Chapter 8
Environmental Labels and Declarations in the Agri-Food Sector

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8.1 Introduction

Environmental protection is currently one of the main issues both nationally and internationally discussed in social and political debates. It has stimulated the European Union (EU) to look for new strategies and instruments to be applied in environmental management which allows the operators of the economic system to manage the environmental variable in an efficient and proactive way (Andreis and Cusinato 2009). The preventive measures adopted against the negative impacts of production on the environment, obviously in line with the strategy of sustainable development, are treated by EU policies as an innovative approach which can change the paradigm whereby different strategic priorities can be defined and implemented. The forerunners who conceived these policies have helped make a better use of natural resources under all aspects, and they have also met the expectations of consumers who are more and more sensitive to environmental problems steering their purchases towards the sustainability of the products and of the companies which produce and trade in them.

For this reason, since 2001 European governments have embarked on an interesting initiative to promote strategies which strengthen and orient environmental policies towards the development of a market of more ecological products. The aim of this strategy, inspired by the Integrated Product Policies (IPPs), was the accomplishment of different environmental policies in order to reduce

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environmental impacts linked to the life cycle of the products (goods/services) (European Commission 2001a; European Commission 2003).

The capability of involving economic, institutional and social subjects is one of the most innovative and interesting aspects of the IPPs because, thanks to the use of the product as the centre of the analysis, all the environmental aspects associated with design, production, consumption and final disposal of the product can be taken into consideration.

Through the IPPs, all the forces operating in the market rally to protect the environment. As a matter of fact, from the supply point of view, companies are stimulated to develop products with a lower environmental impact in all the phases of their life cycle while, from the demand point of view, consumers tend to make a positive use of the advice and information given and thus become fully aware of the choices they have to make.

As a consequence, a new European strategy, termed Sustainable Production and Consumption (SPC), has been planned. It was launched by a Commission Communication on June 18th 2003 and it has been identified as one of the EU priorities for the next ten years: in this case the IPPs have played the major role.

This strategy has strengthened and improved the EU action in the field of environmental policies aimed at preventing, managing and improving the impacts of the life cycle of products. In 2008, with the publication of the "Policy of Sustainable Consumption and Production and of Sustainable Industrial Production", the actions necessary to influence the present models of production and consumption were also defined (European Commission 2008).

This strategy completed the policies on energy consumption, in particular the energy and climate packages adopted by the Commission in the same year which contained, among others, also:

- the GPP communication (Green Public Procurement), COM 2008/400 "Public procurement for a better environment";
- the revision proofs of the EMAS and ECOLABEL standard;
- the proposal of extending the directive to the ecological design of the products.

Trying to become more eco-efficient, the EU lines of action within the SPC were based on innovative instruments able to develop the capability of producers and consumers to make "sustainable" choices and to influence each other (SETAC 1993). These instruments refer to the Life Cycle Assessment (LCA), one of the most important tools for the IPPs implementation and the main operative instrument of the "Life Cycle Thinking" (LCT) (Del Borghi et al. 2007); such instruments, for example, figure in the so-called environmental labels/voluntary declarations (Baldo et al. 2005).

In these last years the labels and environmental communications (Forbes et al. 2009; Houe and Grabot 2009; Limnios et al. 2009) have received a great deal of attention in the international scene in order to implement a policy which, starting from the idea that awareness of environmental problems leads to a behavioural change of stakeholders, can encourage producers to improve the environmental performance of their products thus stimulating consumers to give up their habit of making purchases.

The aim of environmental labels is two-fold: firstly, environmental labels will be a marketing incentive regarding consumers because, being given clear information on the environmental impacts of a product, consumers will be urged to purchase consciously; moreover, labels will be an incentive for producers who can point out the better environmental performance of their products in comparison with competing products which are lacking in information thus obtaining a competitive advantage. Therefore, environmental labels are really important in orientating the demand towards goods and services with a low environmental impact. By encouraging producers to improve their environmental performance, they are also an asset for the companies which have chosen a "virtuous" way of production. Consequently, the adoption of environmental labels triggers a virtuous relationship between the consumer and the production chain whose environmental advantages benefit the entire production-consumption chain.

In order to reach this aim it is necessary that any environmental label should be believable, giving the consumer full information. As a consequence the information which lies at the bottom of any labelling system has to be weighted to be easily understood by the final customers. In relation to this last aspect some labels, defined mono-criterion, give information just about one impact, while others, defined as multi-criteria, give information about several impacts.

The voluntary environmental labelling experience began in Europe at the beginning of the '80s. Initially it was a marketing instrument but then it started acquiring wider connotations till it became a real programme which had to be followed and improved by EU environmental policies.

At the beginning these labels were simple self-certifications used by companies to describe some of the environmental eco-compatibility characteristics of their products, or certifications issued by private bodies specifying the single ecological characteristics of a product.

In order to reduce the unchecked diffusion of vague indications and so rather unclear labels, some countries started adopting some eco-labelling national programes with a voluntary participation.

These labelling systems were based on a strict evaluation of environmental impacts of the productive processes and on the control of the reliability of the given declarations, guaranteeing the right information and, above all, giving great importance to the enterprises in terms of improvement of the eco-efficiency of their processes and/or of their product performances.

Given the presence of different national systems of environmental labelling and in order to bring into line the methodologies to be adopted, the International Organisation for Standardisation (ISO) has elaborated and issued the ISO 14020 standard: the general conditions for the use of environmental indications, labels, logos and declarations were defined. Following the ISO, the aim of these labels/declarations is "to encourage the supply and the demand of those products and services able to cause lower damage to the environment stimulating a process of continuous environmental improvement guided by the market" (ISO 2002a).

The aim of this standard was both to encourage the request and the supply of the products which have a low impact on the environment and also to create at least

some categories of clear self-explanatory environmental labels, which referred to common standards: the LCA methodology. In order to be efficient political instruments, these labels had to be based on clear and public standards and they had to point out significant environmental differences between the products with the labels and those without them.

