangered, such as Scottish Highland cattle, to have significant non-use values as well. In some countries, rare breeds are being conserved in protected areas (The World Monitoring Centre, 1992, p.397)

Despite the fact that most domestic animals and their products are private goods, many breeds have been lost in the last 100 years or so. The World Conservation Monitoring Centre (1992, p.397) reports

“Pursuit of higher production targets, the commercial success of particular breed promoters, and, in developed countries, changes in consumer preferences have led to livestock development activities becoming concentrated in few breeds and breed groups. The corollary of this is that more breeds are declining in importance, many have been lost and the survival of many others is in considerable doubt. Concern for rare breeds has been most marked in northern temperate countries with a history of specialised livestock production, but it is becoming increasingly evident that declining breeds in less developed countries also represent genetic resources of great significance”.

There is considerable uncertainty about the magnitude of the loss in biodiversity of domestic animals but no doubt that loss is considerable. According to the website for

the Civil Society Organisations and Participation Programme of the UNDP, “Half of all Europe’s domesticated animals have become extinct in [the 20th] century. A third of all remaining livestock species in both Europe and North America are endangered” (UNDP/CSOPP, undated, p.2). The NGO, Genetic Resources Action International (undated, p.2), reports “Livestock breeds are disappearing at an annual rate of five percent, or six breeds per month. In Europe, half of all breeds of domestic animals existing in 1900 are gone, with 43 percent of those remaining endangered”.

In some respects, these figures could exaggerate the loss. FAO (undated, pp.44-45) suggests that some lists of extinct or endangered animal species include non-indigenous species and breeds that have never left the research station, e.g. the *FAO Worldwatch List* (Scherf, 1996). These are not species involved in co-evolution. This FAO document (p.44) points out: “The breeds most relevant to biodiversity concerns are those that have co-evolved with a particular environment and farming system and represent an accumulation of both genetic stock and management strategies in relation to particular environment. These have usually taken a long time to evolve and have characters such as humidity resistance, that cannot be easily developed”. On the other hand, there appear to be or to have been breeds in developing countries that have not been identified and which could have already been lost.

Despite this, according to data collected by the World Conservation Centre (1992) there were 3,237 extant livestock breeds in 1992 and 617 breeds had become extinct since 1892. This suggests that almost one in six breeds became extinct in this time period. In addition, another 474 breeds were considered to be rare and endangered. This suggests that within a period of 100 years about 28 percent of livestock breeds either became

extinct or rare or endangered. Therefore, the magnitude of the loss is considerable, even on the basis of conservative efforts.

To a large extent this loss appears to have been accelerated by the extension of market systems and associated processes of globalisation. These processes together with the nature of technologies associated with particular breeds have encouraged global concentration of economic activity on fewer breeds. Furthermore, the changing structures of societies, such as increased urbanisation in developing countries may favour breeds and associated technologies found initially to be of economic value by higher income countries. Development of the livestock industry in developing countries may be 'biased' in favour of breeds and technologies from higher income countries because of their 'prime-mover' advantage and the presence of the breed-technology 'lock-in' effect (Swanson, 1984, 1995a, 1995b).

In this article the proximate causes of breed losses and the processes involved are outlined and the relevance of Swanson's theory (Swanson, 1994) of species extinction is considered. Then follows a discussion of how the extension of markets and economic globalisation accelerates the loss of breeds and encourages the tendency to concentrate on a few breeds. Finally, the growing practice of decoupling the husbandry of animals from their natural environmental is examined. This is partly a market-driven phenomenon mostly involving industrial-type livestock production. It further adds to genetic erosion and raises serious sustainability issues.

2. A Review of Proximate Causes of Breed Losses and the Processes Involved

Breed replacement or substantial replacement of extant breeds can occur as a result of straight replacement by other existing ones considered to be superior from an economic point of view, by the formation of synthetic breeds that eventually replace existing breeds, and by stabilised cross-breeding (World Conservation Monitoring Centre, 1992, p.395). The latter, however, requires pure breeds of parent stock to be maintained and so, unless genetic introgression occurs in the breeding stock, is not a force for breed loss *per se*. However, it is possible that the crosses have superior quality and that results in some breeds being entirely replaced by the crosses.

Apart from breed substitution, economic change can result in the elimination of livestock in some regions in favour of other forms of agriculture such as the growing of crops. In such cases, breeds specific to a region undergoing land-use changes may disappear.

Hammond and Leitch (1996) identify the factors listed in Table 1 as sources of the erosion of livestock biodiversity. Some of these sources have an economic basis e.g. specialisation, some are technologically based (but this change may be ultimately driven by economic considerations) and others depend on political and natural events.

Table 1 here

Table 1 does not sufficiently emphasize the economic and market factors that accelerate erosion of biodiversity. The following economic factors can be important in biodiversity loss.

- (1) As discussed later, the extension of markets via economic globalisation encourages regional economic specialisation. This may result in particular types of livestock production becoming relatively uneconomic in a particular region with loss of breeds peculiar to that region.
- (2) With economic globalisation, it has become less costly to transfer breeds across international boundaries and this increases the possibilities for breed substitution.
- (3) Factor 2 enables the Swanson dominance-effect (discussed in the next section) to operate more easily. The Swanson dominance-effect suggests that breeds selected in more developed countries will tend to replace those in less developed countries.
- (4) The law of specialisation by comparative advantage suggests that specialised breeds will tend to replace multi-purpose breeds as markets expand and market transaction costs fall.
- (5) Changing tastes and demands can hasten breed erosion. Consumer preference for leaner meat is resulting in the demise of breeds of pigs that have a fatter meat.
- (6) Changes in the availability and price of imports e.g. food for livestock can change the economics of keeping different breeds.
- (7) The scope for altering environments in which livestock are held can change the economics of selecting different breeds. To a large extent, livestock in developed countries has been decoupled from dependence on its surrounding natural environment. Much livestock in developed countries (and increasingly so in developing countries) is maintained in an artificial environmental capsule protected from the natural environment in intensive-farming systems. Few of its

inputs, even its food, may be produced locally due to forces making market extension possible.

