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Can Ecolabeling Mitigate Market Failures? An Analysis Applied to Agro-food Products

Douadia Bougherara¹ and Gilles Grolleau¹

Because of their economic properties, environmental characteristics embedded in products are frequently not provided at an efficient level. The “invisible hand” of free markets fails to provide them at a Pareto optimum, notably because they are public goods and credence attributes. In the literature, ecolabeling is frequently proposed as a market-linked tool addressing the asymmetrical information problem by conveying information to consumers on products’ environmental impacts. However, ecolabels also face two other problems capable of disrupting the market mechanism: the limited abilities of consumers to process increasing flows of information, and the public nature of environmental characteristics. Our contribution extends the analysis by considering the ecolabel as a way to simultaneously overcome information asymmetry, informational overload, and public goods problems.

The first section of our paper shows how environmental attributes turn out to be a source of market failures. Because of their credence properties, environmental attributes may lead to adverse selection. Adding complex environmental information on products may exacerbate informational overload. The public goods properties of environmental characteristics may entail problems of free riding and assurance. These obstacles can partially explain why declared willingness to pay does not necessarily correspond to effective purchases. In the second section, we analyze how market failures may be mitigated by emphasizing private benefits, providing accurate and credible information, adding attributes verifiable by consumers and used as proxies for credence attributes, and designing the ecolabel as a cognitive support for consumers. In the third section, we provide a qualitative study of several existing ecolabels on agro-food products to stress how to a greater or lesser degree they succeed in simultaneously attenuating these several sources of market failures.

Environmental Attributes of Agro-food Products: A Source of Market Failures

Eco-labeling can provide the missing market information about production process attributes and be used as a mechanism revealing consumer valuation of environmental attributes of agricultural commodities (Moon et al., 2002, p. 88).

Ecolabeling is frequently considered as a way to overcome the market failure resulting from asymmetrical information between the producer and the consumer. But this view seems restrictive, because marketing of ecofriendly agro-food products generates other market failures that also determine the success of ecolabeling schemes.

Asymmetrical information between producers and consumers

Environmental characteristics of agro-food products correspond notably to impacts of farming and processing practices in environmental areas such as water, soil, air, and biodiversity, which are dissociated from product consumption. These environmental attributes frequently are credence goods according to the typology of Nelson (1970) and Darby and Karni (1973). The economics of information classifies goods or attributes into three categories. For *search attributes*, consumers can get the information on quality before purchase just by inspecting the product. For *experience attributes*, consumers get the information only after purchase. *Credence attributes*, in contrast, cannot be accurately evaluated even after purchase or consumption. In most cases, credence attributes are well known by the producers, but are hidden from consumers. Frequently the most cost-effective way is to give credence to a third-party assessment, e.g., an eco seal of approval that constitutes a proxy, instead of having to get information by more direct means. Credence costs are the costs of

¹UMR INRA-ENESAD, Rural Economics and Sociology, 26 Bd Dr Petitjean, BP 87999 21079 Dijon Cedex, France. Corresponding author is D. Bougherara (d.bougherara@enesad.inra.fr)

getting the proxy, which allows consumers to give credence to the seller's promise.

This informational asymmetry leads to adverse selection. Adverse selection corresponds to hidden information, e.g., the environmental characteristics are already determined, but producers can cheat by providing false information (Akerlof, 1970). If consumers are unable to check environmental characteristics, fraudulent sellers can market bad products with a green image. Fraudulent sellers want to capture the premium that consumers are willing to pay for environmental attributes. But purchasers anticipate sellers' temptation to cheat and then reduce their willingness to pay for environmental friendly products. Ultimately, this situation can lead to the elimination of true ecofriendly products.

Informational overload as a source of market failure

Informational asymmetry corresponds to an unequal partition of information between two agents that allows the better-informed agent, typically the seller, to profit from his advantage, whereas informational overload arises because of limited cognitive abilities of agents. Even in a world characterized by symmetrical information, agents can be overwhelmed by increasing flows of information, and their attention becomes the scarcest resource. H. Simon, quoted by Varian (1995), stresses the need for a switch from an "economy of information" to an "economy of attention":

What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention, and a need to allocate that attention efficiently among the overabundance of information sources that might consume it.