Starting from the principles stated by the above-mentioned standard, the ISO has identified and regulated three types of labels/environmental declarations: Type I, II and III; there is another category which has not been regulated by the ISOs and which has been defined as "environmental labels of type IV"(Defra 2010). The environmental quality trademark is generally represented by a legally protected image: the logo which represents it (Fig. 8.1) attests that the product to which it has been assigned, meets predefined environmental criteria.

Below the general principles on which the four categories of labels are based have been outlined; in Sect. 8.2 there is a critical review of the most significant literature about environmental labels, referring in particular to food products; the aim is to investigate the role that environmental labels have played in the behaviour of consumers and of producers.

- The Type I, ISO 14024:2001 (ISO 2001) labels are based on environmental excellence criteria, single or multiple, proposed and developed by a third body following a pattern of multicriteria evaluation for different products or similar groups of products and for which a similar environmental impact is foreseen.

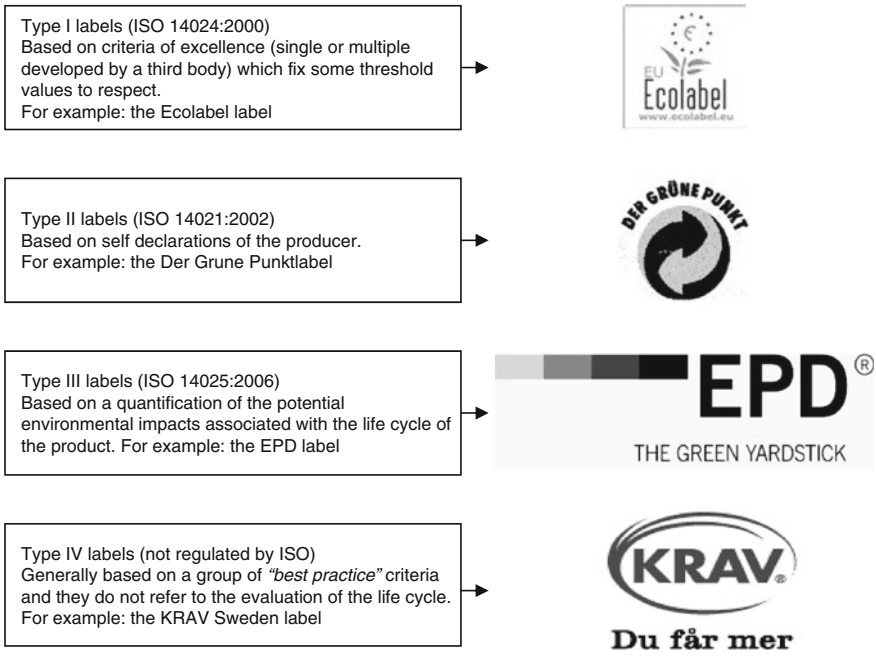

Fig. 8.1 Logo of different labels types

Following an LCA approach, the analysis has pointed out the most significant impacts of products, from the extraction of raw materials, production, transport, to the selling and final disposal. In general, the criteria try to encourage the reduction of impacts on natural habitats and associated resources, the reduction of pollutants in the environment and the reduction of the use of dangerous substances. The criteria also specify the characteristics of the information to give the consumer in order to ensure an efficient use of the product. In order to obtain the issue of the trademark the products have to respect the environmental impact threshold values fixed by the previous criteria. Type I labels are the Scandinavian White Swan (Miljömärkt) (OECD 1997), the German Blue Angel (Der Blaue Engel) (OECD 1997) and Ecolabel, a trademark of ecological quality introduced by the European Union at the beginning of the '90s and which is certainly the most common among type I labels (European Commission 1992).

- The labels of Type II, ISO 14021:2002 (ISO 2002b), are not verified by a third body and they include all the "self-declared environmental statements", that is the declarations, labels and symbols referring to the environment on the packages of the products, on the packaging or in the advertisements, used by the same producers as an instrument of environmental information (Proto et al. 2005). A certification from a third body is not necessary; therefore, for this type of labelling, the reliability guarantee is a very important aspect. As a matter of fact, for the producer ISO 14021 entails both respecting all the requisites conceived to ensure the reliability of the information transmitted to the buyer, and the guarantee of avoiding falling into any unexpected negative effects of the market as a result of an indictment of unfair competition due to deceiving statements. For this reason, the standard excludes the possibility of using generic expressions such as "friendly to the environment", "green" or "non polluting". On the contrary, it outlines the requisites for certain expressions such as "without…": it can be used only if an analytical laboratory verifies that the level of the specified substance is really lower than the substance detected as the bottom level or as the pollutant (Sibilio 2008). The standard also uses symbols without defining a specific icon, except for the one largely used and connected with the percentage of the recycled material in a product and represented by the Mobius Cycle (Beltramo et al. 2004).
- Type III, ISO 14025 (ISO 2006a) labels are based on LCA, like Type I labels, and they consist of a quantified declaration of potential environmental impacts. This type of labels does not determine threshold values of environmental impacts, but measures the environmental performances of the products using real data such as the quantity of emissions, leaving the related considerations to the consumers. Among the labels of type III, the Environmental Product Declaration (EPD) is arousing internationally a great interest. It is regulated by ISO 14025, was approved just in 2006 and has been applied to different programmes and assigned to hundreds of products; this confirms the extent to which the production community is interested in the Environmental Declarations which involve all the participants along the entire productive chain. It is of great importance because it is applied to all sectors, such as agriculture and food, and

is considered, among the voluntary management instruments, as an innovation able to communicate in a credible way the main characteristics and environmental impacts of a product/service, increasing its visibility and social acceptability. The label Earthsure, which is at an experimental stage in the USA, and the Carbon Reduction Label, which measures and determines the total of greenhouse gas emissions, belong to this group.

- The labels of Type IV are environmental trademarks, not regulated by ISOs and defined by several researchers as "environmental trademarks of type IV". As previously mentioned, they are absolutely voluntary trademarks, which exceed the definition of ISO labels of Type II, submitted to an independent check by a third body but their approach is not based on the evaluation of the life cycle or on real measurements. Generally, these labels are based on "best practice" criteria or on standards which are used to distinguish the product from the traditional ones according to the body which issues the label. Some examples of this kind of label are the trademarks Forest Stewardship Council, Dolphin safe and Fairtrade Global.

