

INFORMATIONAL DIFFICULTIES LINKED TO ENVIRONMENTAL FRIENDLY FOOD PRODUCTS SOME CONSIDERATIONS FOR A PRODUCT DIFFERENTIATION STRATEGY

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ABSTRACT

We propose a conceptual definition of environmental friendly food products. We show that success of environmental friendly food products on the market is closely linked to their position in a credibility area, taking into account usual and environmental characteristics. Environmental friendly characteristics correspond to credence characteristics, which stigmatize significant informational asymmetries linked to defining, checking and signaling environmental friendly food products. They give producers incentives to cheat. According to the final (seller-final consumer) or intermediary (farmer-intermediary buyer) market, informational asymmetries correspond respectively to adverse selection in the first case and to moral hazard in the second one. From a theoretical analysis, we show that firms positioned on the green market are bound to set up "systems capable of generating trust". These systems capable of generating trust have to (i) convince consumers of the credibility of their environmental claims by transforming a priori credence characteristics into search or experience characteristics (ii) and prevent rival firms from free riding.

INTRODUCTION

Can consumers preserve the environment by a selective shopping? With the emergence of environmental concern among consumers, food manufacturers and retailers saw opportunities to market environmental friendly food products and they have been quick to issue all manner of green claims on their products, which are frequently confusing, can be misleading, unsubstantiated and often have more to do with marketing than care for the environment. Some environmental labels can mean anything a producer wants, and buyers have no easy way of finding out what they signify. Lack of visibility of environmental characteristics on the purchased product is a big obstacle to the spreading of environmental responsible food products on the market. This difficulty results from the definition and economic nature of environmental friendly food products. According to requirements of the European Eco-label, we propose a conceptual definition of environmental friendly food products and a theoretical analysis of environmental differentiation of agro-food products. This differentiation is complex because it mainly results from a process differentiation. This theoretical analysis allows us to identify crucial informational problems, which prevent development of environmental friendly products on the market. Lastly, we discuss some mechanisms capable of generating and maintaining trust in order to solve the previous informational problems.

DEFINITION AND ECONOMIC ANALYSIS OF ENVIRONMENTAL FRIENDLY FOOD PRODUCTS

According to the Lancasterian consumer theory, each product can be considered as a bundle of characteristics, which are checked by consumers. Hooker and Caswell (1996) have described the quality characteristic space of food products.

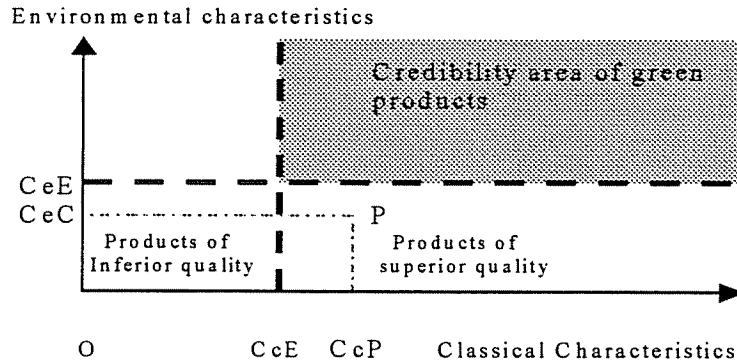
Figure 1
Quality Attribute Space for Food Products (Hooker et Caswell, 1996)

Quality Attribute Subsets				
1. Food Safety Attributes	2. Nutrition Attributes	3. Value Attributes	4. Package Attributes	5. Process Attributes
<ul style="list-style-type: none"> - Foodborne Pathogens - Heavy Metals - Pesticide Residues - Food Additives - Naturally Occurring Toxins - Veterinary Residues 	<ul style="list-style-type: none"> - Fat Content - Calories - Fibre - Sodium - Vitamins - Minerals 	<ul style="list-style-type: none"> - Purity - Compositional - Integrity - Size - Appearance - Taste - Convenience of Preparation 	<ul style="list-style-type: none"> - Package Materials - Labeling - Other Information Provided 	<ul style="list-style-type: none"> - Animal Welfare - Biotechnology - Environmental Impact - Pesticide Use - Worker Safety