This situation requires more than solving an asymmetrical information situation, that is, providing accurate and credible information. In a first approach, competition for consumers' attention arises in a rich informational context, because the label itself provides too much information or because of competition between several sources capable of capturing consumers' attention, such as other labels or the store environment. New information and communication technologies reinforce this situation by providing "huge amounts of information, but most seekers of information face constraints that are tight enough for them to rely mainly on sources with an established reputation for credibility" (Andersson, 2002, p. 716).

For example, In a well-documented study on different kinds of ecolabels, Wynne (1994) shows that environmental "report cards" establish symmetrical but useless information because of information overload and technical inability of consumers to process it. (An example of an environmental report card is Green Cross in the US, which provides a detailed graphical information about performance and environmental impacts of the product, based on a cradle-to-grave study of the product, without value judgement. The report card resembles a nutritional label and aims at allowing the purchaser to compare the environmental burden of one product relative to another.)

Environmental characteristics of agro-food products are public goods

The environmental improvement (or degradation) generated by the environmental characteristics of ecofriendly (conventional) products frequently has properties of public goods. Indeed, the consumption of such attributes by an individual A does not reduce the quantity available for another individual B (non-rivalry), and when these characteristics are produced, it is almost impossible to prevent someone from consuming them (nonexcludability). These two features imply that the purchase of ecofriendly products does not guarantee to the purchasers an exclusive utility from the environmental improvements generated by their purchases. Frequently, it is not feasible to exclude those who do not consume ecofriendly products, such as those produced without degrading air quality, from the benefits generated by environmentally conscious purchasers. Moreover, environmental benefits may be intangible. Environmental impacts are often global, and consumer verification of the impacts is impossible, for example the state of the ozone layer. Other environmental characteristics become tangible only after a long time, longer than a typical consumer's life expectancy, for example the exhaustion of natural resources. Moreover, individual consumers frequently cannot evaluate the real benefits of their contribution. Consequently, public goods lead to a misallocation of scarce resources because the decision-making process does not take into account all the costs. However, we recognize that some environmental characteristics can provide private benefits, such as less consumption of energy during the consumption phase, longer durability, less packaging, and lower pesticides residues in food products.

In the following sections, we consider environmental characteristics that have public properties. The private production of these environmental characteristics can generate two distinct problems:

The free riding problem: Since the good is available to everybody, the free riders consume it without providing a contribution corresponding to their consumption. This problem is well documented, and the presumption of neoclassical economics is that the public good will be under-provided by private and decentralized markets.

The assurance problem: In this case, the agent does not contribute to the production of a public good because he believes that the good will not be produced anyway. Indeed, the production of certain public goods requires a minimum contribution. If these contributions are insufficient, the good will not be produced and the individual will think he has squandered his contribution, corresponding to the “sucker” payoff (Schmidtz, 1991). For example, a consumer can renounce purchasing an ecofriendly agro-food product that preserves ground water because he is convinced that his sole contribution is too weak to induce a perceptible environmental improvement in ground water quality. Consumers are willing to contribute if they are convinced that an adequate threshold of contributions will be reached. Note that the free riding situation arises because of opportunistic behavior, while the assurance problem does not presuppose that agents are self-interested.

There are then three sources of market failure. Between consumers and sellers, there is a two-sided informational asymmetry. Consumers face a multi-sided situation because of the free riding behavior and the assurance problem among themselves. Lastly, an informational overload can lead to the need to allocate consumers’ attention.

How Could Ecolabeling Contribute to Mitigating Market Failures?

Ecolabeling was originally proposed as a voluntary market-linked tool for addressing market failures resulting from environmental characteristics of products. But at the same time ecolabels need to mitigate the other causes of market failures previously identified, namely the problems generated by public good and informational overload. To overcome these barriers, we propose to design ecolabels as a mix of solutions to each of the previous market failures. We

select some solutions, frequently quoted in theoretical and empirical literature.