8.2 Environmental Labels and Declarations in the Agri-Food Sector: State-of-Art and Literature Review

Environmental labels and communications, as already said, are internationally and widely used to implement a policy which, starting from the awareness of environmental problems leads to a behavioural change of the partners, encouraging producers to improve the environmental performances of their products and stimulating consumers to change their buying habits.

As reported in the previous paragraph, the voluntary labelling system is really diversified and it makes it particularly difficult and complex for the operators to choose the most effective type of label to transmit the values of their environmental commitments. Consequently, companies have to choose a labelling system which suits the specific characteristics of their product and the distinctive features of their sector.

This is particularly important in some productive contexts like the agri-food sector, where the characteristics of the products depend on the interactions among different subsystems of the productive chain, from farming to transformation processes and marketing, which bring about some impacts in water, air and soil (Girardin et al. 2000).

In the European Union the environmental impacts due to the production and the transformation of foods, feeds and drinks make up between 20 and 30 % of the total environmental impacts produced by non-durable goods; in case of eutrophication they represent 58 % of the total impacts (Oakdene Hollins Research and Consulting 2011). As regards the consumption of resources, agricultural activities

consume and use materials and energy as any other process of production; for example it is the sector with the highest consumption of water (70 % Agriculture; 22 % Industry; 8 % Civilian). A noteworthy fact is that public opinion is now more aware of the risks linked to the presence of environmental pollutants in foods. Therefore, consumers ask for safer products and this generates new opportunities for the market, new niches which draw the attention of a larger number of producers. Working and guaranteeing safe products means taking care of and respecting the environment, reducing the environmental impact, enhancing the sustainability of the productive process and preserving biodiversity and the ecosystem balance.

The organisations belonging to the agri-food sector have to be able to manage the environmental risks connected with their activities in order to remain always competitive, to protect their own reputation and to increase the value of their trademark. Moreover, for many of the agri-food companies which export their products in the international market, where customers and consumers are more senstive to environmental problems, the sustainability of the products is the key factor to their success and labels and the product declarations are the best marketing instruments since they give consumers all the necessary information regarding eco-sustainability values.

Since the first aim of environmental labels is to give the consumers clear information about the environmental impact of a product in order for them to opt for a more conscious purchase, labels have to be clear, readable and they should be integrated with health information (White et al. 2009). They should also help consumers to make a comparison between similar products, to reflect the different impact levels, to be validated by independent checkers/verifiers and, above all, they have to be clear and impartial about the entire productive process using some product "criteria" equal for any specific sector. Regarding this last point and considering, in particular, the distinctive features of the foods, some concern has been expressed about the difficulties defining unambiguous and reliable criteria regarding environmental impacts for the entire productive chain (Morris 1997; Zarrilli et al. 1997). For the same reason, after a careful revision, the Ecolabel trademark has not yet been extended to foods (Oakdene Hollins Research and Consulting 2011).

In the agri-food sector labelling systems are really proliferating both within the labels regulated by the ISO and those in force outside these standards. For this reason, efforts are being made to conciliate and standardise some environmental quality trademarks also in order to reduce the confusion both of the industry and of the consumers.

Given all the available labels and the remarkable relative literature, foremost consideration should be given to the state-of-the-art of the labelling schemes which can be used for the environmental information about agri-food products; subsequently a critical analysis of the scientific literature can be carried out.

8.2.1 State-of-the-Art of Environmental Labels and Declarations in the Agri-Food Sector

Although interest in environmental labels has increased worldwide, the number of useful ISO- regulated systems in the agri- food sector is not so high. Most of the labelling and communications indeed belong to type IV.

This probably depends on a set of factors including the characteristics of the foods and of the production systems and the complexity of pointing out and quantify clearly the environmental impacts of the entire productive chain.

Some of the labelling and environmental communications systems which can be used to transmit the environmental values of agri-food products are reported and analysed below. The selected schemes are treated following the classification reported in Sect. 8.1: Types I, II, III and IV. The Ecolabel scheme has not been taken into account because this label has not been extended to foods.

8.2.1.1 Type I Labels

In this kind of label, only one type is suitable for the agri-food sector: Ukraine Living Planet (Global Ecolabelling Network 2012). It is a non-governmental trademark of environmental quality for foods and other products, implemented in 2003 on the initiative of the "Living Planet", supported by the Committee of Verkhovna Rada (Ukraine Parliament) of Ukraine. Its implementation has been done following the eco-labelling programme for the environmental labels of type I, which means that it conforms to the ISO 14024 international standard. The ecological criteria of the products have been elaborated by the subcommittee "Life Cycle Assessment" which is an integral part of the National Technical Committee of Standardisation "Natural Environmental Protection of Ukraine" (TC 82).

8.2.1.2 Type II Labels

- Casino Carbon Index (CCI)
  It is a mono-criterion scheme of environmental labelling based on the LCA approach and developed by a French multinational company, CASINO Group, in order to give indications to consumers about the environmental performance of the products traded by the Group. Its trademark is a green leaf drawn on the front of the package; it clearly indicates the quantity of greenhouse gas emitted per 100 g of product and it also gives information about the recyclability of the package.
  At the moment this way of labelling has a low direct impact on consumer choices because the global economic conditions have worsened and it is the price which really influences purchases; however, in the future, consumer decisions will be more sensitive to environmental issues (Packaging-gateway 2011).

