

# **Industrial Food Quality - Policy and Management in Favour of Sustainable Development**

A study of the French food sector

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## Abstract

The report, designed for interested parties of the industrial food industry in France, is founded on three research questions inspired by literature studies of sustainable development, management of corporate social responsibility, industrial food production and food product quality. The research questions search for the identification and explanation of critical categories of concern relevant for addressing in industrial food quality policies in favour of sustainable development, the role of management tools (i.e. voluntary and informative steering instruments) and further steering instruments for enhanced industrial management. The empirical information of the report consists of qualitative data derived from a self-administered questionnaire based on five questions representing the three research questions, and applied in the entity of interviews made with 12 stakeholders selected as representatives of the French industrial food sector. The report can conclude that five categories of concern, i.e. satisfaction, health, environment, ethics and economics, summarized in the SHEEE model, have found support from the interviewed stakeholders and could be suggested as a potentially applicable framework in industrial policy development of food quality favouring a sustainable development. The crucial role of management tools for industrial adoption is confirmed by the research and three principal steering instruments are recommended for enhanced industrial management: 1) Voluntary instruments in the form of less rigorous operational management systems and increased availability of standards for objective setting; 2) Industry self-regulation for the incorporation of operational management systems and standards for objective setting as well as professional support and amplification of the trust vis-à-vis the consumer; 3) Informative instruments in the form of product labelling verified by third party (i.e. ISO Type I) in combination with further-going information from the producers enabled through off-pack communication (i.e. other information carriers than the packaging) such as private web sites. The benefits of this combination would be consumer trust, information value, awareness raising, little bureaucracy and incentives for sector wide quality improvement. In accordance with the scope of the thesis and the focus on the business agenda, the administrative and economic steering instruments appear only in the form of drivers and barriers of industrial management. Against the background of diverse reactions from stakeholders upon the role and appreciation of regulation and economic steering, those instruments will not be recommended as sole instruments and will thus not take predominant roles in the final recommendations. Moreover, these instruments will not assist companies on their way to increased efficiency of industrial operations and the need for voluntary instruments in the form of management tools will still be prevailing. Finally, suggestions upon subjects for future research would include possibilities for industry self-regulation of the French food sector, and optimisation programmes of labelling schemes with regards to inclusion of categories of concern and integration within the product life cycle.



# Executive Summary

## Introduction

Corporate social responsibility entered the European public policy sphere by the European Commission's Green paper from 2001 with the dual aim of launching a debate about the concept Corporate Social Responsibility (CSR) and identifying how to build partnership for the development of a European framework for its promotion. The document was followed by a Communication on CSR in 2002. (Commission Proposal COM(02) 347 final & French Ministry of Ecology and Sustainable development, 2005a)

CSR has in the European Union's Green Paper been defined as follows: "*A concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis*" (Commission Proposal COM(02) 347 final). Further, despite diverse approaches to CSR, there is large consensus on some main features such as:

- CSR is behaviour by businesses over and above legal requirements, voluntarily adopted because businesses deem it to be in their long-term interest.
- CSR is intrinsically linked to the concept of sustainable development; businesses need to integrate the economic, social and environmental impact in their operations
- CSR is not an optional "*add-on*" to business core activities, but about the way in which businesses are managed. (Commission Proposal COM(02) 347 final)

The French national strategy of sustainable development includes the following CSR ambitions (French Ministry of Ecology and Sustainable Development, 2005a):

- Encouraging all companies to commit to sustainable development.
- Integrating sustainable development onto goods and services, production and consumption methods.
- Developing innovation and company creation in fields of activity related to sustainable development.
- Development of companies' social and environmental responsibility, an essential condition of their proper governance.
- Implementation, at the State level, of an incentive financial system.

The French new financial law (nouvelle régulation économique (NRE), law number 2001-420 from 15 May 2001) states that companies on the French stock exchange market shall in their annual report declare their response to environmental and social consequences created by their activities. (French Ministry of Ecology and Sustainable Development, 2005c)

The President of the World Business Council for Sustainable Development (WBCSD) points out that companies need to address two sustainable development agendas (WBCSD, 2005); the "*public policy agenda*" driven by forces outside of business and the "*business agenda*", which focuses on the business case for sustainable development. (WBCSD, 2003) The business agenda is referred to in the Communication Proposal COM(02) 347 final on Corporate Social Responsibility (CSR), as "*enterprise policies*", whose objectives are "*to ensure a balanced approach to sustainable development, which maximises synergies between economic, social and environmental dimensions*".

Several are the guidelines developed to guide companies on their road, such as the United Nation (UN) Global Compact's ten principles on human rights, environmental and social aspects; the Organisation for Economic Co-operation and Development's (OECD) principles

of corporate governance; Global Report Initiative (GRI) for universal reporting; the ISO14000-series and EU's Environmental Management Audit Scheme (EMAS) for improved environmental management etc., all serving as steering instruments and tools for implementation. Despite this development of tools for facilitated understanding and implementation of sustainable development into business activities, one of the main challenges involved in effective adoption and execution of CSR is still the collection of relevant information and guidelines (World Bank Group, 2005).

