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Information as a regulatory instrument to price biodiversity benefits: certification and ecolabeling policy practices

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Abstract. In this paper we address the issue of market failure arising from the non-existence of (market) prices for biodiversity, and also present and discuss alternative policies to cope with it. Particular attention is given to certification and ecolabeling of policies. First, we critically survey the role of certification and ecolabeling as an information provision instrument. Second, we provide a comprehensive view on basic foundations and crucial issues that underpin the design of a certification and ecolabeling policy. Finally, we present some case studies to draw some lessons from current certification and ecolabeling policy practices.

Introduction

Biodiversity can be broadly defined as variety of life on earth. It provides a wide range of benefits to human activities. Most biodiversity benefits have a public good character – showing either non-rivalry, or non-excludability in the consumption. In concrete terms, this means that the one's consumption of a public good does not change the consumption opportunities to the remaining elements of the society. In addition, if one person gets access to or consumes biodiversity benefits, others cannot be excluded from enjoying them. A well-know example of a biodiversity benefits with a public good character is the non-use value of biodiversity, i.e. the benefit that one can derive simply by knowing the that diversity exists regardless of any human use. Consequently, traditional market price mechanisms will have difficulties to express the value of biodiversity benefits. One way to solve this is to ask people directly how much they would be willing to pay for biodiversity benefits to which they have access (see Nunes and Van den Bergh 2001). Unfortunately, individual consumers do not tend truthfully to reveal their willingness to pay. In such circumstances, the policy makers need to agree upon the design and

implementation of an incentive compatible policy instrument, i.e. a policy instrument that induces individual consumers to truthfully reveal their own willingness to pay for biodiversity benefits and this way signaling the demand in the biodiversity segmented market.

In addition, biodiversity benefits also exhibit production and consumption externalities (see Nunes et al. 2001). No market prices exist to really reflect the value of these externalities. As a result, biodiversity externalities are not taken into account in the production and consumption decisions of economic agents. This exclusion hinders the proper functioning of the market mechanism, and therefore will lead to inefficiencies in the allocation of resources in the economy. Such inefficiencies bring about biodiversity quality-degradation, diminishing the ability of our ecosystems to keep up with the rapid progress of economic development. In the long run, such an imbalanced development pattern decreases our well-being (Nunes et al. 2003). In this context, value signaling through certification and ecolabeling can play a crucial role in assisting economic agents to price biodiversity benefits and to internalize them, greasing the wheel of the market mechanism. Hence, the market failure problem can potentially be mitigated. An efficient biodiversity-conservation, which will maintain the balance between our ecosystem's quality and economic development, can then be realized.

This paper presents a discussion and comprehensive survey on the role of certification and ecolabeling in guiding economic agents to value the biodiversity externalities. Certification and ecolabeling is thus seen here as an alternative policy instrument to mitigate the problem of market failure. The next section reviews some government policy instruments dealing with the problem of market failure. Then a more comprehensive review of certification and ecolabeling policy in the domain of biodiversity is given. General ideas will be made concrete with three examples of certification policy. The penultimate section discusses some caveats, after which conclusions are given.

Government policies dealing with the problem of market failure

Direct government intervention: taxes and standards

One possible way of addressing the problem of market failure is through direct government intervention. This involves, for instance, an introduction of taxes or standards in the markets. The best known tax instrument is the optimal or 'Pigouvian' tax, which at the optimal equilibrium is set equal to the marginal social costs caused by the economic activity responsible for the environmental externality. This taxation restores a resource allocation with biodiversity externalities to a social optimum. Such policy requires however, an important amount of accurate information concerning the general public's map of preferences with respect to biodiversity non-market benefits. Such information plays a crucial role in the design of an effective tax system. Thus government

needs to conduct thorough research on the assessment of the economic value of biodiversity non-market benefits. This is a fairly costly activity.

The use of standards, referred to in this paper as 'command-and-control system', is especially attractive from the view point of its effectiveness. This is because the government directly dictates a clear quantity target (restriction) that has to be followed by market participants. In the area of biodiversity and nature conservation, an example of this type of policy is the limitation on the number of visitors to certain natural recreation areas (biodiversity sensitive areas). More recently, the settling of a fixed number of possible bioprospecting market contracts between the state and pharmaceutical industries is another example of this command-and-control policy. These contracts are signed to support the search of genetic codes contained in living organisms that can be used for the development of chemical compounds that have commercial value in agricultural, industrial, or pharmaceutical applications (Simpson et al. 1996). The most noted example of these agreements is the pioneering venture between Merck and Co., the world's largest pharmaceutical firm, and 'Instituto National de Biodiversidad' (INBio) in Costa Rica. At the time of contract signing, in 1991, Merck paid Costa Rica approximately one million dollars and agreed to pay royalties whenever a new commercial product is put into the market.