- "Environmental Label"
  The Environmental Label (Etichetta ambientale 2011) is a new model of environmental communication about the product, carried out in Italy in 2012.
  It is a multi- criteria label, based on the LCA approach and developed by the Environment Platform for Convenience Goods–PAB, created thanks to the collaboration between the communication experts from SPRIM, an international Society of Strategic Consulting which works in the area of Human and Environmental health, and the researchers of the Institute of Agricultural Chemistry of the University Cattolica del Sacro Cuore of Piacenza.
  It was set up following the indications given by ISO 14040 (ISO 2006b), 14044:2006 (ISO 2006c) and ISO 14021:2002 (ISO 2002a), the French guide lines AFNOR-ADEME and the Report Communicating environmental performance along the food chain (European Food Sustainable Council and Production Round Table 2012).
  In order to simplify environmental communication, the label shows a "global index" of the impact of the product along with another three sub-indicators which highlight the impact on the water, air and soil ecosystems, and it is expressed as a percentage figure compared to the average daily impact on a European citizen (European school for a living planet 2011). The global index which gives endpoint information has been calculated by aggregating—a with three different weights—the three macro-indicators water, air and soil which have been respectively obtained aggregating 18 ReCiPe indicators 2008 (Goedkoop et al. 2009).
  As far as food is concerned, the functional unit used for the LCA study is the daily portion of food recommended by the National Institute for Nutrition. It deals with day-to-day consumption and it gives a simple and fast result to the consumer who can have some difficulties understanding the absolute results expressed by often incomprehensible units of measurement.
  The label applied directly on the package of convenience goods helps consumers to be immediately aware of the environmental impact of the bought products thanks not only to the scale which indicates the total "environmental cost" but also to the three indicators for the single elements: air, water, soil.

- Genetech Free
  It's a mono-criterion label introduced in 2009 by the German Ministry of Agriculture and it is used by firms to communicate to consumers that the product does not contain Genetically Modified Organism (International service for the acquisition of agri-biotech application 2012). Nowadays it is principally used to distinguish the foods, such as meat or milk, obtained from animals which were never fed with animal feed produced by OGM plants (GMO compass 2012); it has been used for a dairy product distributed by Campina Company and by small producers. Lewis and other authors (Lewis et al. 2010) underlined that the wording "without gene technology" is not really precise, because this label is allowed to be used also for foods of animal origin which contain vitamins, enzymes or additives obtained using genetic engineering techniques.

8.2.1.3 Type III Labels

- Environmental Product Declaration (EPD)
  At the present time, environmental declarations and in particular the ones belonging to Type III, Environmental Product Declaration EPD Fig. 8.1, are brief documents which indicate the "environmental profile" of a product/service and which give objective, comparable and believable information, without specifying assessment criteria, preferability or minimum levels to be respected. Credibility is granted by the LCA methodology, while comparability is based on the elaboration of specific and common requisites for each type of product (RINA 2006).
  The European Commission is carefully following the development of this instrument within the strategies of "sustainable production and consumption", both for its clear interconnections with Ecolabel and for the capacity of spreading green information among European consumers (Baldo et al. 2005) and also because unlike Ecolabel, it can be applied to the agricultural food chain.
  The standards which determine the EPD modes are:

  – using the analysis of the life cycle (LCA), in line with the standard of the ISO 14040:2006 set (ISO 2006a);
  – applicability to all products and services, regardless of their position inside the productive chain;
  – verifications done by an independent and accredited body.
    It has to be underlined that the EPD contents are meant just for information: the final aim, in fact, is to improve the environmental communication among producers, on the one hand, and distributors and consumers on the other, allowing them to make a comparison between the products and the services which are basically equivalent. The EPD is addressed in particular to the professional purchaser, so the environmental information is intended to flow along the whole production line.
    Even if the EPD system seems to be a technical instrument, it is a dynamic communication method able to follow the development of the products in the national and international markets; it should be used as a support for product policies and it should make up for the lack of Ecolabel in the sector of certain durable goods and of agricultural and food products (Del Borghi et al. 2007).
    In the last decades, some agencies which operate internationally have arranged some schemes for the certification and registration of EPD. In Europe, since 1998, the most active scheme has been implemented by the Swedish Environmental Management Council (SEMCo), today known as the International EPD Consortium (IEC). Simply known as "EPD system", it is a voluntary scheme for product certification and it is based on the indications written in the international standard 14025:2006 and in the Swedish one MSR 1999:2 which was substituted in 2008 by the new "General Programme Instructions for EPD". After a period of transition and the test of the European Community, in 2003, this system has obtained a full supranational value and it has been managed by an international panel: the network, the Global Type III Environmental Product

Declaration Network (GEDnet) which also promotes information about this theme all over the world.

With the passing of time, the EPD system has been reviewed. On the whole, following the revision of 2007, the changes have made the trademark consistent with the indications of the new ISO 14025:2006 (ISO 2006a) standard encouraging both the diffusion of the label around the world and the harmonisation of the different existing environmental trademarks for the products. In particular, the main changes concern: the organisational and valuation structure of the system; the logo; the definition and identification of the product categories; the harmonisation and the consulting phase on an international level of the Product Category Rules (PCR) (Fieschi and Filareti 2008); the EPD contents; the subdivision of the internal and external documentary verifications and the opportunity to elaborate EPDs based on a unique impact category (Fieschi et al. 2008). Regarding this last aspect, the EPD information has been sometimes critised as being too generic, because it covers all the relevant aspects of the environmental performance of a product; one of the innovations introduced in 2008, was a specific declaration named Climate Change or Climate Declaration, connected with the specific contribution which a product or an activity has given for climatic change; in particular, this declaration describes the greenhouse gas emissions during each phase of the life cycle of a product, expressed in mass of CO_2 eq,(carbon footprint) (Lo Giudice and Clasadonte 2010).

The EPD system is valid for foods and other goods and, apart from Sweden, the countries which are testing and encouraging this system are Italy, Japan, Switzerland and Spain. As far as food and beverages are concerned (mineral water, extra virgin olive oil, milk, beer, biscuits, pasta, crackers, toasted bread, etc.) in July, 2012 there were 45 registrations:16 are Swedish products while 29 are Italian products (Swedish Environmental Management Council 2012).

These last data point out that the Environmental Product Declaration is fully used for the environmental communication linked to agricultural and food products.

- Earthsure

  It's a multi-criteria environmental labelling system which was developed in 2000 by the Institute for Environmental Research and Education (IERE) USA in order to guarantee environmental communication regarding products which respect the environment, to sensitise consumers and encourage them to buy these products and promote sustainable economy in the agri-food sector (Schenck 2008; Schenck 2009).

  The Institute for Environmental Research and Education is a non-profit organisation, founded in 1997, and it is headquartered near Seattle, Washington; it is the professional society for LCA in the US.