Thus, the scope for economic forces to contribute to breed losses is very wide. Economic impacts are closely associated with the strengthening of the forces of globalisation and market extension. Furthermore, the pattern of breed losses may be influenced by the Swanson dominance-effect. Consider the Swanson dominance-effect in this context.

3. The Swanson Dominance-Effect and Breed Loss

Swanson (1994) identified two important factors contributing to biodiversity loss generally. The first was the loss of natural habitat due its conversion to human-use, mainly for agriculture. Tisdell (1999, Ch.4) suggests that in addition to this, man-made activities have increased the uniformity of extant environments and that this has contributed, amongst other things, to reduced diversity of species.

A further influence is the selective approach of humankind to conserving and husbanding species. As Swanson (1994, pp.99-100) states:

“..... the entire roster of species is not being considered for use on any given parcel of land. It is more likely that the choice is only for a handful of ‘commercialised’ crops and livestock. The roster of species used to appropriate photosynthetic products for humans has converged to this very small select group of plants and animals”.

Swanson (1994, pp.101-106) argues that path dependence (a situation where initial conditions heavily influence the subsequent development path), as had been observed

in relation to the development and survival of new technologies (David, 1985), is important in the survival of species. If this is so then, by analogy, it should also be important in relation to the survival of domesticated animal breeds.

Swanson (1994) argues that learning, investment and experience in developing the use of a species tends to be species-specific. It cannot be easily shifted to other species but it may be shifted to other geographical regions. A similar situation may exist for breeds of livestock.

Swanson (1995a, 1995b) further elaborates on his hypothesis that choices of the species developed depend on the prime-moving regions and determine the choices made and paths taken by many subsequent societies. Specifically Swanson (1995a, 1995b) argues that “the degree of conversion witnessed in developing societies is predetermined by the conversion decision made by the first-developing societies. These societies selected a set of locally available natural assets around which to develop, but many subsequent asset selections have taken their shape in response to those initial decisions. Now societies that are ‘catching up’ attempt to leapfrog intermediate stages of development made by previous developers in their own territories. In this way development is biased toward the conversion of natural environments to the same set of assets across the globe. This is diversity decline as a result of the uniformity of the development process across heterogeneous states”.

Presumably, by analogy, the Swanson path-dependence hypothesis would also extend to the selection of different animal breeds. As economic development occurs, one might

expect to witness increasing global dominance of breeds selected in higher income countries and the displacement of breeds specific to less developed countries.

Swanson (1994) largely attributes these lock-in effects of choice of utilised species to non-rivalry in the use of knowledge and dynamic externalities of the type mentioned by Romer (1987, 1990a, 1990b), but in fact foreshadowed earlier by Myrdal (1956). In line with Romer's view, Swanson suggests that this leads to a non-convexity in development. Increasing returns (in contrast to decreasing returns) by specialising in the production and development of particular products provides an example of a non-convexity. Alternatively, this phenomenon could also be envisaged as involving a form of hysteresis, that is reduced plasticity or flexibility in the relevant system. Furthermore, lock-in can conceivably arise in the absence of knowledge externalities. The latter could happen where, for instance, a monopolist obtains effective property-rights to new breeds or varieties of crops.

Because the initial selection of breeds or species for development tends to be partial and to a large extent uncoordinated, breeds or species may be selected for development that from a global perspective do not maximise economic returns. The array of breeds developed, although having some economic advantages, may not constitute the economically optimal choice. But lock-in occurs and species fail to survive which would have been superior from an economic viewpoint if developed in time.

This can be illustrated by Figure 1. Two breeds I and II are assumed to be available initially and a 'decision' is to be made to develop one or the other. If no breed development takes place, the flow of the net economic value of Breed I might be as

indicated by line CD and that breed II as indicate by line AB. If Breed II is developed rather than breed I, the flow of net economic value from it might be as indicated by line EFG. On the other hand, if Breed I is developed, the flow might be as represented by line HJK.

INSERT FIGURE 1

It can be seen from Figure 1 that if Breed II is developed and Breed I is neglected that eventually the flow of economic benefits from Breed II overtake those from Breed I. The opportunity cost of developing Breed I increases given the development of Breed II and the sunk costs of investment in this. Consequently, as time passes, it becomes increasingly clear that the development of Breed I is no longer economical. Its inherent superior genetic position is eroded as time passes by its relative neglect.

In the case illustrated in Figure 1, the initially inferior breed is shown to always remain inferior for the same level of investment in its development as the initially superior breed. In practice, this may not be so. The potential for what appears initially to be the inferior breed to respond to development may be greater than for the breed initially appearing superior in terms of its net economic value. Nevertheless, lock-in can occur in either case.

Systems involving path-dependence can be extremely complex, particularly if coupled with the presence of radical uncertainty. They certainly add force to Clark's observation that "predicting the future is a risky business at best, particularly where human activities are involved" (Clark, 1995, p.143).