Providing accurate and credible information by third party certification

It is well known that producers suffer from a credibility deficit about the environmental information of their products. To solve the adverse selection and cognitive problems generated by credence attributes, participation of credible third parties is generally necessary to manage three things: 1) the definition of an ecofriendly food product, i.e., the criteria allowing use of the ecolabel; 2) the monitoring of previously defined criteria to check product conformity with the specifications according to a previously elaborated procedure; and 3) the efficient signaling of an ecofriendly product (Grolleau and BenAbid, 2001). An efficient signal allows consumers to distinguish true ecofriendly products from conventional ones (and possibly to rank them by levels of ecofriendliness) at a non-prohibitive cost, i.e., to get a separating equilibrium. Indeed, in some circumstances, the transaction costs can be excessive and swallow up consumers’ willingness to pay a premium, which in their decision-making was intended to cover the ecofriendly product’s higher production costs. Generally, this signal is a third-party certified ecolabel (Caswell and Modjuszka, 1996).

Designing the ecolabel as a cognitive support for consumers

In an environment overloaded with information, the success of an ecolabel depends on its ability to capture the consumer’s attention rather than only providing factual, correct and complete information unprocessable by consumers (Grolleau and Ben Abid, 2001). This cognitive support can be “markers and knowledge summaries” capable of capturing the consumer’s attention without requiring excessive transaction costs (Valceschini, 2000). Barzel (1982) argues that people will use proxies “because the alternative is more costly.” Doussan (1998) provides anecdotal evidence that a direct measurement of environmental impacts of farming can require excessive transaction costs. Indeed, a direct measurement of environmental characteristics can require a “sworn inspector monitoring continuously the farmer in each field, with all technical means capable of verifying specific environmental data” (Doussan, 1998). Instead of spending excessive money in direct measurement, the consumer searches for a cognitive support, such as an ecoseal of approval, that synthesizes

the previous conditions.

Understanding the limited abilities of consumers can help ecolabel designers realize that the success of ecolabeling requires both capturing attention and providing an informational summary. Some empirical studies argue that effectiveness of capturing the consumer's attention depends more on the reputation and status of the third party than on a precise knowledge of the methods of its intervention. For example, the use of names and logos of well-known environmental associations such as WWF and Green Peace increases the visibility as well as credibility of green claims (Leubuscher et al., 1998).

Reducing free riding by emphasizing private benefits

In the real world, it seems that people may contribute to public goods at levels that exceed the predictions of the neoclassical theory (charity, donations, etc). Several explanations have been provided, such as the "warm glow" concept, that is, the increased utility from the act of giving rather than receiving (Andreoni, 1990), or the "Veblen effect," for which consumption may be conspicuous, thereby having a status value (Leibenstein, 1950). A solution to the assurance problem is "assurance contracts," defined as contractual agreements that contribute to a collective good project (Schmidt, 1991). These contracts guarantee to all parties that their contributions will not be wasted, for example by money-back guarantees, if the collective good is financially under-supported.

A solution to the public good problems is to add and emphasize private benefits, such as health or taste, to the collective benefits of preserving the environment (Grolleau and Caswell, 2003), as some environmental labels for green food products already do. This association between environmental attributes of goods and private ones can come from labeling, but may also already exist in the consumer's mind. Intuitively, we understand that low-chemical production (fertilizers and pesticides) may result in low pesticide residues in food, although it is not scientifically supported. For example, the purchase of organic products seems more motivated by self-benefits, that is, safer products, rather than public environmental benefits, which constitute a secondary driver. By associating private benefits with public ones, ecolabel designers can reduce free riding and the assurance problem by creating excludability. The market switches to a quasi-conventional one with private

goods, where environmental attributes are provided as additional public benefits. The purchase driver remains conventional private benefits, and environmental attributes are bundled in the product. People are willing to purchase ecofriendly products not only for themselves, but also because they primarily enjoy the private attributes resulting from environmentally friendly production. For example, Moon et al. (2002, p. 96) show that "respondents who are more concerned about food safety associated with vegetables are more likely to be willing to pay a premium for the environmental attributes of agricultural products."

Many consumers expect that food products from an ecofriendly process will taste better than conventional products. According to several experimental studies (Deliza et al., 1999; Johansson et al., 1999), provision of information about environmental impacts of farming methods influences the quality perceived by consumers. For example, a perceived better taste allows consumers to mitigate the free riding and assurance situations by emphasizing private benefits, to attenuate information asymmetry because consumers infer, or at least do not invalidate, the achievement of an ecofriendly process, and to reduce information overload by focusing consumers' attention on a conventional dimension of food quality.