However, adopting a command-and-control policy also implies embracing high monitoring and enforcement costs. For instance, in the case of bioprospecting contracts, the government – owner of the resource – has to determine the acceptable threshold level of samples of compounds of plant, fungus and bacterial origin in the country that will be submitted to a pharmaceutical screen and which will be reflected in the market agreement. In addition, the government may have to set-up a regulatory body, which monitors the amount of bioprospecting samples that a given pharmaceutical firm has access to and then enforces penalties upon any violation.

In a world of asymmetric information, in which firms do not have an incentive to truthfully reveal their own information, the government may need to regulate and monitor intensely firms' conduct. Environmental auditing could be an example of such a monitoring activity. From an economic point of view, the discussion and evaluation of these two instruments of environmental policy is traditionally done on the basis of their efficiency features (Baumol and Oates 1988). Effectiveness and distribution effects, such as equity and fairness, often work as secondary policy evaluation criteria. The most common comparison is between uniform standards and uniform taxes. Taxes are attractive as they provide better incentives than standards to change individuals' behavior, for example, recreationists' behavior when visiting natural areas. Thus, taxes may lead to a more efficient outcome in term of the social welfare than standards.

Independently of the policy instrument chosen by the government, there are some factors that hinder the effectiveness of its involvement. First, governmental intervention involves high administrative costs because the government

may have to establish a monitoring and enforcement agency. Second, governmental intervention may not be effective if the flow of information between firms and the government is characterized by a strong asymmetry. In fact, the capacity to design an effective government policy is hindered by the presence of information imperfection, in the majority of real-world situations. Finally, such policies may create bureaucratic inefficiency. Bureaucrats may pursue are prone to be influenced by market participants via lobbying activities (see Milgrom 1988). Even if the rent-seeking behavior is absent, direct government involvement may also create a disincentive for market participants to innovate or to employ the most efficient method of production. In this context, a policy instrument based on a market creation mechanism can be a valid alternative to direct government intervention. Policy instruments based on market creation mechanisms are discussed in the following section.

Market creation mechanism: information provision

In the context of biodiversity benefits, policy instruments based on market creation mechanism are characterized by the provision of information with respect to market and non-market biodiversity benefits. In other words, the certification mechanism informs the consumer about the product characteristics that are not directly related to its consumption or use, however provide environmental benefits, including the conservation of the biodiversity. In turn, the provision of such information works under one of two basic conceptual frameworks: ecolabeling and certification. Ecolabeling refers to the policy scheme that is characterized by the evaluation of a product, or product characteristics, against particular specifications. The idea here is to measure and confront specific characteristics attributed to the product's origins to detailed ecological, social and economic specifications. This information is, along with the product, provided to the consumer. Certification refers to the policy scheme that is characterized by an evaluation of the product's underlying management system against particular management specifications. The latter involves the identification and monitoring of the supply chain including the transport and processing of raw materials, secondary manufacturing and, finally, retail distribution. As before, such information is provided to the consumer.

Therefore, the overall objective of ecolabeling and certification policies is to link the consumers who wish to favor more biodiversity or socially responsible sounding products with the producers of these products and the raw materials and processes from which they are made, creating a separated market for these differentiated products. The respective market price will incorporate biodiversity benefits and therefore contribute to a better allocation of biodiversity. In either case, the government is not directly involved in the process. However, it has a crucial role in providing a favorable environment that helps to enhance the effectiveness of a certification and ecolabeling policy. For example, a credible scheme must evaluate the integrity of the producer's claims and the

authenticity of product origin. Furthermore, the evaluation scheme needs to be seen as objective and impartial. Therefore, the success of certification and ecolabeling strategy *per se* may prove to be difficult to achieve. For this reason, this strategy often goes hand-in-hand with other micro-economic policies, giving rise to a 'mixed policy.' This government strategy will be analyzed in the following section.

Mixed policy

The core of this policy strategy is in the combination of direct government involvement (see above) and the market creation mechanism (see above) policies. The goal of this policy is to circumvent the weaknesses and inefficiencies that may occur when adopting either the command-and-control policy or the market mechanism approach.

Mixed policy is characterized by two features. They refer to the establishing of a quantity or quality standard and introducing the possibility of trade among economic agents. The first feature makes sure that an upper limit of biodiversity damages is set at regional or national level. This threshold level is reminiscent of the command and control system. The second feature assures flexibility and efficiency (cost-effectiveness) at the level of individual agents, and leads to equal costs of biodiversity damage reduction at the margin among all individuals and firms. This is because the certified credits can be sold to another participant who needs to satisfy the threshold level with respect to biodiversity damage. This type of trade possibility enhances agents' incentives to conform to the biodiversity damage standard.

This instrument has not yet led to applications in the area of land use, nature conservation and biodiversity protection. An exception is the Dutch bio-label energy system (see below for a more detailed discussion of this policy instrument).