In his work, Swanson (1994, 1955a, 1995b) stresses that initial choices of species and associated technological development are the prime influences on biodiversity loss. While these processes and mechanisms are important, his approach does not provide sufficient emphasis on the role of market extension, and associated economic globalisation, as a contributor to the extent of biodiversity loss..

4. Market Extension and Economic Globalisation as a Source of Biodiversity Loss

Market extension can help to magnify the types of initial persistent genetic biases identified by Swanson. In addition, market extension creates new avenues for extinction of breeds and species by eliminating economic niches (cf. Tisdell and Seidl, 2001) and unleashing other competitive forces. In fact, the patterns of breed and species elimination arising from the extension of markets can be quite varied and complex. Here it is only possible to identify some of these patterns.

The spread of the market system favours selfish competitive forces and individual survival often depends on the economic entities participating in economic rivalry. These forces also favour the adoption of least-cost technology (Svizzero and Tisdell, 2001). Thus when the market system is introduced to a region using a regional-specific breed inferior in productivity compared to an exotic breed, if introduced to the locality, the exotic breed will replace the regional breed. Therefore, the regional breed will become extinct.

This is illustrated by the simple supply and demand curve analysis shown in Figure 2. Once the local region gets linked to wider markets, the demand for its livestock

produce might be as represented by the curve marked DD. The local breed of livestock has the supply curve for this produce of S_1S_1 . But because of enhanced global links, the local region can obtain an exotic breed (new technology) for which the supply curve of the region's livestock produce is as shown by S_2S_2 . The exotic breed can produce livestock output at lower cost. Consequently, competition will result in it replacing the local breed. The local breed is driven to extinction by economic change. It matters not at all in this context whether the replacement breed has been made superior by the Swanson bias-type process.

INSERT FIGURE 2

Economic globalisation, the process of extending markets, as extolled by Adam Smith and seen by David Ricardo as a powerful force for reducing economic scarcity, encourages regional and international specialisation in production. However, at the same time, it is a powerful force for loss of genetic diversity. Two different types of illustration follow.

In the case shown in Figure 3, as a result of the extension of markets or economic globalisation, it becomes cheaper in a region to import livestock produce rather than supply it locally. The cost curve for supplying the produce locally might be as shown by S_1S_1 whereas the supply curve of the produce from outside the region is as indicated by S_2S_2 . Thus if DD represents the demand for livestock produce in the region, all livestock produce will be imported. If there is an endemic livestock breed, it will disappear.

INSERT FIGURE 3

Figure 4 illustrates the matter in a more holistic way. Assume that individuals in a region are identical and have the same resources, preferences and production opportunities. Any one individual is representative of all. In Figure 4, the line ABC may represent the production possibilities available to an individual and the indifference curves marked I_1I_1 and I_2I_2 represent individual preferences. In the absence of trade, a mixed production system corresponding to the combination of crop and livestock production at B is ideal. But with the opening up of interregional trade, individuals in this region can engage in exchange, and exchange opportunities represented by the line CEF become available. This indicates that this region has a comparative advantage in crop production. It specialises therefore in crop production and livestock production ceases. Hence, with market development individuals can move to equilibrium, E, and be 'better off'. However, if there is a specialised local breed, it becomes extinct.

INSERT FIGURE 4

FAO (no date) provides a relevant example. It states: "In many areas in Southern Nigeria, rising prices of tree-crops such as cocoa and palm-oil have caused the communities to dispense with their traditional dwarf cattle and goats to concentrate on these profitable crops" (FAO, no date, p.45). These local breeds are in danger of disappearing. This FAO report continues with the following relevant value-laden statement: "This is a perfectly rational medium-term strategy on their part. But it would be short-sighted of the national government to lose the genetic resource these livestock

represent because of a temporary pattern in world trade". It is argued that this loss will reduce economic flexibility in an uncertain world and options should rationally be kept open at the national level by, at least, conserving a portion of this genetic resource.

It has been observed that with the extension of markets and economic development, there is a general switch from multi-purpose breeds to specialised breeds. There may occur for several reasons. One may be the path of development and differentiation of technology ancillary to the different types of specialised produce of special breeds. The technology and knowledge of husbandry needed for efficient milk production from cattle now differs to a considerable extent from that required for efficient beef production. Thus the Swanson-technology driving factor can eliminate multi-purpose breeds.

A second reason may have to do with market development. In a non-exchange subsistence economy, keeping multi-purpose breeds to meet human needs in a balanced way is likely to be an advantage. Market exchange may be absent in such economies because of the social system or because high market-transaction costs make markets uneconomical. But once markets become an economical possibility, pre-existing constraints to specialisation are removed.

This case can be illustrated by Figure 5. Assume that three breeds of cattle A, B and C are available in a local region, and that initially it is a non-exchange economy. For simplicity, assume that all in the region have the same resources and preferences. Their preferences are only for milk and beef. The indifference curves I_1I_1 and I_2I_2 in Figure 5 represent these individual preferences. Production possibilities if breed A only is used,

is represented for each resource-holder by point A in Figure 5. Similarly for breeds B and C.

INSERT FIGURE 5

In the absence of exchange and assuming that mixed herds are not genetically or economically viable (that is, a divisibility problem exists), farmers will maximise their welfare by keeping multi-purpose breed B. A choice of A or C would place them on a lower indifference curve than I_1I_1 . But if exchange became possible with zero (or minor market transaction costs) farmers can gain by specialising in milk or meat production, that is by having a herd either consisting entirely of breed A or breed C. For example, if the exchange line is ADC, they can reach point D on the indifference curve I_2I_2 . Consequently, the multi-purpose breed, B, is eliminated. In fact, in many cases the specialisation goes so far that none of the by-product of one breed is marketed. For example, beef producers in specialised conditions do not also supply milk to markets.