Marketers and designers of ecolabels will try simultaneously to switch from focusing mainly on public attributes to emphasizing private ones, and from credence attributes to proxies perceived as search or experience attributes by consumers. Examples of these strategies are provided in the following section, where we show how several ecolabels attempt to take into account these potential sources of market failures.

How Do Existing Ecolabels Alleviate the Problems of Supplying Environmental Characteristics?

We proposed to design ecolabels that mitigate the problems analyzed in the previous sections. Existing ecolabels have often focused on ways to overcome some of the following problems: asymmetrical information, informational overload, and public good problems. Some ecolabels help alleviate one problem, while others simultaneously mitigate two or three. The International Standard Organization (ISO) distinguishes three types of ecolabels according to the presence or absence of third party verification and the

type of characteristics certified (Table 1). We follow this classification to analyze how each type of ecolabel can mitigate market failures.

Type I ecolabeling

In the late 1970s, several countries and groups of countries set up ecolabeling programs (Type I ecolabels, Table 2) aiming both at encouraging the supply of ecofriendly products as well as enabling consumers to express their preferences for these products. Thus, they were first designed to mitigate the informational asymmetry. A logo identifies products that are less harmful for the environment than other products in the same category. Type I ecolabels help to mitigate the informational asymmetry through the mechanism of third party certification. For consumers, credence attributes become search attributes through the use of credible third parties (Caswell and Mojdzuska, 1996). Moreover, the use of logos as informational summaries as well as means to capture the consumer's attention may aid in mitigating the informational overload problem. However, problems related to the public properties of environmental characteristics remain.

Type II ecolabeling

For Type II ecolabeling, we applied our analysis to agro-food products in France. Indeed, the French seal of approval NF Environnement and the European Ecolabel exclude food products (Bougherara et al., forthcoming). France constitutes a favorable field for the development of self-declared ecolabeling (Type II). We did a survey and collected ecolabels on agro-food products in 2001-2002 in several representative French stores. We qualitatively analyzed how they help mitigate the three problems we identified (Tables 3 and 4). Our sample is too small to draw any accurate quantitative analysis, so the percentages given are only indicative.

The analysis shows that Type II ecolabels of food products especially add health or taste to environmental attributes to overcome the public goods problem (through added private attributes) and the informational asymmetry problem (through added search attributes). This may be specific to food products for which the link between the two kinds of attributes often is already in the consumer's mind. A confusion, sustained by marketers' efforts, exists between the impact of the product and its production process on the environment on one hand, and on the other the impact of the environment on the food products, e.g., safety attributes. For example, on certain mineral

water it is claimed that "the spring ... benefits from a natural preserved environment." That this water comes from a preserved environment says nothing about the environmental performances of the producer. Rather, it refers to the absence of contamination of water by the production site. It is well-known that environmental claims are frequently spurious and generate confusion among consumers' between a "preserved area" and an environmentally friendly process of production. Many claims are narrowly focused and respond more to safety concerns than to environmental ones (Leubuscher et al., 1998).

Other mechanisms enabling consumers to trust ecolabels appear through the analyzed ecolabels. Indeed, most of the products are branded. Brands may transfer their reputation to the environmental attributes, making them more credible. Moreover, some ecolabels refer to sponsoring. Organizations such as WWF or ONF (French National Forest Agency) can reinforce the credibility of the seller's claims.

Type III ecolabels

The third party certification in Type III ecolabels helps mitigate informational asymmetry, but the consumer is left with the task of processing the information provided with each product to determine which is least harmful for the environment. Besides, information overload can occur, depending on the quantity of environmental data given and the other information sources, such as other labels and the store environment. Ecolabels can cover a large spectrum between two extremes. At one end, they might be concerned with only one environmental area or one step of the production process, while at the other end with the entire life cycle. Comparing products according to one variable might be easy. However, comparing products across many variables and making a trade-off among them may be a time-consuming and demanding effort requiring expert abilities. Wynne (1994, p. 95) claims that

Simply making information available to consumers in no way assures that they will process it. One must distinguish between "information provision" and "information impact", because there is no one to one relationship between information provided and the impact, if any, of this information on the recipient.