  The Earthsure labelling system started to be developed in 2000, following ISO TR 14025, and the eco-label (the Product Category Standard for meat production) has undergone a public process which has involved producers, consumers and interested parties (over 300 reviewers were engaged).

Earthsure is a declaration for a product based on LCA principles which fully conforms to the ISO 14025 of 2006 (ISO 2006a) Standard and it can be applied to all agri- industrial production systems covering the entire life cycle of the products (Earthsure 2009) from the farming to the selling. The Earthsure eco-label name was trademarked with the US Patent office in 2006.
The products certified by Earthsure are grouped into large categories while the criteria necessary for their certification are pointed out by a Committee which involves the delegates of the organisation which has asked for the certification, the suppliers, environmentalist ONG and consumers. The criteria are specific for each of the examined group of products and they include the evaluation of the most important environmental impacts on water, air and soil, pointed out through the complete analysis of the life cycle (LCA). Other important criteria are: the observance of laws and of the set of environmental standards and the presence of an environmental management system.
A careful evaluation is also done for the definition of the Product Category Rules (PCR) in order to fix precise standards to develop the LCA for the same category of products thus making it possible to compare the LCA and EPD studies based on the same PCR.

- CarbonNZero
  It's a mono-criterion environmental communication which can be obtained for foods and other goods (coffee, honey, travel, tourism, household goods, freight, etc.).
  The organisations certified by CarboNZero have requested the measurement of the greenhouse gas (GHG) emissions in the environment in order to quantify their impact on the global climate (Measurement and Reduction Scheme 2012). The CarboNZero programme was born in New Zealand and it has become the first greenhouse gas certification scheme which is internationally reliable and recognised by the International Accreditation Forum (IAF). International accreditation has been awarded by the Joint Accreditation System—Australia and New Zealand (JAS-ANZ), an international body established following a treaty drawn up by the governments of New Zealand and Australia.
  The certifications are issued following two independent steps: the ISO 14065:2007 (ISO 2007) specifies principles and requirements for the organisations which verify GHG emissions and the Cemars certification (CEMARS 2012) which is dedicated to the measurement and the management of greenhouse gas emissions; CEMARS points out and proposes plans for the reduction of greenhouse gas emissions issuing independent certifications for both actions. In order to obtain the CarboNZero certification organisations have to demonstrate that they have taken action in order to check greenhouse gas production, for example, by using renewable energy sources or by carrying out energy-efficiency rating projects or supporting reforestation.

- Carbon Reduction Label
  The Carbon Label Company was developed in 2007 by the Carbon Trust in partnership with the UK Department for the Environment, Food and Rural Affairs (Defra) and BSI British Standards (Carbon trust certification 2012).
  In 2009 the company became the Carbon Trust Footprinting Company whose aim was to provide fair and independent certification services, based on the measurement of the quantity of carbon and CO_2, contained in the products.
  The company supports the firms which have made a request to measure, reduce and inform about the life cycle of the greenhouse gas of their products and services including foods and beverages. The mono criterion issued label which clearly highlights the carbon mark, helps consumers to make more conscious choices oriented towards the reduction of carbon dioxide. It also informs consumers so that they can make a better use of the purchased products thus reducing their carbon mark.
  Carbon Trust has collaborated with the Department for Environmental Food and Rural Affairs, of the United Kingdom (Defra) in drawing up the PAS 2050 (BSI 2008) Standard which identifies in the ISO 14040 Standard the most effective and coherent instrument to determine the Life Cycle of greenhouse gas emissions of goods and services. Contemporaneously, the Code of Good Practice on GHG emissions and reductions claims (the Code) (Carbon Trust 2008), provides guidance on developing and making GHG emissions claims.
  The process to obtain the Carbon Reduction Label for a product is divided in different steps:

  – the entire chain involved in the realisation and supply of the product and its boundary thresholds are detected;
  – all the data connected with the entire chain are identified and collected, evaluating the carefulness and any cases of uncertainty;
  – with the help of a comprehensive toolkit a coherent carbon mark is built in conformity with PAS 2050 (BSI 2008);
  – then the certification which authorised the "Carbon Reduction" label is issued (PE International Sustainability Performance 2012).

- CarbonCounted
  The environmental CarbonCounted is a mono-criterion label and it has been proposed by the non-profit organisation CarbonCounted Carbon Footprint Solutions Canada; it can be issued for foods and other goods. (Carbon Counted 2012).
  Using a greenhouse gas stocktaking system based on PAS 2050 (BSI 2008), the company provides online consulting services for the firms which would like to calculate the carbon dioxide emissions related to the life cycle of their products; as a third party, the company also verifies the corporate data. Using the software, firms calculate the emissions and, following further verification, they can download and use the environmental label.
  According to Lewis et al. (2010) the methodology is not clear.

8.2.1.4 Other Labels

Even if Type IV Labels are considered as "environmental labels" because, indirectly, their adoption brings about environmental benefits, the main interest is often addressed to the biological quality of the foods, to the welfare of the animals, to fair trade, to the promotion of sustainable fishing, etc. Below is a report on a selection of the labels which are considered the most significant within this research.

- IFOAM Organic Production
  The International Federation of Organic Agricultural Movements' Standards is a global organisation, born in 1972, which develops, promotes and defends the principles of biological agriculture, facilitates its adoption and gives credence to all the worldwide organisms of biological certification (IFOAM 2009).
  The IFOAM crediting procedure is granted to the certification organisations which meet the criteria fixed by the IFOAM to guarantee fair trade in all countries. Certification by a third body is the formal procedure supported by documentary evidence which guarantees that the standards of biological production have been followed. Nowadays, some standards regarding biological production adhere to regulations fixed by over 60 governments and the foods sold as "biological" have to be produced following the European laws on the subject. These laws establish that these foods have to come from cultivators, workers and importers recognised by the organisations of biological certification, approved by IFOAM, or by a controlling body similar to the others present in the European Union.
  Biological production standards are based on a "best practice" set of criteria to differentiate the product from others coming from conventional agriculture. No evaluation of the life cycle is carried out to detect major environmental effects.