In many developing countries, farming is actually of a semi-subsistence type rather than pure subsistence or entirely non-exchange in nature. In such cases, there are many additional ways by which local breeds disappear as market systems expand. For example, in Asia, breeds of livestock have traditionally been kept for multiple purposes. Cattle and buffalo, for example, provide fertilizer, draught power and at the end of their working life may be sold for meat to obtain cash. In addition, they provide a store of value. But with the extension of market systems, the value of one or more of these functions may be reduced. For example, market extension makes chemical fertilizer available as a substitute for animal manure, the availability of motorised

vehicles, stationary motors, and electricity reduces the demand for animal draught power, and increased competition from other meat supplies may reduce the 'retirement' price of an animal. All these circumstances also reduce the utility of an animal as a store of value. Furthermore, the extension of the cash economy and banking provides an alternative and in many respects, more convenient means to store value. Thus, because of changing economic circumstances fostered by market extension, it may no longer be economical for a farmer to keep a local breed. In addition, the increasing possibility of off-farm work may accelerate the loss of traditional local breeds.

5. Decoupling of Breeds and Animal Husbandry from Local Natural Environments

Modern agricultural technologies tend to decouple agriculture from the surrounding natural environment. This they do partly by the creation of man-made environments for domestic animals such as the provision of artificial housing, regulated water and food supplies for livestock managed under industrial-type farming. But even in the case of less intensive modern agriculture, livestock is much protected as a rule from its surrounding natural environment e.g. via vaccinations and veterinary care, improved pastures. Furthermore, for intensively managed livestock in particular, and intensive poultry production, it is possible that none of the food used comes from the local environment. For instance, there may be a heavy reliance on imported grains and food additives. The environmental decoupling phenomenon is most pronounced for poultry and pigs kept in intensive conditions but can also be important for dairy cattle and beef lot cattle.

This form of animal husbandry seems to have been initially developed in higher income countries. It favours breeds that are highly productive under such conditions and may cause the Swanson genetic-bias factor to develop strongly in their favour. Thus a breed with very little environmental tolerance, say breed I, is likely to be favoured in comparison to a breed with a high degree of environmental tolerance, say breed II. In Figure 6, for example, curve ABC may represent production from species I in relation to a range of environmental conditions and the corresponding curve for breed II might be as indicated by curve DEF. Such curves reflect the biological law of tolerance (Tisdell, 1983). If it is economic by human manipulation to hold environmental conditions at or in the neighbourhood of x_1 , breed I will be favoured and breed II may disappear. Thus a high-yielding risky situation is chosen. Nevertheless, if for some reason, farmers cannot sustain ideal or near ideal environmental conditions for breed I, production from it collapses. In contrast, breed II is more tolerant and robust (cf. Tisdell, 1999, pp.38, 46-47).

INSERT FIGURE 6

From a long-term point of view, it is possible that concentration on high-yielding environmentally-sensitive breeds will create a serious problem for the sustainability of livestock production. There is the problem already mentioned. In addition, it is possible that farmers will lose their ability at some time to manipulate natural environmental conditions. If all environmentally tolerant breeds are lost in the interim, the level of livestock production could collapse.

The decoupled environmental nature of modern animal husbandry has another consequence. It may tend to further widen market competition. It increasingly enables much livestock production to become footloose. Such production is no longer tied necessarily to local environmental conditions and to local food supplies for animals. This footloose tendency is happening increasingly in the broiler industry. To the extent that this raises market competition, it is liable to add to the demise of breeds not ideal for intensive husbandry. It accelerates genetic erosion.

This erosion may now become a major social problem given growing opposition in many higher income countries to industrial animal husbandry, and increasing demand for products from animals kept under more natural conditions, e.g. increased demand for free-range eggs. Many of the breeds best suited for natural conditions may already have been lost or be in danger of being lost. But to some extent, changing consumer tastes in higher income countries could reverse past trends in livestock husbandry in more developed countries. It is not clear, however, that the tendency towards concentration of breeds will be completely offset worldwide, especially given that modern supermarketing of food products puts a high premium on products conforming to regular set standards. Breeds able to deliver standardised products are favoured in such systems.

6. Concluding Remarks

Observe that the article has not tried to address the question of what breeds of domesticated animals should be saved from extinction. This is a large, complex and important topic in itself and cannot be addressed adequately in the space available here. However, the World Conservation Monitoring Center (1992. p.404) states that “a breed

can be conserved (a stock maintained which continues to represent the foundation stock without too much genetic drift or inbreeding) for surprisingly small cost compared with possible economic benefits". Smith (1984) demonstrates that the net economic benefits of conserving livestock breeds can be very great. Nevertheless, it is unlikely to be economical to conserve all breeds and difficult selection choices cannot be avoided (cf. Tisdell, 1990). At the same time, it is clear that human selection given current social mechanisms, including market systems, is unlikely to result in an optimal social choice of breeds to be conserved, if the utility of humankind alone is considered (cf. Perrings et al., 1995).

To conclude: This article argues that the Swanson lock-in or path dependence effect developed by him in relation to species selection is also important in relation to the conservation of breeds of domesticated animals. In fact, it may be even more important at this level than at the species-selection level. It was, however, demonstrated that this is only one contributor to biodiversity loss. In addition to this effect, the extension of market systems is a powerful force for biodiversity loss, especially for the loss of breeds. This is not to deny that the system may result in the development of new breeds better suited for marketing. However, this outcome may merely add to the erosion of existing breeds. The overall result of the extension of markets and economic globalisation appears to be to reduce the number of extant breeds and to reduce biodiversity generally. Worldwide this loss is continuing as market systems penetrate developing countries more deeply.