A critical evaluation of certification and ecolabeling instruments

The framework

Certification is an integral part of a policy directed to induce the working of the market mechanism, without direct government involvement in the supply and demand forces. The goal of biodiversity certification policy is to inform consumers that a product has been processed in a production method that is biodiversity sound. Thus, in making their purchasing decisions, consumers will be exposed to a choice between buying biodiversity and non-biodiversity oriented products. If some consumers prefer to buy the former, then the policy maker can effectively segment the market. A new market-niche, i.e. the market for the biodiversity-oriented products, will then emerge. In order to sustain the

biodiversity segmented market the policy maker should enhance the role of this new market-niche. An efficient working of the biodiversity segmented market crucially depends on the flow of information across demand and supply forces. In his seminal article, Akerlof (1970) showed that the presence of an informational problem could lead to a market failure.[1] The latter is, in turn, the cornerstone of any certification and ecolabeling policy instrument. This section critically analyzes the role of certification as an information provision instrument. Figure 1 presents an overview of the structure that will steer our comprehensive discussion and analysis.

The crucial questions to ask here are; to what extent would the certification and ecolabeling policies be successful for creating markets for biodiversity? Would an emerging segment-of-market where biodiversity benefits are internalized in the respective market price be, in fact, an effective tool to stimulate an efficient working of markets related to biodiversity oriented products, and thereby achieve a better allocation of such a scarce resource? Should other policy measures be complemented with this policy? The answers to these questions are discussed in detail in the following sections.

Market and non-market benefits of biodiversity

Our starting point in answering those questions is the identification of the type of the market and non-market biodiversity benefits. What we mean by the non-market biodiversity benefits are the net marginal social-benefits of consuming the goods that are accrue to society and which are not explicitly considered by producers in their strategic decision-making. Alternatively, market biodiversity benefits refer to the benefits that are indirectly related to the use or to the consumption of the good and are taken into account in market price determination. The participation of consumers in markets for these differentiated, biodiversity-oriented products usually permits the internalization of the market values immediately. If consumers internalize the non-market benefits of biodiversity, they are willing to pay for these benefits.[2] Then the question is: can consumers, who purchase the environmentally friendly good, internalize the non-market benefits of the good? If the answer to this question is yes, we can then categorize the good as a *private good*. Otherwise, the good is categorized as a *public good*.

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[1]In the literature we distinguish two types of informational problem, i.e. the hidden information (adverse selection) and hidden action (moral hazard) problem. Hidden information refers to a case in which one party knows more about her true type than the other party before a contract (relationship) is initiated. Hidden action refers to a case in which one party knows more about her type (effort) after a contract (a relationship) is initiated.

[2]The Environmental Protection Agency (EPA 1993) reported that 'several surveys indicate that a majority of Americans consider themselves to be environmentalists and would prefer to buy products with a lessened environmental impact when the quality and costs are comparable.'