The goal of Scientific Card Certification in creating the Environmental Report Card was to reestablish consumer sovereignty by leaving to consumers the right to fully compare products themselves. The transaction costs it raises may be much higher than

the expected benefits. Thus, Type III ecolabels may be more suited for certain categories of products for which purchase frequency is rather low and for which consumers take time to choose, such as durable goods like cars or washing machines (Allison and Carter, 2000). Type III ecolabels may be less suited for agro-food products.

Concluding Remarks

An important implication of our analysis of ecolabel success is to design ecolabels as providers of mixed solutions to the several market failures. Indeed, the market failures caused by environmental characteristics create an extra social cost for society, and ecolabels try to attenuate this situation. But a careful analysis seems necessary to be sure that the attempt to mitigate these failures is not more costly than the market failures themselves. Indeed, in some cases we may just waste money shifting from a market failure to an ecolabel failure. Consumers' willingness to pay a premium may be wasted in high transaction costs rather than used to improve environmental quality. In a new institutional framework, the use of ecolabels as an alternative to another policy tool is efficient if the cost of designing and implementing ecolabeling policies is lower than both the cost of the other solutions to mitigate market failures and its expected benefits. Other factors should also be taken into account, such as property rights to use environmental claims [??], anti-deception laws, level of enforcement, credible sanctions that influence the level of transaction costs, and the efficiency of ecolabeling.

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Table 1. A classification of ecolabels (ISO 14020, 1998).

Type of ecolabel	Definition by the ISO
Type I: Environmental labeling program	Voluntary, multiple-criteria-based third party program that awards a license which authorizes the use of environmental labels on products indicating overall environmental preferability of a product within a particular product category based on life cycle considerations.
Type II: Self-declared nvironmental claims	Environmental claim that is made, without independent third-party certification, by manufacturers, importers, distributors, retailers or anyone else likely to benefit from such a claim.
Type III: Environmental declaration	Quantified environmental data of a product under pre-set categories of parameters set by a qualified third party.

Table 2. Some Type I ecolabels (EPA, 1998).

Name	Year	Location	Governmental or Non-Governmental	Number of Product Categories
Blue Angel	1977	Germany	Governmental	88
Nordic Swan	1989	Denmark, Finland, Iceland, Norway, Sweden	Governmental	42
Green Seal	1989	USA	Private Non-Profit Association	88
European Ecolabel	1992	European Community	Governmental	11
NF Environnement	1992	France	Governmental	6

Table 3. Type II ecolabels on agro-food products in some French stores.

	Product name	Product type
1	Bonduelle	Salad
2	Jordans	Cereals
3	Mac Cain	French fries
4	Coopérative Nangica	Potatoes
5	Mas de Nans	Wheat
6	Trilégumes	Potatoes
7	Fermiers de Loué	Turkey
8	Gerblé	Biscuits
9	Casino	Fresh vegetables
10	Carrefour	Fresh vegetables, Meat
11	Auchan	Fresh vegetables, Meat
12	Cora	Fresh vegetables, Meat
13	5 ^{ème} Saison	Salad
14	Les Crudettes	Salad
15	Florette	Salad
16	Candia	Milk
17	Thonon	Mineral water
18	Saupiquet	Tuna
19	Paul	Bread
20	La Mie Câline	Bread
21	Point Chaud	Bread
22	Bret's	Chips
23	Peyronnet	Salad
24	Nactalia	Milk
25	Milka Alp action	Chocolate

Table 4. How Type II ecolabels are designed to mitigate market failures.

Type of market failures and mechanisms attenuating them				
	<i>Public goods problem</i>	<i>Informational asymmetry</i>		<i>Informational overload</i>
Product	Adding private benefits	Adding experience attributes	Third party certification	Logo
1				X
2	X	X	X	X
3	X	X		
4	X	X		
5	X	X		
6	X	X		
7				X
8	X	X		X
9	X	X	X	X
10	X	X	X	X
11	X	X	X	X
12	X	X	X	X
13	X	X	X	
14	X	X	X	
15	X	X	X	
16				X
17				X
18				X
19	X	X		X
20	X	X		
21				
22				
23				
24				
25				X
	15 products out of 25	15 products out of 25	8 products out of 25	13 products out of 25
	(60%)	(60%)	(32%)	(52%)