Swanson (1995a, p.4) claims that the choice of species for use in developing countries (and we can include here breeds of domesticated animals) are heavily influenced by the

choices in more developed countries. On the whole, this seems to be so. Nevertheless, more developed countries have sometimes brought genetic stock from less developed ones to improve their stocks of domesticated animals. There have been some two-way flows. Consider, for example, the development of Brahmin cattle, Brangus cattle and so on in the United States and Australia.

It has also been noted that much development of animal husbandry in recent decades has resulted in its being decoupled from local natural environmental conditions. As a consequence, processes of co-evolution have largely been circumvented. This brings with it new environmental dangers and social problems (Tisdell, 2000). Apart from concerns for animal welfare (and in some cases human health) raised by industrialised animal husbandry systems, they may constitute a time-bomb for the collapse of livestock production. One cannot safely ignore the sustainability consequences of such methods of economic production. Whether or not consumer backlash against such methods will change such trends and result in more varied breeds being conserved is not clear, but it might do this. It might also be observed that hobbyists and enthusiasts in Western countries play a role in conserving rare and endangered breeds, but their role may be marginal. This is probably also true of the conservation of such breeds in protected areas. Nevertheless, these 'aberrations' in self-seeking economic market systems make some positive contribution to the conservation of breeds, and could, therefore, have social merit.

References

- Clark, C. W. (1995) "Scale and Feedback Mechanism in Market Economics". Pp.143-148 in T. M. Swanson (ed.) *The Economics and Ecology of Biodiversity Decline: The Forces Driving Global Change*, Cambridge University Press, Cambridge.
- David, P. A. (1985 "Cleo and the Economics of QWERTY", *American Economic Review*, **75**, 332-337.
- FAO (no date) *Extensive Pastoral Livestock systems: Issues and Options for the Future*. <http://www.fao-kyokai.or.jp/edocuments/docement2.html>
- Genetic Resources Action International (no date) "Biodiversity Threat: The steamroller of modern monoculture and factory farming in sweeping away our crop and domestic livestock diversity, putting future food production at risk". <http://www.grain.org/publications/destruction-documetns-meltdown.cfm>. Accessed 27/09/01.
- Hammond, K. and Leitch, H. W. (1995) "Towards Better Management of Animal Genetic Resources", *World Animal Review*, Nos.84/85, 48-53.
- Myrdal, G. (1956) *On International Economy: Problems and Prospects*, Routledge and Kegan Paul, London.
- Perrings, C., Mäler, K.-G., Folke, C., Holling, C. S. and Jansson, B.-O. (1995) "Introduction: Framing the Problem of Biodiversity Loss". Pp.1-17 in C. Perrings, K.-G. Mäler, C. Folke, C. S. Holling and B.-O. Jansson (eds.) *Biodiversity Loss: Economic and Ecological Issues*, Cambridge University Press, Cambridge.
- Romer, P. (1987) "Growth Based on Increasing Returns due to Specialisation", *American Economic Review*, **77**, 56-62.
- Romer, P. (1990a) "Endogenous Technological Change", *Journal of Political Economy*, **98**, 245-273.

- Romer, P. (1990b) “Are Nonconvexities Important for Understanding Growth?”, *American Economic Review*, **80**(2), 97-103.
- Scherf, B. (1996) *Worldwatch List*, edition 2, FAO, Rome.
- Smith, C. (1984) “Economic Benefits of Conserving Animal Genetic Resources”, *Animal Genetic Resource Information*, **3**, 10-14.
- Svizzero, S. and Tisdell, C. (2001) “Concepts of Competition in Theory and Practice”, *Revista Internazionale de Scienze Economiche e Commerciali*, **47**, 143-162.
- Swanson, T. M. (1994) *The International Regulation of Extinction*, New York University Press, New York.
- Swanson, T. M. (1995a) “Why does Biodiversity Decline? The Analysis of Forces for Global Change”. Pp.109 in T. M. Swanson (ed.) *The Economics and Ecology of Biodiversity Decline: The Forces Driving Global Change*, Cambridge University Press, Cambridge.
- Swanson, T. M. (1995b) “Uniformity in Development and the Decline of Biological Diversity”. Pp.41-54 in T. M. Swanson (ed.) *The Economics and Ecology of Biodiversity Decline: The Forces Driving Global Change*, Cambridge University Press, Cambridge.
- Tisdell, C. A. (1983) “The Biological Law of Tolerance Average Biomass and Production in a Variable Uncontrolled Environment”, *International Journal of Ecology and Environmental Science*, **9**(2), 99-109.
- Tisdell, C. A. (1990) “Economics and the Debate about the Preservation of Species, Crop Varieties and Genetic Diversity”, *Ecological Economics*, **12**, 77-90.
- Tisdell, C. A. (1999) *Biodiversity, Conservation and Sustainable Development*, Edward Elgar, Cheltenham, UK.

Tisdell, C. A. (2000) "Coevolution, Agricultural Practices and Sustainability: Some Major Social and Ecological Issues", *International Journal of Agricultural Resources, Governance and Ecology*, **1**, 6-16.

Tisdell, C. and Seidl, I. (2001) "Niches and Economic Competition: Implications for Economic Efficiency, Growth and Diversity", *Economic Theory, Applications and Issues*, Working Paper No.8, School of Economics, The University of Queensland, Brisbane.