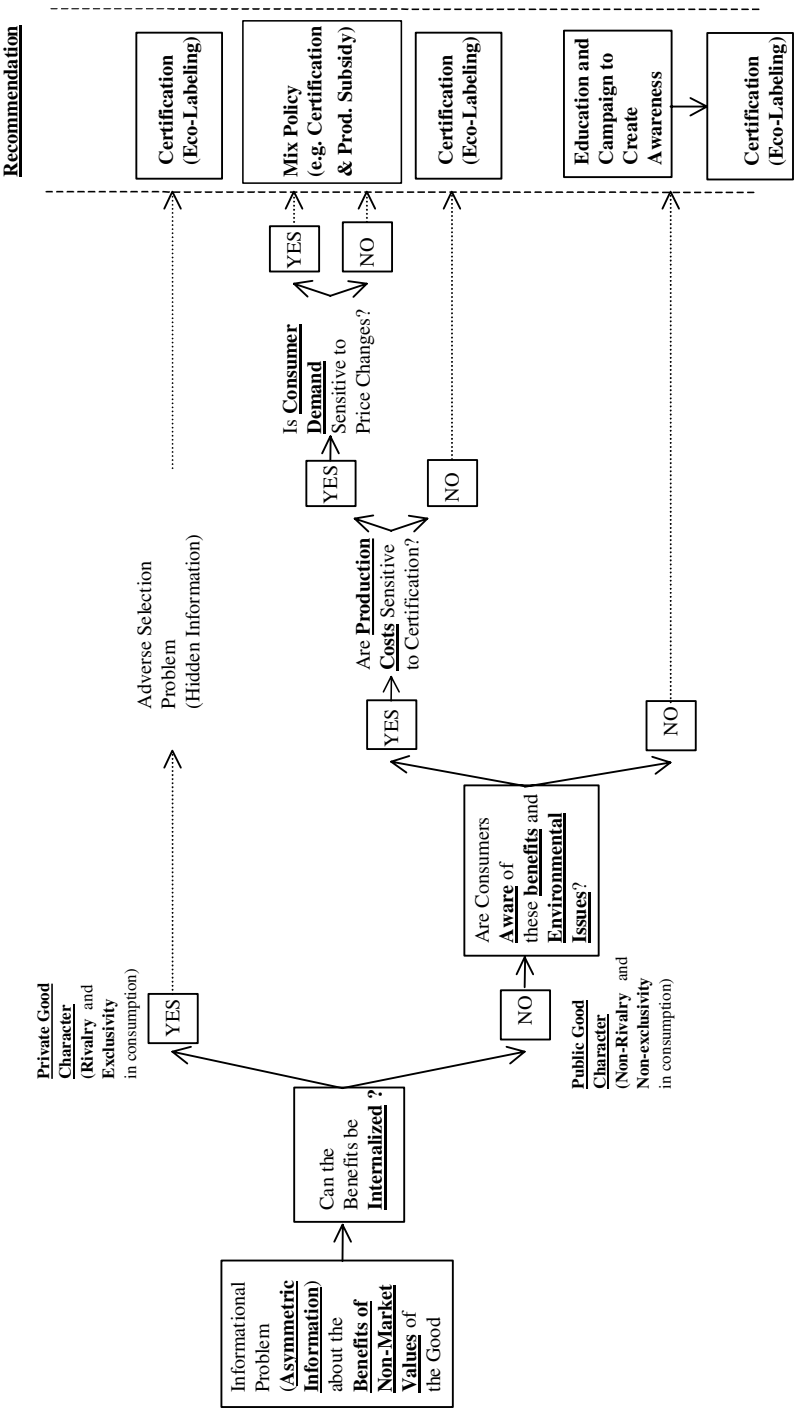

Figure 1. A comprehensive view on the certification and ecolabeling policy.

An organic vegetable product, i.e. a vegetable product that is grown without chemical fertilizers, could be an example of a private good. Consumers may, subjectively or not, believe that there is a difference in taste between an organic and a non-organic vegetable. It is often argued that the organic vegetable tastes better than the non-organic one. Furthermore, consumers may also able to distinguish the two products by looking at their appearance. They also perceive that the organic product is healthier than the non-organic one. Hence in this case, consumers are able to internalize the benefits of consuming the good. They can experience the satisfaction obtained from consuming the good.[3]

Nonetheless, it does not mean that in this situation consumers will not face any further informational problem. The problem remains, since consumers are lacking perfect knowledge of the quality standard of the organic vegetable. A quality standard certification can be helpful in providing assurance to consumers. Here, the role of certification is simple. It acts as an instrument to resolve the standard hidden information problem. The market is also accommodating here, in the sense that if there are enough consumers who want to buy the organic vegetable, then some producers will have an incentive to enroll in this market segment. They have a proper incentive to do so. They also have interest in using certification to try to differentiate themselves from the other producers.

Things become more complicated when the biodiversity benefits have a public good character, in the sense that the biodiversity benefits of consuming the good are experienced by the society at large, which may include those who do not purchase the good. Two examples of such a good are biodiversity-oriented electricity and biodiversity-oriented forest products. Let us take the case of electricity. Recent environmental policies in the electricity sector seem to give unequivocal support to the belief that electricity that is produced using biodiversity friendly processes has a significant, positive social value. However, nobody can internalize the benefits and thereby exclude anybody else from enjoying the benefits. Furthermore, the nature of the biodiversity-oriented electricity products cannot really be physically distinguished from the remaining ones. Making the use of the language of Industrial Organization Theory, electricity is a homogeneous product. The same case applies for the biodiversity-oriented forest products, for instance plywood. Nobody can really distinguish the biodiversity-oriented plywood from the other type plywood by just inspecting the two products. It is therefore harder to design a certification policy in this case than in the previous one.

According to Figure 1, there are three important components that determine the success of the ecolabeling/certification policy. The first refers to the 'consumers' awareness' of the biodiversity protection issues and the social benefits of having a clean environment.

[3](van Ravenswaay 1995, 1996) indeed shows that organic products exhibit a high consumer awareness of the environment and private benefits of these products.

Consumers' awareness

Consumers' awareness is a necessary condition to achieve an efficient certification policy when the biodiversity benefits have public good characteristics. However to be sufficient it should be coupled with consumers' willingness to take into account the social benefits in their consumption behavior. Of course there will be no interest for using biodiversity certification schemes when consumers are not at all aware of the respective biodiversity benefits.

If consumers have no awareness with respect to non-market biodiversity benefits, then there is a crucial and urgent action that has to be taken before the policy makers can launch the certification policy. Consumer awareness may take many years to develop (see van Ravenswaay and Blend 1997). Hence, the policy makers should launch extensive information campaigns, targeting the general public, as well as initiate formal education programs about the values and the benefits of having a clean, and biodiverse environment. Let's imagine a country or a society in which the public is not at all aware about the need to sustain biodiversity and to protect the environment. In such society, there is no use in implementing a certification policy, because it is doomed to fail (see Salim et al. 1997). Once there is sufficient consumer awareness about the biodiversity benefits, environmental friendly products and management processes then there maybe be a willingness to pay a price premium for ecolabeled or certified products. In other words, consumer is a necessary condition for policy design. However, in order to guarantee the success, the policy maker will need also to deal with the nature of marker supply and the nature of consumer demand.