- Soil Association
  The Soil Association was set up in England in 1946 by a group of people concerned about the impacts that intensive agriculture might have on soil, foods, landscape, and so forth (Soil Association 2011). In 1967, the Soil Association drew up the first biological agriculture standards which were stricter than those established by national regulations, and in 1973 it elaborated the scheme for the related certification.
  Following this scheme primary production, foods, beverages, health and beauty products, textiles, ethical trade goods and so forth can be certified. The Standards cover all the aspects of biological product certification from production to packaging, the welfare of the animals, the preservation of wildlife and the ban on the use of food additives in transformed biological foods.
  The certification is issued by the Soil Association Certification Limited (SACL), an independent non-profit organisation affiliated to the Soil Association which also gives consulting services about all the aspects of biological certification. SACL is one of the ten bodies recognised in the United Kingdom which are authorised to issue biological certification.

Like other biological certification systems, the criteria used by the Soil Association to certificate agricultural products are not based on the evaluation of the impacts generated by the life cycle of the product but on best practice.

- Fair Trade Federation (FTF)
  The certification trademark "FairTrade Labelling" was born in 1988 on the initiative of Solidaridad, a Dutch development agency which promotes the sale of Mexican coffee produced without the exploitation of the pickers. In 1997, in Bonn—Germany, the International Fairtrade Labelling Organisations (FLO) was set up to join the initiatives of ethical labelling all over the world under a unique label, standardising the criteria and certification (Fairtrade labeling organisations international 2011). In 2009, the FLO along with the World Fair Trade Organisation adopted the Charter of Fair Trade Principles (Fairtrade labelling organisations international 2011) which became the only reference for fair trade.
  The Fairtrade system is presently managed both by the FLO, a non-profit organisation responsible for the strategic direction of fair trade and which establishes Fairtrade standards and supports producers, and the FLO-CERT, an independent certification society, which belongs to the FLO. The FLO-CERT inspects producers and traders to guarantee compliance with Fairtrade standards.
  Besides the international organisation, some national organisations are present in many countries and they work within the Fairtrade certification system; nowadays, in fact, worldwide there are 19 Fairtrade Labelling Initiatives which cover 23 countries in Europe, North America, Japan, Australia and New Zealand. Certifications concern foods, fibres and ornamental plants such as bananas, coffee, cocoa, cotton, flowers, fresh fruits, honey, fruit juices, sugar, tea and wine.
  From an environmental point of view, Fairtrade encourages eco-sustainable farm production and biological farming. Producers, in fact, have to protect the environment in which they live and work; they have to face the problems of soil erosion and of waste management; they have to follow national and international standards for the use of chemical products and they have to point out the impacts that their activities cause on the environment, and plan to reduce them and keep them under control.

- Stichting Milieukeur-SMK
  The SMK label is the Dutch State trademark for environmental quality which can be applied to foods and other products, and which was developed in 1992 by Stichting Milieukeuran, an independent organisation (CPI 2008; Liefferink 1996). The Eco-label Foundation (SMK), to which belong all the delegates of the parties concerned (environmental associations, consumers, industry and government officials) is the competent body which establishes the criteria for products and services. The criteria are developed for each of the products belonging to the same category.
  For agricultural and food products the criteria do not refer to precise environmental standards; they are based on the results of research studies which have

examined the entire productive chain and have pointed out the best agricultural practices. Generally, what is taken into account is the quality and quantity of fertilizers and pesticides which have been used, the watering techniques and the quantity of water and respect for the natural habitat; these data are updated on a yearly basis in order to take into consideration any new laws or the availability of new pesticides and/or of new technologies.
In the case of agricultural and food products, the environmental label SMK does not adopt the LCA approach; however, it provides a fair method to guarantee a good level of environmental quality given that the organisations which participate have to manage the productive cycle carefully and they have to satisfy a large number of criteria (Lewis et al. 2010).
With regard to non-food products, the environmental impacts of the single products/services are evaluated using the LCA approach; consequently, in this case, the SMK label is considered as a Type I label.
The certification is issued by certification bodies recognised by SMK and which conform to ISO 45011.

- Marine Stewardship Council (MSC)
  The Marine Stewardship Council is the communications label for sustainable fishing products. The MSC, an international non-profit independent body, based in the UK, was set up by the World Wide Fund for Nature (WWF) and Unilever to promote sustainable fishing. From 1997 to 1999 the MSC, in cooperation with a large group of interested international subjects, established and wrote a set of principles and of criteria to which all the companies and the organisations which want to obtain the certification and to use the logo have to refer (Deere 1999). The standard is based on fundamental principles such as the sustainability of the fish population, the minimisation of environmental impacts, the protection of ecosystems and the respect for local, national and international laws. The certification is issued by an independent third body, accredited by MSC and is subdivided in different phases in order to determine if fishing satisfies the MSC standard.

- Dolphin Friendly/Dolphin Safe/Salmon Safe
  These are eco-labels which can be used for foods, like tuna, which are produced using the techniques which protect dolphins and salmon (Sustainable Corporate Corporation 2001).
  "Dolphin Friendly/Dolphin Safe" promotes the protection of dolphins during the tuna fishing season; Salmon Safe certificates that the salmon comes from the drainage basins where the silt outflow of the farms, which is extremely toxic for these animals, is well controlled. Tuna fish with the label "Dolphin Friendly/Dolphin Safe" is sold in many countries all over the world; wine with the label "salmon-safe" is sold in America and is produced from vineyards which have adopted the controls on soil erosion to reduce the silt outflow.

8.2.2 Literature Review and Critical Analysis of Environmental Labels and Declarations in the Agri-Food Sector

Despite the fact that interest in environmental labelling of agri-food products is still lower than that in other productive sectors, in recent years it has certainly increased. This is demonstrated by the debate in the international scientific literature which tries to ascertain whether environmental concerns influence the attitude of consumers in their purchases and whether labels are an effective tool to induce real change both in consumers and in producers. Today, in fact, a great variety of environmental label schemes aim at guiding and promoting sustainable consumption. These product labels form part of a new environmental policy, which is market-based, consumer-driven, and jointly formulated and implemented by state and private associations. Environmental labels promote sustainability by giving the consumer information as to whether products meet or fail to meet certain environmental standards. However, especially in affluent societies, enabling the consumer to buy sustainable products by providing environmental labels is one important step towards increasing sustainability.