First, we analyze food products as a bundle of classical characteristics and environmental characteristics. Classical characteristics (e.g. taste, freshness) are usual characteristics of generic and similar food products without environmental differentiation. This conceptual distinction is useful but imperfect, because some classical characteristics (pesticide residues) can become environmental characteristics through consumers' perception. We characterize food products in a bi-dimensional characteristic space. We apply the generic requirements of the European Eco-label (EU Regulation n° 880/92), which exclude agro-food products. Environmental friendly food products have a less harmful impact on the environment as compared with similar products, through their life cycle. The environmental friendly food products keep all the usual properties of similar products. This approach takes into account all environmental fields from cradle to grave to prevent pollution from transferring from an environmental field to another, from a life cycle stage to another or from a place to another. Indeed, these transfers raise certain questions about equivalence between various environmental impacts. Is it better to pollute air or water? To solve this problem, social preferences could be taken into account. These social preferences are not necessarily based on scientific knowledge or altruist behavior. In real world, many people prefer preserving their close environment than unknown and endangered species of a distant country. Certain "environmental friendly" claims are substantiated by farm environmental management only. The other stages notably food processing and retailing are not taken into account. Moreover, marketers exploit the positive correlation perceived by consumers between environmental characteristics and low processing of food products. The less processed the product, the stronger the consumers' sensitivity, except for children food. But a credible approach of environmental friendly food products involves taking into account all the stages of life cycle through agro-food chain.

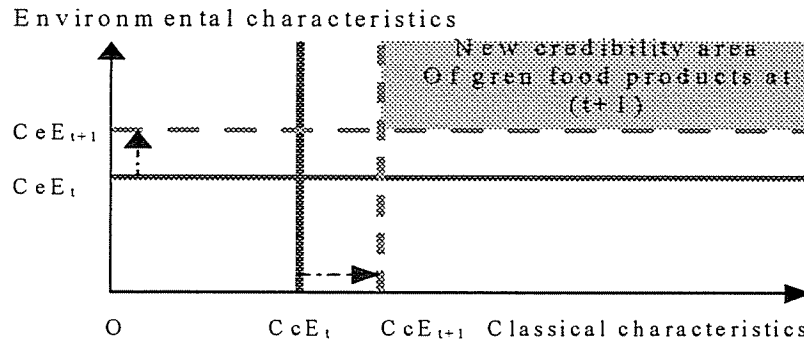
In the characteristic space, at the time t , environmental friendly food products must at least satisfy to the CcE level. This CcE threshold corresponds to the classical characteristics expected by consumers for similar products. In the same time, environmental friendly food products own environmental characteristics with a minimum level CeE. For example, the classical product P is a product of superior quality, but it does not own the minimum environmental level to be an environmental friendly product. We define a credibility area for environmental friendly food products by the space where $(x, y) \geq (CcE, CeE)$. From a conceptual point of view, all the products of this area could be labeled as environmental friendly products (Grolleau, 2000).

Figure 2
Credibility area of environmental friendly products in the characteristic space



An ecolabeling scheme involves continuously updating the product selection criteria. At $(t+1)$, the thresholds CcE and CeE increase to correspond to new consumer requirements and to improve environmental performances. For example, consumer's requirements for taste and food safety increase continually. Thus, the thresholds of classical and environmental characteristics are valid for a specific period and must be regularly reviewed.

Figure 3
An updating credibility area of environmental friendly products



Credibility of environmental friendly products is linked to conditions of developing product selection criteria. For example, if a leader firm in a product market defines itself the thresholds, he could label its products without environmental improvement (Nadaï, 1998). In addition to this quantitative approach of environmental attributes, it is necessary to achieve a qualitative approach to check the conformity between consumers' requirements and environmental friendly products criteria selected by experts (Grolleau, 2000).

ENVIRONMENTAL CHARACTERISTICS CONSIDERED AS CREDENCE ONES

Traditionally, economists categorize product characteristics in terms of search, experience and credence attributes according to when the consumer detects the product quality, as the seller knows product quality. Some research (Andersen & Philipsen, 1998) has extended the original

concepts. Search characteristics of a product (e.g. apple color) can be accurately and efficiently evaluated prior to purchase using knowledge, inspection, reasonable effort and normal channels of information acquisition such as the consumer report. We postulate that search characteristics are validated ipso facto by consumers during initial investigations. Market mechanism functions without problems and practically, there is no need of governmental intervention. Experience characteristics of a product (e.g. apple taste) can be accurately and efficiently evaluated only after the product has been purchased and used for a short period of time in comparison to the product's total usage life. Several mechanisms linked to the firm reputation can solve the adverse selection problem due to experience characteristics: informed consumers share information with the un-informed consumers, repeated purchases, and quality signaling (Caswell et Modjuszka, 1996). Credence characteristics (e.g. organic apple) cannot be accurately and efficiently evaluated even after purchase or consumption, because the consumer lacks technical expertise. The consumer can not check the characteristics even after the product has been used extensively. The cost of acquiring sufficient and accurate information is more prohibitive than its expected value and/or there is no tangible link between the expected characteristics and consumption of the product".