Firms' incentive to endorse certification and ecolabeling policies

In addition to consumers' awareness, the degree of sensitivity of firms' production costs to the adoption of the certification schemes will also play an important role in determining the success of the certification policy in the case of a biodiversity benefits with a public good character. If production costs are not sensitive to certification, then producers may have sufficient incentive to accommodate the certification policy. However, in most cases the adoption of certification and ecolabeling policies will increase a firms' production costs because producers may have to install new production technologies, or may have to avail themselves of certain kind of inputs in order to satisfy the environmental standards that are stipulated in the product 'bio' label – see (van Ravenswaay and Blend 1997) for more details. Therefore, adopting certification implies higher production costs, which force them to increase the price. This, in turn, may damage the firm's market competitiveness. Furthermore, if quantity demanded by the consumer is sufficiently sensitive to changes in prices, then an increase in price means a reduction in the overall quantity demanded that, in turn, is reflected in a reduction in the firm's profits. Hence,

hardly any producers will choose to engage in this new market segment and embrace the market for biodiversity oriented products. There are simply not enough incentives for the market mechanism to work.

In this setting policy makers need to complement (or combine) certification policy instruments with other micro-economic policies aimed at providing enough incentive for producers to adopt certification. Examples of such mix policies are, for instance; an input subsidy, technical assistance provision, and a R&D subsidy.

It is also worth noting that even if production costs are not sensitive to the certification, it does not mean that a certification policy is always advisable. Under marketing or price complementarities between environmental and conventional innovation production lines, a certification or ecolabeling requirement may also stimulate investment in the production technology of the conventional product (see Mattoo and Singh (1994) for more details). This in turn may lead to an increase in the output of the conventional product, thus making the certification policy miss its goal in stimulating biodiversity oriented management practices and respective niche-market. If this prevails, then certification should again be complemented with other policies. In this context, Dosi and Moretto (1998) propose a restriction (rationing), i.e. awarding certificates and ecolabels only to production lines that meet the environmental innovation criteria without increasing investments in the production technology of the conventional product.

Sensitivity of consumer demand to production costs

According to Figure 1, the last crucial component that determines the success of the certification policy in the case of a public biodiversity benefit is the nature of the consumer demand. As previously mentioned, if consumer demand is sufficiently elastic, an increase in price means a reduction in profits. This elasticity depends on the consumers' preference toward biodiversity oriented goods, which in turn depends on the consumers' awareness of issues related to biodiversity non-market benefits. The degree of consumer awareness with respect to biodiversity benefits varies across countries with different socio-economic status. For instance, one would tend to agree that the degree of consumer awareness is lower in the developing countries than in the developed countries.

Since the awareness of biodiversity benefits is generally lower in the developing countries, consumers in these countries tend not to have a high willingness to pay for the biodiversity-oriented products. As a result, while the introduction of an ecolabel or certification scheme raises the production costs, then producers' profits will inevitably decrease. Without any further effort, the certification scheme would probably fail. In order to avoid such failure other policy strategies should be considered. For instance, policy makers can launch a certification and an environmental campaign at the same time. NGOs could

be encouraged to disseminate information that can increase consumer awareness. Alternatively, the government can interfere in the market functioning, directly influencing the supply and demand forces in the biodiversity segmented market.

A command-control policy within the certification and ecolabeling

The government can impose certain restrictions in the segmented market of biodiversity products. For instance the government can require producers to achieve a certain output of biodiversity products and in exchange producers obtain a certificate of compliance. The government can, at the same time, set biodiversity compliance thresholds to consumers. Thus, rather than facilitating the working of market mechanism to sustain the certification and ecolabeling policy, the government directly motivates producers and consumers to embrace the certification and ecolabeling policy. Figure 2 summarizes this idea.

For example, let us consider a scheme in which the number of certificates that can be issued by a seller depends on the quantity that he produces to the biodiversity segmented market. The number of 'biodiversity certificates' that can be issued by a seller depends on its production to the biodiversity segmented market. Therefore, the two markets co-exist, i.e. the market for the conventional product itself and the market for biodiversity-oriented products. If the demand exceeds the supply in the market for biodiversity-oriented products, the producers will be motivated to generate more biodiversity certificates to satisfy the demand. This implies that there will be more production on the biodiversity market segment. The revenue generated from trading bio-certificates compensates for the potential increase in production costs. Of course, one crucial aspect to take into account here is the determination of the 'settlement' price for the bio-certificates. It should be set lower than or equal to the reservation value of the consumers. The magnitude of this reservation value

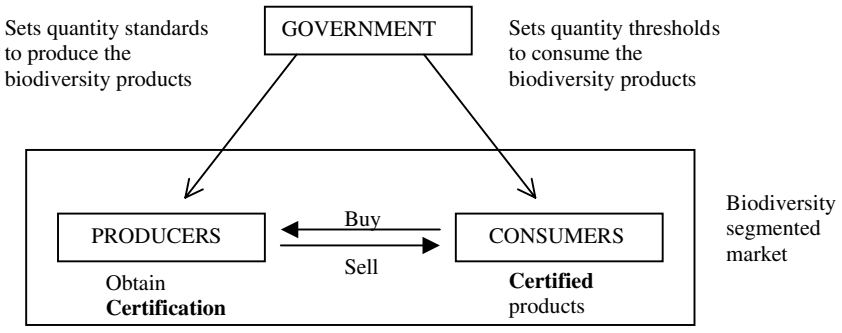

Figure 2. Command and control policy and the certification and ecolabeling.

reflects the higher premium that consumers are willing to pay in order to have access to the products in the biodiversity segmented market.