UNDP/CSOPP Documents (no date) "Conserving Indigenous Knowledge"

[Http://www.undp.org/csopp/CSO/NewFiles/dociknowledge2.html](http://www.undp.org/csopp/CSO/NewFiles/dociknowledge2.html). Accessed 27/09/01.

World Conservation Monitoring Centre (1992) *Global Biodiversity: Status of the Earth's Living Resources*, Chapman and Hall, London.

Table 1 Causes of Erosion of Livestock Biodiversity

Factor	Description
Development interventions	Preference given to high-input, high output breeds developed for benign environments. Commercial interest in donor countries promote use of relatively temperate-adapted breeds and create unrealistic expectations in developing countries
Specialisation	Emphasis on a single productive trait, e.g. dairying, leading to exclusion of multi-purpose animals
Genetic Introgression	Crossbreeding and accidental introgression leading to loss of indigenous breeds
Technology	Machinery replaces work animals
Biotechnology	Cryopreservation equipment inadequate to store germplasm of threatened breeds. Artificial insemination and embryo
Political instability	Can eliminate local breeds owned by vulnerable population
Natural disaster	Floods, drought and epizootics preferentially affect remote or isolated human and livestock populations

Adapted from Hammond and Leith (1996) by FAO (no date)

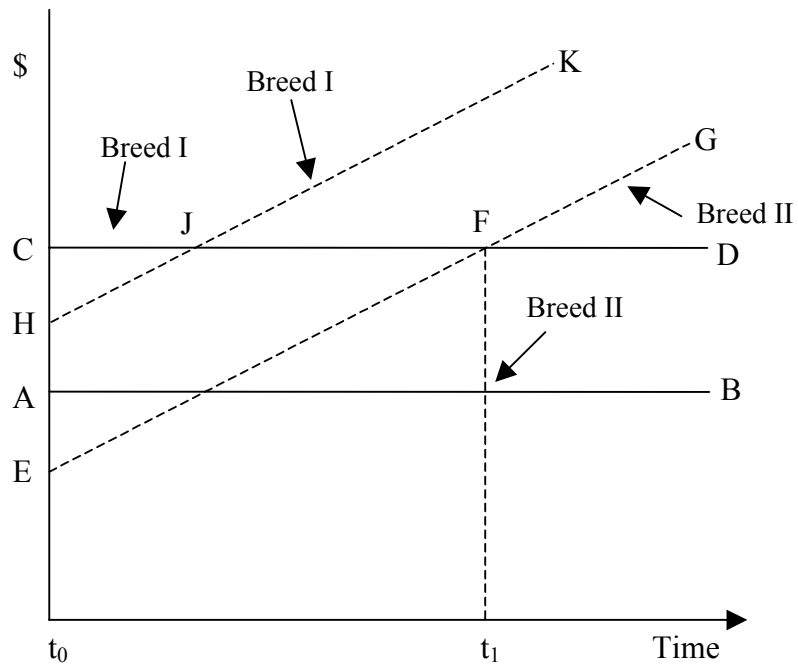


Figure 1 Illustration of the Swanson lock-in effect when applied to choice of breeds.

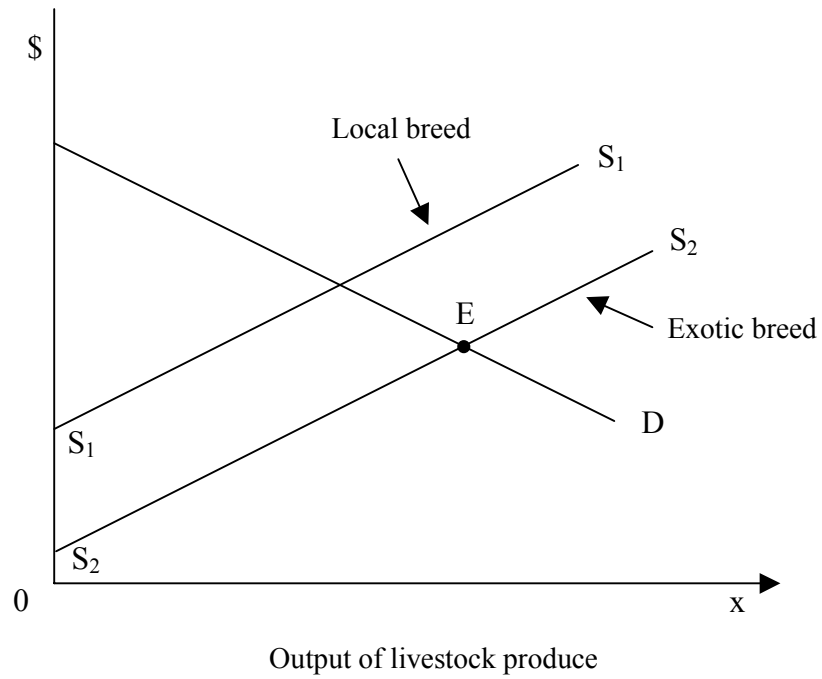


Figure 2 Market systems and global genetic opportunities result in this case in extinction of the local breed.