In order to analyse the effectiveness of this instrument of communication properly it is necessary to point out that its success is due to the activities of various subjects: producers/processors who should choose the appropriate label to communicate to the stakeholder their environmental commitment thus obtaining the right economic benefits; consumers who should be better informed about the value of the label to "re-push" the market towards eco-sustainable products; public and/or private bodies which should offer systems of stimulating, believable and effective visual communication based on instruments which measure the real improvements of the environmental performances of the product.

Many researchers have tried to study how "environmental labels and declarations in the agri-food sector" are perceived by producers and consumers and whether they influence their habits; above all, they have tried to highlight the points of strength and weakness of labels and declarations. A complete and comprehensive review on this subject nwas carried out by Defra (Defra 2010) within the "Effective approaches to environmental labelling of food products" project, and was published in November, 2010. The researchers who worked on the Report have examined more that 200 specialised scientific papers and more than 60 types of available labelling systems for foods and other products, analysing in detail: the scientific basis of the labelling; the effectiveness of its communication; the attitudes of the consumers and of the producers; they have also assessed the costs and benefits that the adoption of these systems require; the consequent environmental advantages.

In general, the literature review at first pointed out that the interest in environmental labelling was high worldwide, but it also remarked that the labelling dedicated to foods was limited, even if it was growing, and this was due to such factors as the peculiarity of the food products, the difference of the productive

systems and the difficulties, especially for the multicriteria labels, in determining and communicating exactly the environmental impacts in the involved areas (air, soil, water, bio-diversity, landscape, non renewable resources, waste materials, etc.). Moreover most of the labels for agri-food products were based on best-practice; they did not quantify the impacts and as a consequence, they did not give information about the damages and/or the achieved environmental benefits.

From the survey carried out some significant information has emerged about the effectiveness of this instrument; to give a full picture of the analysis, reference is made below to the most important aspects relative to the relevant actors who are differently involved in the agri-food chain: the consumers and the producers.

With regard to the first ones the analysis of the literature has pointed out that there are several variables which influence the purchase of food products, because consumers are guided by some important factors such as: price, distribution, availability, promotion, health and security, social, moral, economic and cultural differences (Defra 2010).

In particular, in relation to environmental labels, from the surveys carried out in Europe, it has emerged that the labelling weight on the purchase decisions remarkably change from country to country and that the more sensitive subjects are the better educated people, young people and women.

As far as the relationship between food and the environment is concerned, it has been noticed that the environment is not considered fundamental, except for the more sensitive subjects who consider the health of foods, the welfare of the animals, waste management and recycling important (Defra 2010; Eurobarometer 2009; Goedkoop et al. 2009; White et al. 2009).

The research has pointed out that consumers, during their purchases, seldom read and correctly understand all the information available on an environmental label, so it is necessary for the communication to be simple and readable; from this point of view, multi-criteria labels should speed up the decisional process of the consumers, changing their mentality towards agri-food sustainability.

In order to increase the interest of the consumers in environmental labelling, it is necessary to start a marketing and educational campaign based on environmental awareness and which should guide the market towards eco-sustainable and labelled food products. In this context an important role should be played by the governments, producers and resellers who should operate to make it easier for the consumers to make their sustainable choices (Defra 2010).

Despite the fact that producers have not yet been discussed in detail, (Nilsson et al. 2004), research has pointed out that the environmental labelling of agri-food products is not widespread both because it is not easy to determine the environmental impacts in such a varied sector and because the producers find it hard to communicate the attainable environmental benefits (Bruce and Laroiya 2007). However, this situation is changing: producers, in fact, are urged to use environmental communication labels according to the needs of the market which ask for a better security and quality of the production methods of the foods. For the producers, one of the reasons for choosing environmental labels, and which has been widely analysed by the literature, is the costs/benefit analysis (UNEP 2005). A lot

of producers, in fact, consider the costs of carrying out the logo procedure too high; moreover, the introduction into the markets of the labelled products takes too long and it becomes difficult to plan the return charges. The literature also highlights the mark up of prices for the consumer who cannot always justify its increase, especially in a period of worldwide economic recession. Economic incentives to the producers should become the regulating instruments to promote voluntary environmental improvements (Defra 2010).

The adoption of the trademark of ecological quality should give producers a competitive advantage helping them to gradually eliminate the products which do not respect the environment; this should contribute both to the sales and incomes growth and it should promote the change inside the supply chain improving the company reputation and creating a positive impact of the brand (Defra 2010).

In relation to the effectiveness that these systems have on the environment, from the analysis of the literature examined by Defra, it appears clear that the reliable data in literature are not so many, so it becomes necessary to collect further scientific data to have more information about their environmental effects (UNEP 2005; Defra 2010).

The uncertainty of the data is due to the fact that many labelling systems used today are of type IV; it means that they are based on "best practice" criteria and they do not enable experts to quantify exactly the environmental impacts on the different eco-systems; to collect more precise information productive sites should be better known, using the appropriate instruments of analysis. But this does not demonstrate that the labelling systems are inefficient; it only demonstrates that the research carried out so far is doubtful also because there are a lot of variables which influence the environment (Defra 2010).

More recent studies (Czarnezki 2011) point out that society is more aware of the fact that the agri-food sector greatly contributes towards environmental decay and the choices of foods can contribute to the climate crisis, can cause the loss of bio-diversity and of water, can endanger the quality of the air and quicken the decay of the soil. These studies confirm the importance of environmental labels as an instrument to promote a sustainable food system. Czarnezki also thinks that act the labelling system of agri-food products should be improved.

It has to be underlined that studies have been carried out also regarding the role of labels for the protection of the climate (Czarnezki 2011; Gadema and Oglethorpe 2011; Bonnedahl and Eriksson 2011; Zhao et al. 2012) and for the safeguard of water (Ridoutt et al. 2010; Ridoutt et al. 2012), sectors which seem to sensitise the public opinion.