Intermediate conclusions

It is clear that whenever (i) consumers are aware of the non-market biodiversity benefits, (ii) consumers are able to internalize biodiversity benefits, and (iii) the production costs are not too sensitive to the certification schemes, consumers are willing to pay a price premium and in this context certification policy can be sustained as an instrument for biodiversity conservation. Nevertheless, policy makers should still be concerned with the possibility that the product differentiation created by certification can, under certain conditions, lead to an increase in the demand of both biodiversity oriented market segment and remaining ones. The design of an efficient policy strategy becomes much more complex whenever the biodiversity benefits have a public good character. In this context, consumers are unable to fully internalize biodiversity benefits and thus ecolabeling and certification policy *alone* is likely to fail. Therefore, the design of an efficient policy strategy will involve an additional government intervention. For example, the government can launch extensive information campaigns and provide additional educational programs, aiming at the rising of consumer awareness of biodiversity benefits. It can also extend an input subsidy to induce producers to endorse certification, as well as provide output subsidy for 'bio' products. Finally, the policy maker is also able to make use of certification and ecolabeling policies together with command and control market interventions.

Certification and ecolabeling policy in practice

In order to move away from the general level of discussion, some illustrations are presented in which the aspects viewed in Section 'a critical evaluation of certification and ecolabeling instruments' come together. These are no means exhaustive. Our purpose here is to draw some lessons of experience from the current practices of certification policy.

Organic food and labeling in the Netherlands[4]

The European Common Agriculture Policy aims at, *inter alia*, the reduction of the environmental impact of agriculture, and reinforcing the path towards sustainable development practices, such as organic farming and integrated crop management. In the last decade all European countries have experienced

[4]See (van der Grijp and den Hond 1999) and van Bellegem et al. (1999) for more details.

growth in the number of organic farms. There are, however, considerable variations among European countries. In general, European Countries can be distinguished in terms of their organic farm development into four groups, namely: (a) booming countries (Denmark, Finland and Italy); (b) stabilizing countries (Austria, Germany and Sweden); (c) high potential countries (Greece, Ireland, Norway, Portugal and Spain), and (d) lagging behind countries (Belgium, France, Luxembourg, the Netherlands and UK). These differences are associated with a wide range of factors, such as the diversity of national labor markets, the variation in consumer awareness with respect to ecological issues, the distinct direct government interventions to influence market supply and demand forces, and various labeling and certification strategies for the organic products. The latter implies the use of clear and accurate information on the organic status of products.[5] In the Netherlands, for example, it has been suggested that the diverse, fragmented and often unclear set of certification schemes for organic products created much confusion and skepticism among consumers and this can explain why the Netherlands is one of the countries lagging behind in organic food production.

As mentioned earlier, the capacity to distinguish organic products plays an important role in creating markets for biodiversity. Unfortunately, in the Netherlands this capacity is hindered by the fact that there are in general too many logos. This calls for a further standardization policy. Such a policy should also resolve the question of who should be given the right to standardize.

Another obstacle for the creation of markets for biodiversity is the fact that in the Netherlands most agricultural products are sold loose or are only packed late in the commercial chain. Take, for instance, fruit and meat products. For the creation of an efficient market, it is desirable that a reliable chain of products should be established. This can actually be achieved by individual, separate sales firms for organic products (organic butchers and health food stores) and by a clear, uniform and transparent labeling system under the principles and guidelines of an accredited, independent third party authority. This third party authority should be responsible for assessing the different food retailers' (e.g. supermarket chains) efforts to separate product streams so as to create a distinguishable product for the consumer. Furthermore, the prospect of achieving a successful organic market creation will increase if a clear, uniform and transparent labeling system goes hand-in-hand with fiscal and environmental micro-economic policies.

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[5]For example, when a product has fulfilled a full standard requirement, i.e. a requirement stipulating that at least 95% of the ingredients of this product are certified organic in nature, the product may then be labeled as a certified-organic product. Alternatively, if less than 95% but not less than 70% of the ingredients of a product are of certified organic origin, the product will be called a *product made with organic ingredients*. The proportion of each organic ingredient will be clearly stated. Finally, if less than 70% of the ingredients are of certified organic origin, such a product cannot be called an organic product (IFOAM 2000).