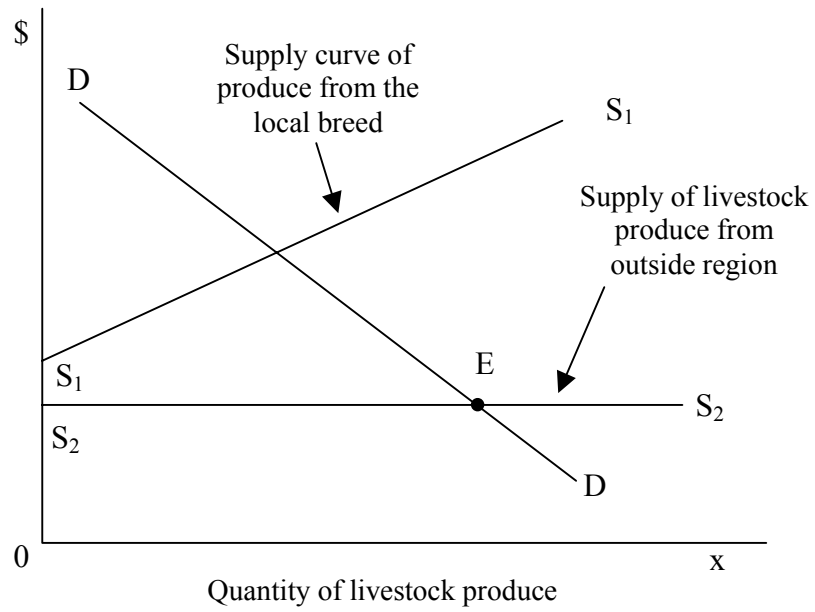


Figure 3 A case in which a local livestock breed is rendered extinct by import of livestock produce.

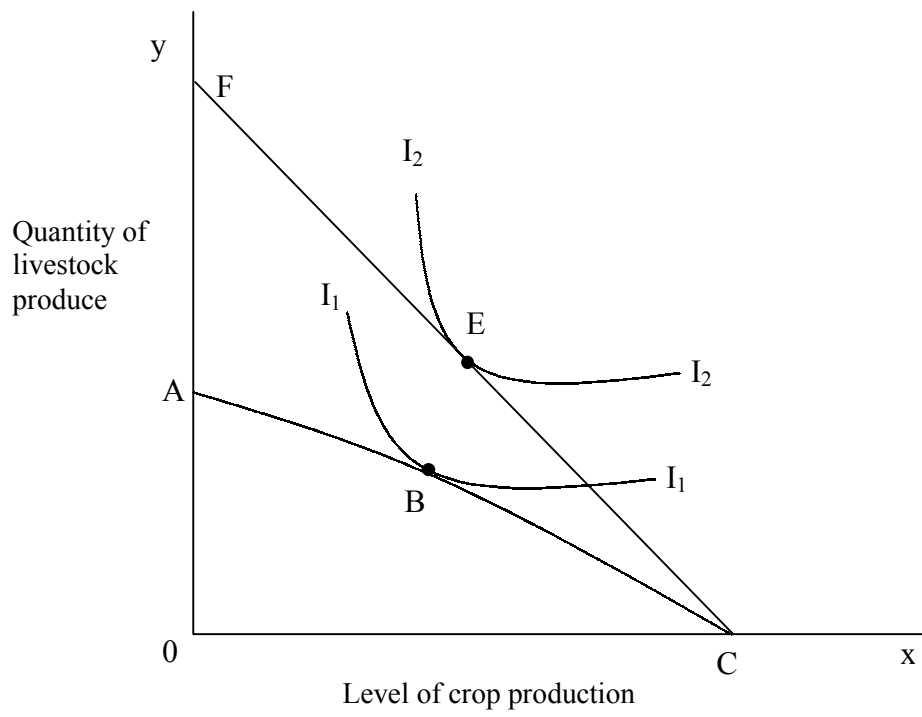


Figure 4 Another case of breed elimination as result of market extension.