For credence characteristics of agro-food products, we adapt Andersen & Philipsen's typology by distinguishing internal and external credence characteristics. Consumers cannot detect internal credence characteristics by inspecting the final product, but expert can detect them. For example experts can check on the final products the contamination level of pathogens or heavy metals, the presence of Genetically Modified Organisms [GMO]). For external or hidden credence characteristics, consumers cannot detect them by inspecting the finished good because they concern details about the production process that has little or no influence on the objective characteristics of the purchased good (e.g. environmental friendly process, fair trade). Even, experts cannot check this quality on the final product. For example, most of the pertinent environmental characteristics of agro-food products are linked to the environmental impacts of farming methods and do not have influence on the objective and tangible characteristics of the purchased good (Grolleau, 2000). According to several experimental studies (Johansson et al., 1999), we recognize that provision of information about environmental impacts of farming methods influence the quality perceived by consumers. Checking these process attributes needs inspection of the process itself, according to the criteria previously selected in the defining stage. In the international trade terminology, these process attributes are called "non-product related production and process methods". Nevertheless, perceived attributes by consumers are often wider than environmental qualification of environmental friendly food products by experts (Grolleau 2000). Indeed, use of biotechnology and sewage sludge in farming practices has an environmental connotation. Sewage sludge spreading can be the preferable environmental solution and some scientists praise environmental benefits of GMO. But, there are important uncertainties, especially for health consequences. This views leads to an incompatibility between global image of environmental friendly food products and agricultural use of GMO or sewage sludge.

Some properties of GMO and sewage sludge correspond to a new kind of characteristics initially developed by Lupton (2000) controversial characteristics. Indeed, these characteristics are not search, experience or credence characteristics, because there is not a classical situation of informational asymmetry. This new kind of characteristics comes from a controversy and uncertainty framework. This situation is characterized by a lack of knowledge about some environmental and sanitary consequences shared by all agents. Scientific knowledge is not established and stabilized (Hadfield and Thomson, 1999). There are important controversies and debates. In the case of credence characteristics, consumers cannot evaluate this quality (before or after purchase) at any step of characteristic life cycle. But some agents (e.g. producers, experts) own this credence information and can use it to cheat. With controversial characteristics, all agents are conscious of a potential risk, but this risk is unknown and anyone can probabilize it.

In the following sections, we will deal with environmental characteristics, which are hidden credence characteristics. Environmental friendly food products own true differences, but they are not visible on the final product. This situation explains the need of other mechanisms capable of defining, monitoring and signaling environmental attributes in a credible way. Subjective or "informational" differentiation changes the product perception and not the characteristics themselves. Environmental friendly food products need both objective and subjective differentiation to guarantee fair-trading.

INFORMATIONAL DIFFICULTIES LINKED WITH ENVIRONMENTAL FRIENDLY FOOD PRODUCTS

We analyze these difficulties according to the position of the buyer (or the seller) in the transaction. We distinguish the business to business relation from the seller to consumer relation. Indeed, retailers and final consumers are purchasers of agro-food products, but they have not the same expertise and negotiation power.

For customers

When producers praise hidden credence characteristics of their products, customers can not check their claims. Due to the nature of environmental impacts, consumers cannot evaluate environmental consequences resulting from products. Some impacts are global and consumers' checking is impossible. Other environmental characteristics become tangible after a long time, which overcomes consumers' evaluation scale. Some environmental characteristics result from total polluting emissions generated by a product market and have public good properties. It is not feasible to exclude those who do not consume environmental friendly product. An individual customer cannot evaluate and take advantage of his contribution (Nadaï, 1998). Consumers consider environmental characteristics of food products, not by intrinsic qualities of food products, but by its environmental consequences or impacts. There is not a linear relation between environmental characteristics and environmental impacts. In the case of environmental friendly food products, this relation depends on factors like pedological and climatical conditions. Some environmental impacts depend on customers' behavior. For example, customers can use recycling structures or throw their wastes without distinction. Moreover, perceptions of the seriousness of the environmental impacts vary among countries. Customers are dependent on sellers' assertions and system disclosing environmental quality. For credence characteristics, buyers deduce quality from perceived signal, but they can not control it themselves. Purchasers are aware that sellers have incentives to cheat because it is costly both to use environmental friendly practices and to check that these practices are truly used. Purchasers can develop a strong cynicism about environmental claims, which can be false or misleading. This situation allows cheating behaviors, which eliminate the true environmental friendly food products from the market. Consumers who want to purchase an environmental friendly product do not know if the producers have provided the expected efforts (hidden action / moral hazard). In the same way, they do not know some fixed properties of the product. The sellers are better informed (hidden information / adverse selection) and they can use this information to mislead consumers. This first analysis can lead a market failure because of asymmetrical information about product quality. To solve this problem, customers must find a credible way to believe or not sellers. This way is generally alternative source of information, which can change a credence characteristic into a search one (Caswell & Modjuszka, 1996).