Energy market and certification: the Dutch bio-label system [6]

In the Netherlands, a system similar to the bio-certificate system was introduced starting in January 1998. The aim of the system was to increase the Dutch consumption of renewable energy to 10% of the total energy consumption by 2020, and also to induce producers to increase the production of the renewable energy products.[7] There are two phases of implementation. In the first phase, the sale of the bio-labels to consumers is based on voluntary purchase at a premium price. In the second phase, which started from the year 2001, the sale is determined by a minimum quota of renewable energy consumption.

In this system, renewable energy producers receive a bio-label for each 10,000 kW h of renewable electricity they produce, which is valid for 1 year. Thus, there is no possibility of inter-temporal fulfillment of the quota. The renewable electricity is sold to the same market as the non-renewable one. Thus, their price is the same. To compensate producers for keeping the selling price constant despite the higher production costs, the consumers are requested to attain a minimum quota of renewable energy consumption and producers are allowed to collect the revenues from selling the certificate that demonstrates that each household in complying the minimum quota with respect to the consumption of renewable energy. As the system was recently started, it is hard to evaluate its performance. Thus, it remains to be seen how successful the system will be in inducing production and investment in renewable energy products. Nevertheless, it should be noted that the design of the system is quite ingenious. It *limits* the direct role of the government, and allows the market mechanism to contribute in achieving the biodiversity goals. Furthermore, it will be less costly for the government, as the government can then reduce the government spending on input and R&D subsidies.

Nevertheless, there are two main obstacles for the proper working of the system, namely the credibility of the system, i.e. the settlement of the minimum quota and the determination of the price-ceiling for the certificates, i.e. the highest price consumers are willing to pay for the bio-label. The government should ensure that those who do not comply with the minimum level of consumption with respect to of renewable energy be sufficiently penalized. For instance, if consumers and distributors cannot fulfill the quota, then they are required to pay a non-compliance fee or to bio-labels at a higher price.

The price-ceiling is easier to be determined if the government knows the consumers' reservation value for the bio-labels. Unfortunately, this reservation value is private information of individual consumers. If the price-ceiling is set too low, then there will not be enough incentive for producers to invest in

[6]See Nielsen and Jeppesen (2000) for a detailed review.

[7]The production of renewable energy is costlier than the production of non-renewable energy, hence increasing the production of renewable energy implies increasing production costs for the producers.

renewable energy products. However, if it is set too high, consumers will not find it individually rational to buy bio-labels, and if they are required to purchase the bio-labels anyway, then consumers will be worse off.[8]

Timber market and certification: the Indonesian case[9]

A timber certification is a process that results in a written statement attesting the origin of the woods and its status and qualifications. This certification typically includes two main components: (a) The forest management system certification, and (b) the timber product certification. The forest management system certification covers forest inventory, management planning, harvesting, road construction and other related activities, as well as the environmental, economic and social aspects of forest activities. The timber product certification can be used to validate any type of environmental claim made by a producer, and to provide objectively stated facts about the market system, the timber products and their forest of origin. These facts are normally not disclosed by the producer or manufacturer (Barron 1994; Baharuddin 2001).

The main focus of a timber certification policy is based on the standard of forest management as well as on broader environmental credentials. The later includes certification of environmental process-related issues such as plant pollution conditions, energy use, transport, disposal methods, etc. For instance, the content of the re-cycled or wastepaper used or the processes used to manufacture the product (e.g. whether the product is chlorine-free) are of interest. This last aspect is of crucial importance particularly for the pulp and paper industry, which represents a significant share of revenue within the timber industry activities. Furthermore, regulations are increasingly being introduced for packing and packaging, specifying the type of material that may be used and re-used, together with specific recycling materials as well as systems of recovery or return that must be followed (Bourke 2000a, b).

In an international context, two different schemes of timber certification emerge. On the one hand, there are the principles, guidelines and criteria for accreditation set by the Forest Stewardship Council (FSC) system (e.g. SGS Qualifor, SCS, Rainforest Alliance, Soil Association). On the other hand, there is the International Organization for Standardization (ISO) system and its 1400 series standards relating to environmental management tools and systems to measure a company's practices. There is a consensus that these schemes

[8]One can actually apply valuation methods in order to retrieve individuals' preferences and willingness to pay. There are two groups of valuation methods: revealed and stated preference methods (Braden and Kolstad 1991; Garrod and Willis 1999). Revealed preference methods use existing market data to retrieve individuals' preferences for biodiversity benefits whereas stated preference methods are based on collecting data by means of questionnaires (Carson et al. 1992; Nunes 2002). The latter are often supported by multidisciplinary research teams in order to describe and present accurately the environmental good under consideration.