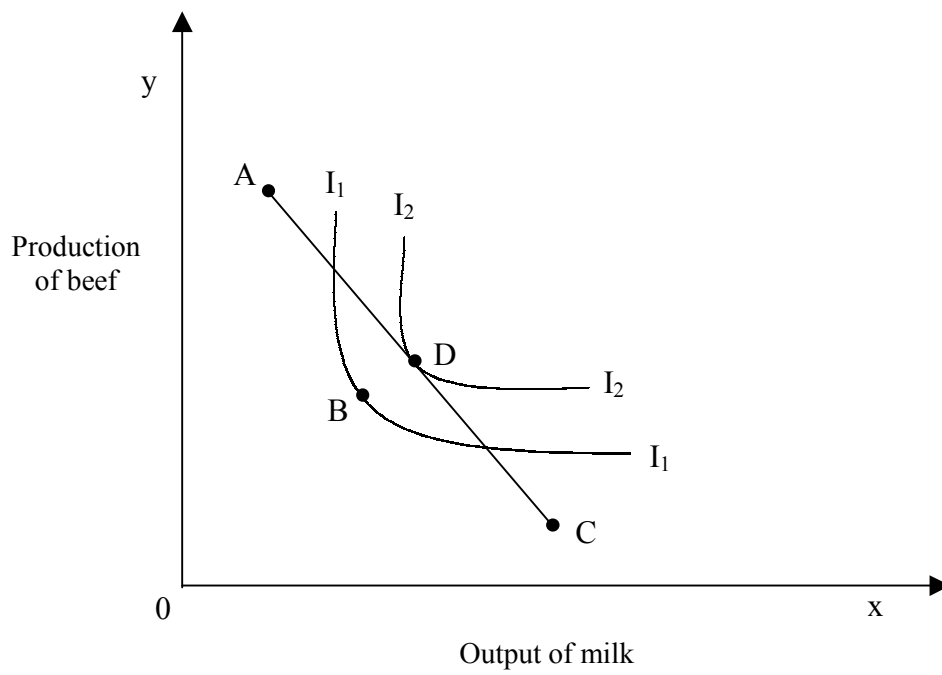


Figure 5 A case in which the creation of markets eliminates multi-purpose breeds

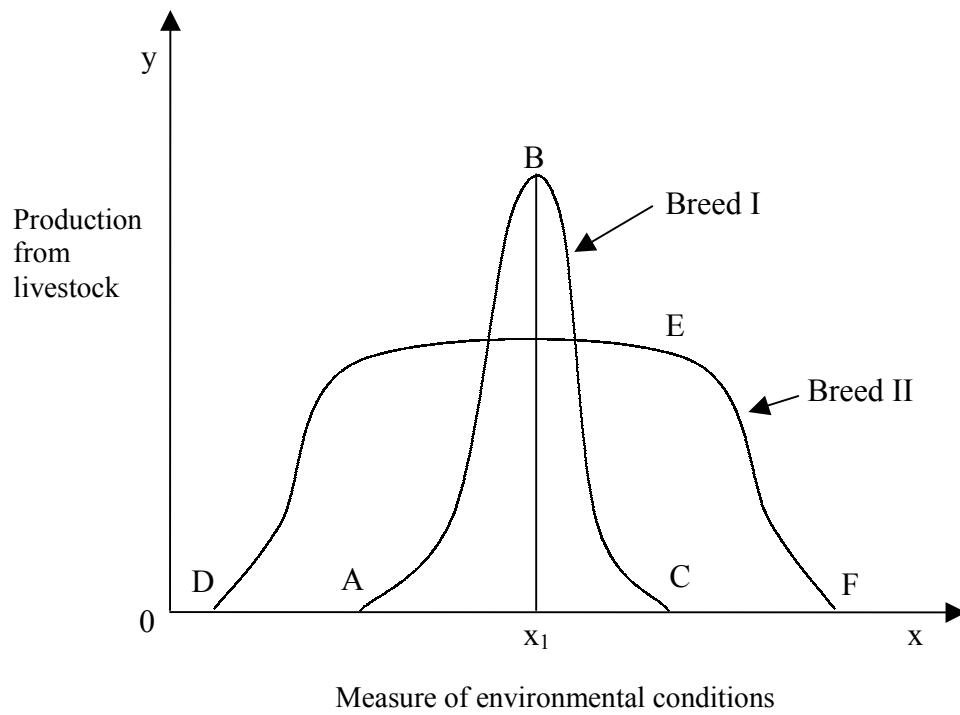


Figure 6 Modern livestock husbandry may favour breeds that are highly productive but show a low degree of environmental tolerance.

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

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

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

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

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

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

SUST	103.2001	<i>Riccardo SCARPA, Simon ANDERSON, Adam DRUCKER and Veronica GOMEZ: <u>Valuing Genetic Resources in Courtyard Economies: The Case of Creole Pig in Yucatan</u></i>
SUST	104.2001	<i>Riccardo SCARPA, E. RUTO, P. KRISTJANSON and M. RADENY: <u>Valuing Genetic Resources in African Livestock: An Empirical Comparison of Stated and Revealed Preference Value Estimates</u></i>
SUST	105.2001	<i>Clemens B.A. WOLLNY: <u>The Need to Conserve Farm Animal Genetic Resources Through Community-Based Management in Africa: Should Policy Makers be Concerned?</u></i>
SUST	106.2001	<i>J.T. KARUGIA, O.A. MWAI, R. KAITHO, Adam G. DRUCKER, C.B.A. WOLLNY and J.E.O. REGE: <u>Economic Analysis of Crossbreeding Programmes in Sub-Saharan Africa: A Conceptual Framework and Kenyan Case Study</u></i>
SUST	107.2001	<i>W. AYALEW, J.M. KING, E. BURNS and B. RISCHKOWSKY: <u>Economic Evaluation of Smallholder Subsistence Livestock Production: Lessons from an Ethiopian Goat Development Program</u></i>
SUST	108.2001	<i>Gianni CICIA, Elisabetta D'ERCOLE and Davide MARINO: <u>Valuing Farm Animal Genetic Resources by Means of Contingent Valuation and a Bio-Economic Model: The Case of the Pentro Horse</u></i>
SUST	109.2001	<i>Clem TISDELL: <u>Socioeconomic Causes of Loss of Animal Genetic Diversity: Analysis and Assessment</u></i>

(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 Autònoma 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.

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

2001 SERIES

MGMT	<i>Corporate Sustainable Management</i> (Editor: Andrea Marsanich)
CLIM	<i>Climate Change Modelling and Policy</i> (Editor: Marzio Galeotti)
PRIV	<i>Privatisation, Antitrust, Regulation</i> (Editor: Bernardo Bortolotti)
KNOW	<i>Knowledge, Technology, Human Capital</i> (Editor: Dino Pinelli)
NRM	<i>Natural Resources Management</i> (Editor: Carlo Giupponi)
SUST	<i>Sustainability Indicators and Environmental Evaluation</i> (Editor: Marialuisa Tamborra)
VOL	<i>Voluntary and International Agreements</i> (Editor: Carlo Carraro)
ETA	<i>Economic Theory and Applications</i> (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:
<input type="checkbox"/> receive the Periodic E-mail Working Papers Bulletin	
<input type="checkbox"/> place a full annual subscription for 2001 (US\$ 250.00/ITL 425,000)	_____
<input type="checkbox"/> 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