For producers

In the same time, firms want to direct purchasers' choice. Firms emit signals like green advertising to signal environmental friendly characteristics. As a result of consumers' inability to check environmental friendly claims and costly production of environmental characteristics, opportunist firms can manipulate emitted information to increase their profits. Opportunist firms praise environmental characteristics of their products without providing the expected efforts. Some environmental claims mislead consumers because they do not take into account the life cycle of the products and all environmental fields. This pseudo-differentiation can be environmental labeling of their products without environmental improvement. These firms can try to manipulate criteria selection of true ecolabels to obtain ecolabeling of their products, without environmental improvement (Nadaï 1998). Rival firms can confuse the message to eliminate competitive advantage of true environmental friendly firms. Consequently, the proliferation of spurious, unsubstantiated and misleading green claims can destroy credibility of honest approaches.

An informational distinction according to various buyers

According to the business to business transaction (farmer – intermediary buyer) or the final market (seller-final consumer), informational asymmetries correspond respectively to adverse selection in the first case and to moral hazard in the second. In case of a business to business relationship – farmer/ food industry or farmer/ retailer, environmental characteristics come from the environmental friendly behavior of the farmer. Moral hazard (hidden action) is here encountered since one side of the market cannot observe the other side's behavior or can observe the action but without being able to check whether it is appropriate since he cannot observe the circumstances of the action (expert service). Moral hazard is encountered everytime an agent has no incentive to keep his promises his behavior not being observable by the other agent. Since the buyer cannot check the producer's effort level, the latter may provide a minimum environmental effort (that is to say producing a product whose environmental characteristics - that are costly to provide - are as low as possible). Indeed, to guarantee environmental characteristics for a food product is to guarantee the environmental friendly behavior of the producer. The producer effort level not being observable by the classical buyer, the price does not reflect this environmental effort and it is hard to choose pro-environmental suppliers. These firms are free riders, seeking to benefit from buyers who are sensitive to the environmental quality without providing the expected effort level, striving not to be exposed. The classical farm disguised as an environmental friendly farm having a price advantage, the true environmental friendly farmer will be eliminated from the market because of its not being price competitive.

In general, adverse selection problems are encountered when a given characteristic of the exchanged product cannot be observed by one of the partners. The price is no more a signal of the product's value since for the same price, goods of variable quality can be obtained. Consequences are bad not only for buyers but also for the good sellers whose products are of high quality and who cannot signal them freely with credibility» (Cahuc 1993). Adverse selection arises when goods quality is difficult to observe and leads to eliminate good products from the market. Adverse selection does not affect the quality of the goods but the decision to market good products. Buyers do not know the quality of the product they buy so that we can consider the price as being independent from quality. Price being independent from quality, it is better for the seller market products, which have production costs as low as possible that is to say bad products. If consumers are unable to check environmental and ethical characteristics, fraudulent sellers can market bad products with a green image. Consumers agree to pay premium for environmental quality. Fraudulent sellers want to recover this premium. But purchasers anticipate sellers' temptation to cheat and then reduce their willingness to pay environmental friendly products. Sellers of true environmental friendly products can not cover their high production cost. They reduce their willingness to market true environmental friendly products. Finally, this situation leads to the elimination of true environmental friendly products. So, even if consumers have subjective preferences about environment, they can not classify products according to their environmental impacts (Nadaï, 1998). Besides, there is no cross-checking between the environmental field of firm claims and the consumers' requirements. In this situation, the classical approach of consumer's choice by maximizing his utility fails. Consumers need external mechanism to guarantee fair-trading. The market of environmental friendly products corresponds to both adverse selection and moral hazard. In this situation, success of environmental friendly products is strongly dependent on informational management (Reinhardt, 1998).