[9]For a complete account of the study see Salim et al. (1997).

complement each other. However, FCS is largely supported by NGOs whereas ISO accreditation is perceived to be heavily influenced by the industrialist lobby. In the Indonesian context, it is very important that a reliable certification scheme need to issued by a third party in order to avoid widespread documented corruption in the sector. The FSC has recently reported that about 17.7 million ha (FSC 2000). This represents about 0.5% of the world's forest area. Little of this relates to tropical areas. As a matter of fact, about 86% of the certified area is in temperate countries, largely Europe and North America. In addition, a new European certification process, the Pan-European Forest Certification Framework, has been launched with governing bodies established in countries like Austria, Belgium, Czech Republic, France, Finland, Ireland, Norway, Portugal, Spain, Sweden and Switzerland. In addition Southeast Asian countries[10] have established a national set of criteria for the auditing of forest management on logging concessions, as well as the ecolabeling of products of those concessions in light of the International Tropical Timber Organization guidelines.

For the sake of its extensive experience in the area of forest management and regulation, it may be useful to discuss in more detail the experience of the Indonesian timber industry and certification. Indonesia has benefited by the rapid growth of the forestry sector. This sector contributed US$ 2 billions in earnings during the 1980s and US$ 9 billion in 1994. Such a massive contribution puts the Indonesian forests under considerable heavy pressure. Recognizing these pressing problems, the Ministry of Forestry took several measures, including the initiative to create an Ecolabeling Working Group. This task force played a crucial role in the design of a set of criteria and indicators of sustainable forest management and in establishing the Indonesian Ecolabeling Institute. It is a consultative, objective and independent third party authority that is designed to allow producers to measure their management practices against standards and to demonstrate compliance with those standards. Today, after almost a decade of timber certification, the balance shows that the success of certified timber policies was particularly strong among specific timber products, the niche markets. For example, a timber commodity such as plywood, representing 70% of all Indonesia's forestry exports, has received very little eco-market attention. This fact has been justified by the concern of forest managers and forest stakeholders, who often assume that certification programs create obstacles to the trade since firms' additional costs will damage their position in international competition ranking. In addition, the demand for certified timber seems to be strongest in eco-sensitive countries such as Germany and the Netherlands and virtually non-existent in countries such as Japan and Korea. The latter constitute the main commercial partners of Indonesian forestry products, leaving only a small percentage of exports for eco-sensitive countries.

[10]Indonesia, Malaysia and China represent 75% of the forest products exports among the developing countries that, in turn, represent 15% of the world trade of forest products.

Some caveats

This section briefly covers some caveats of the certification and ecolabeling policies that deserve further attention. First, it is important to find a clear, concise and trustfully criteria, which are underpinning the definition of certification and ecolabeling policy practices. In this respect, there should be a consensus on the common schemes to be adopted. Too many criteria create confusion for consumers, and in turn it may affect the credibility of the certification policy. Related to this, the questions of which institution should have the authority to set the common standard and at what level (i.e. regional, national, or international) this institution should be are crucial. Finally, and admitting that a common standard will be set at an international level, there should be a good coordination of certification policy between the institution which sets the standard and WTO. One of the commonly cited issues concerning the setting up of a common international scheme is the feasibility of what is commonly called *cradle to the grave* certification. This type of policy subjects products to a thorough evaluation including production and processing methods (FAO 1995). This type of certification policy is often seen as an intangible barrier to enter to the international market for developing countries' products. Hence, special attention is required so as to avoid using certification and ecolabeling policy as a barrier to the free-trade policy campaign of the WTO.

Concluding remarks

This paper provides a common ground for discussions on issues related to the use of information as a regulatory instrument for policy management. In particular, we focused attention on certification and ecolabeling policy practices dealing with the problem of market failure caused by the inexistence of prices for biodiversity non-market benefits. The complexity of the range of biodiversity benefits and the wide range of possible policy strategies constitute the basis for the proposed comprehensive view on the certification and ecolabeling policy. We conclude that the success of certification and ecolabeling as a policy instrument depends on the nature of some crucial factors, including the ability of the proposed policy instrument to internalize externalities caused by the inexistence of market prices for biodiversity benefits. The success of such an internalization attempt depends on, first, the public good nature of the non-market biodiversity benefits, second, on the application of appropriate economic valuation methodologies to assess the monetary magnitude of the non-market biodiversity benefits, and, finally, on the characteristics of the market supply and demand mechanism. The latter include, for example, the level of consumers' awareness with respect to biodiversity-sound products and producers' propensity to embrace the certification and ecolabeling scheme.

In addition, we also stress that in some situations the certification and ecolabeling policy *alone* is not sufficient instrument to price biodiversity benefits. Indeed, mixed policies strategies such as, an example, the Dutch bioenergy certificate system, which involves a certification and direct government intervention in the supply or demand forces. Moreover, and observing closely the Indonesian's forest certification setting, one realizes that it is imperative to bring national initiatives closer together, to encourage an international common ground for certification and ecolabeling, and to avoid using such a policy instrument for the encouragement of unfair international trade practices.

Finally, it is also important to have a certification and ecolabeling policies that are sufficiently flexible to allow mutual recognition among countries, as well as meeting the demand of weak sensitive markets, remembering each country's unique environment and cultural characteristics.

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