Thus, buying labelled goods might well be a functional equivalent to other forms of sustainable consumption spurred and institutionalised by differing market and retailing conditions. In the future, more research is needed to take into account different patterns of sustainable consumption, the organisational varieties of environmental labelling arrangements, as well as differing market structures. This would help to further understand the complex dynamics and path-dependent developments that have shaped the markets for sustainable goods (Koos 2011).

8.3 Conclusions

Food choices contribute to the climate crisis, cause the loss of some species, damage water and air quality, and accelerate land use degradation. In particular, the large production and distribution systems of modern agriculture and commercial processing are powered by fossil fuels (Edwards and Laurance 2012). A lot of life-cycles of food products only have significant carbon footprints; these are some of the most important pollution impacts, but of course not the only ones, and in any case they have to be considered together and as interacting with all the other factors. However, quality eco-labelling of food requires accurate and verifiable information, and it must provide life-cycle information on production, processing, and distribution. Consumers must have access to aggregated information that takes into consideration the chemical additives, land stewardship practices, and fossil fuel consumption required to introduce any food into the market (Czarnezki 2011).

As shown in the preceding paragraphs, the aims of labels and of environmental declarations in the agri-food sector are: to help consumers distinguish among the products on the market those which respect the environment most; to induce consumers to buy this type of products giving, at the same time, to the more sensitive producers a competitive advantage in comparison with their competitors. Labels and environmental declarations can, therefore, been seen as instruments of environmental policy; starting from the concept of the responsibility of the producer, they are the drivers to promote the change in the production and consumption of foods in order to reduce the negative environmental impacts along the chain of this sector.

The review of the relevant literature has collected some knowledge concerning the labels and the environmental communications which delve into the highlights and shadows of these systems. The general context suggests that labelling can influence the behaviour of some consumers and it can encourage producers to reduce their environmental impact; it will certainly continue to play a role along with other initiatives, to improve the sustainability of food production and consumption. However there are many actions to take before making it credible, solid, practical and effective. Some criticism is related to the difficulties of determining, unambiguously and constantly in all productive sectors, the environmental impacts which occur in the different areas of the ecosystem. This is probably due to the fact that there are a lot of sectors to consider (air, water, soil, bio-diversity, landscape, natural resources, etc.) and that each method has its characteristics to investigate and its observed impacts to quantify. For this reason and to make labelling more believable, clear and fair towards the analysed products, labelling systems should envisage the possibility of having only one instrument to analyse and quantify the impacts. The LCA studies seem to be the most significant in that they give thorough information on the impacts and on the actions to be taken to reduce them, and they make it possible to compare the environmental performances of two or more products. Besides, it seems to be necessary to go through a phase of standardisation and normalisation of the methodology whereby impacts can be evaluated

and the whole system made more effective. In this perspective, a wider use of some existing harmonisation approaches such as the methods recommended by LCIA (Procter and Gamble 2012) should be welcome.

Another important aspect to point out is that labels have to communicate the message in a clear and easy way, allowing a fast comparison between the "best" or the "worse" products. The multi-criteria labels should be preferred to the mono-criterion ones, because they give information about different impact areas; the mono-criterion labels, in fact, show what happens in only one area, but they say little or nothing about other types of environmental pollution caused by the product. An effective environmental life-cycle eco-labeling system for food would inform consumers about the environmental costs of their food purchases and provide a baseline comparison for food in different production categories (Ridoutt et al. 2010). Consequently, it would be a good idea to establish reliable life-cycle environmental assessment methodologies for foods, and to determine the best way of supplying information to consumers to enable them to make informed choices (Roheim et al. 2011).

Of course, some very interesting actions in this direction have already been developed and are presently being discussed. Among these labels we have "The European Food Sustainable Consumption and Production Round Table" in which scientifically reliable and uniform environmental assessment methodologies are identified for food and drink products (European Food Sustainable Council and Production Round Table 2012).

For future studies, water is a critical resource supporting the health of humans and the ecosystem; the use of water is the most significant environmental burden in some product systems, so the development of methods of channeling water use is an important innovation occurring in life cycle assessment (Humbert 2010), but one must not forget that a single impact category is not an indicator of the overall environmental impact (Ridoutt et al. 2012).

Another consideration is that a list of relevant impact categories for the environmental assessment of food and drink products has to be outlined as a minimum requirement, with the option of additional impacts whose inclusion should be relevant, feasible and appropriate (Tlusty 2011; FoodDrinkEurope 2012).

To achieve that success, market benefits are necessary for environmental label and declaration programmes to influence production and management practices in any industry. To achieve these objectives, scientifically reliable and uniform environmental assessment methodologies should be identified for food and drink products; product category specifications should be included where relevant, considering their significant impacts throughout the entire life-cycle of the product. Moreover, it is necessary to identify suitable communication tools for consumers and other stakeholders and draw up some guide-lines as to the use of these tools, taking all channels and means of communication into due consideration. Finally, it is fundamental to promote and report on continuous environmental improvement along the entire food supply chain and engage in an open dialog with its stakeholders (European Food Sustainable Council and Production Round Table 2012). To achieve these purposes, we have proposed some guidelines, an

innovative instrument suitable for evaluating the characteristics and the environmental impacts of a product/service and for assisting the firms which are willing to apply an environmental label to their own outputs by choosing a communication system close to their activities through the evaluation of their objectives.

Improved labelling, schemes to support environment-friendly food consumption, and the market of available food products must be improved. Legal and marketing policies should support even further local, low-input, and nonindustrial unprocessed food markets through streamlined organic certification for small farmers, low-carbon diets, community-supported agriculture, farmers' markets, and increased consumer access to sustainable food products. The industrial conventional food market will continue to shift to organic production (to such an extent that perhaps, in the future, organic food will rival the conventional food market). Following these trends, improved labelling regimes will enhance consumer awareness by stating the environmental costs of consumer purchases; they will also create shifts in consumer choice and, consequently, will modify the norms of food production and distribution for farmers and companies (Czarnezki 2011).

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