OVERVIEW AND DISCUSSION OF SOME MECHANISMS CAPABLE OF (RE)ESTABLISHING TRUST ON FINAL MARKET

Honest sellers need reliable means to transmit information about environmental characteristics of their products to potential buyers. So, honest firms are penalized by rival firms opportunism and buyers suspicion. Honest firms have to set up "systems capable of generating trust" which have to (i) convince the consumer of the truthfulness of the honest environmental assertions. These systems capable of generating trust can change a credence characteristic into a search one. For example, in this way, a producer could claim the low pesticides contents of his products. The assessment of an independent laboratory or the reading of an independent review (considered as deserving buyer's trust) changes this a priori credence characteristic into a search characteristic. In

fact, a credence characteristic can become a search characteristic if the consumers possess a way to valid the information emitted by producers. (ii) become an entry barrier for fraudulent firms, which want to take advantage of the market of environmental friendly food products without true environmental improvement. Indeed, systems capable of generating trust must be attractive for honest firms and dissuasive for opportunist firms. "A credible signal has to be less costly for "good" agents than for "bad" agents" (Cahuc, 1993). Economic theory mentions several mechanisms capable of re-establishing, at least partially, a symmetrical information. Symmetrical information seems to be the solution, but consumers need also a cognitive support. Indeed, even if there is a symmetrical information, consumers can not process it because they lack expertise. For example, Wynne (1994) shows that environmental report cards (graphical presentation of environmental performances without value judgement) establish a symmetrical but useless information for consumers who lack expertise to process them. In real world, absence of communication seems sometimes preferable. During the Belgium crisis of dioxin chicken, some French poultry producers became aware that their willingness to communicate about their non-implication in this crisis has been misunderstood and they lost money. In similar circumstances, they did not communicate and they kept their sales figures. Effectiveness of several mechanisms is clearly reduced by the credence nature of environmental characteristics:

- (i) *Warranties and serious insurances*: honest sellers can signal high quality products, but these mechanisms are unsatisfying for environmental characteristics. Indeed, their effectiveness depends on consumers' abilities to detect environmental defaults that are generally impossible for consumers whatever the considered period
- (ii) *Reputation mechanisms* can only function if there is disclosure of environmental defaults and sanctions against the fraudulent firms. The stronger environmental reputation of the firm is the more important the prejudice will be in case of environmental defaults. Effectiveness of this mechanism needs intervention of credible agents. For example, governments, environmental activists and consumers associations have expertise and can punish fraudulent firms by using denunciation, boycott, and legal proceedings (Feddersen et Gilligan, 2000; Grodsky 1993). For example, Greenpeace discloses periodically true choices of some food processors concerning the presence or not of GMO.
- (iii) *Standards and certifications* like the ISO 14000 family and the third party certified ecolabels. A standard is a document, established by consensus and approved by a recognized body, that provides for common and repeated use rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context. Certification is a procedure by which an independent and expert third party gives written assurance that a product, process or service conforms to specified requirements. This insurance is a credible way to signal quality to uninformed consumers. For example, ISO 14001 certification attests implementation of environmental management system and guarantees a minimal environmental behavior. This standard could be considered as credible approach to distinguish green suppliers in a "business to business" relationship. Credible third party certified ecolabels can signal in the final market true environmental friendly products. Indeed, true ecolabels summarize a complex scientific information susceptible to direct consumers in their choices. Van Ravenswaay (1996) and Van Ravenswaay and Blend (1997) analyze use and effectiveness of environmental labels on food products.

This theoretical classification illustrates polar cases. In true world, mixed strategies are widely used. Some strategies combine standards/certifications with reputation mechanisms. Reinhardt (1998) shows that the credibility of environmental claims is strongly linked to the firm's reputation. For example, the loss of an environmental management certification or an environmental label on products can have adverse effects on the firm reputation. In the case of environmental friendly food products, these environment management tools (system / product) are complementary because environmental claims on the products result from production process and not from product tangible

characteristics. Thus, these approaches can be considered as mechanisms capable of disclosing the true environmental choices of firms.

CONCLUSIVE REMARKS

The analysis of environmental characteristics is complex. A true green differentiation is an objective one, but needs also an informational and cognitive differentiation to be efficient on the market. So, we have shown the limits of classical asymmetrical information theories, especially in the case of controversial characteristics. It is obvious that consumers are not in a situation of "sovereign choice". Indeed, even if consumers use third party certified ecolabels, they are not sure that their expected contributions and the selected criteria for the ecolabel are identical, both in quantitative and qualitative point of views. The environmental characteristics space is defined by the ecolabel committee and not by consumers themselves. However, perhaps this solution could be considered as the lesser of two evils. Moreover, marketing of process attributes, which have not influence on the final products is a big deal for international trade forums (e.g. the dispute between Mexico and the United States about dolphin-safe methods of harvesting tuna), notably to search for win-win strategies (win for the consumer, win for the international trade) and guarantee fairness in trading practices.

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