Many small and medium sized enterprises (SMEs), defined in the European Union as companies with 15 to 249 employees, experience that available monitoring and certification schemes are developed for larger companies and that these systems tend to create a counterproductive administrative burden. Moreover, SMEs do often not have staff with sufficient environmental and social expertise. In countries within the OECD, 95% of businesses are SMEs and 60-70% of jobs are in these businesses. SMEs are often prevalent in industries with high resources and emission intensity, e.g. brewing, food processing, fish farming, textile making and more. (UNEP, 2003)

The SMEs have a central function in the French food sector by representing 90% of the number of companies and 40% of the turnover (French Ministry of Agriculture, Food and Fishery, 2005).

In the food sector, concerns for corporate social and environmental responsibility have developed alongside the more traditional health and safety concerns (Raynard & Forstater, 2002 as quoted by Cerne, 2003). Food is of concern to all people, in the form of food security (i.e. supply) and in the form of food safety (i.e. health). Food production is further a major human activity causing environmental problems, such as surface water and energy use. (Smil, 2000 as quoted by Aiking & de Boer, 2004) The increasing prevalence of obesity and diabetes; contested subjects such as genetically modified organisms (GMO); or pathogenic issues related to beef and poultry build the fear of the general public and the concern for food safety and health. The dietary risks are listed as one of the top ten leading risks to health globally, according to the World Health Report of 2002. Against this background, the Director-General of the WHO, Dr. Gro Harlem Brundtland, stresses that health should be mainstreamed in corporate social responsibility (CSR) initiatives. (WHO, 2003)

This thesis handles the industrial food sector and the second agenda of sustainable development - the "*business agenda*", referred to by the President of the WBSCD, or the "*enterprise policies*," as referred to in the European Commissions Communication on CSR. The aim of the thesis is to clarify what could be relevant expectations upon industrial food manufacturers in terms of critical areas of concern to address in food quality policies in favour of sustainable development and to investigate the current ground and future horizons for enhanced implementation and management of such policies.

### **Scope, purpose and methodology**

Designed for stakeholders of the industrial food industry in France, the purpose of the thesis is to suggest critical categories of concern relevant for addressing in industrial food policies in favour of sustainable development; and management tools for enhanced industrial implementation and execution.

The three research questions developed are inspired by literature studies of sustainable development, management of corporate social responsibility, industrial food production and food product quality in general and for sustainable development in particular:



- 1) Which are the critical categories of concern to consider in policies of industrial food quality in respect of sustainable development?
- 2) Could the availability of useful management tools (i.e. voluntary and informative steering instruments) be described as a crucial matter, i.e. driver or barrier, for industrial initiation and implementation of policies?
- 3) Which supplementary steering initiatives would be prone to enhance the industrial management in favour of sustainable development?

The empirical information obtained during the fieldwork, consists of qualitative data derived from a self-administered questionnaire based on five questions representing the three research questions. The five questions were applied in the entity of 12 interviews made with selected representatives of stakeholders of the French industrial food sector.

The analysis has been made on the basis of theories obtained during the literature review and presented in the theoretical chapter. Resulting conclusions and recommendations are presented in the end of the report, accompanied by proposals upon future research emerging from key areas of further development appearing during the thesis project.

## Conceptual context and theories

### *Policy development*

On the way towards a definition of food product quality in favour of sustainable development, the multi-disciplinary scientific sources detected during the literature review build a platform of categories of concern, potentially applicable for a food producer aiming for an inclusive food quality definition. The categories identified are five and can be summarised in the form of a model named “SHEEE”, as presented in Table 2-15. The model serves as a framework and represents an attempt to render concrete and food specific, the generic terms of corporate social responsibility. The category of “*satisfaction*” is based on quality theories of addressing pre-consumption expectations and post consumption experiences. The means assisting the consumer in making informed choices while providing satisfactory experiences through intrinsic product characteristics such as taste, smell and texture.

*Table 2-15 The SHEEE model is a model based on multi-disciplinary sources and represents a framework of categories of concern for industrial food quality in favour of sustainable development.*

FOOD PRODUCT QUALITY FAVOURING SUSTAINABLE DEVELOPMENT – THE SHEEE MODEL		
	CATEGORY	DESCRIPTION
<b>S</b>	Satisfaction	Consumer satisfaction: <ul style="list-style-type: none"> <li>• Pre-consumption, i.e. information.</li> <li>• Post-consumption, i.e. experience.</li> </ul>
<b>H</b>	Health	Products in respect of: <ul style="list-style-type: none"> <li>• Food safety.</li> <li>• Response to nutritional needs.</li> </ul>
<b>E</b>	Environment	Environmental concern: <ul style="list-style-type: none"> <li>• Natural resource use.</li> <li>• Emissions and wastes.</li> </ul>

<b>E</b>	Ethics	Business procedures in respect of: <ul style="list-style-type: none"> <li>• Human occupational welfare.</li> <li>• Animal welfare.</li> </ul>
<b>E</b>	Economy	Long-term profit build-up: <ul style="list-style-type: none"> <li>• Farmers and fishermen.</li> <li>• Producers of national food.</li> </ul>

*Implementation and management of policies*

Steering instruments, also called policy instruments, aim for guiding human and/or organisational behaviour in a certain direction. Those can be classified into groups and be developed by various initiators such as governments or industries. No generally accepted classification has been developed. Six main categories have been selected for this thesis, in accordance with a classification made by Dalhammar (2005): 1) Administrative instruments; i.e. regulatory tools such as bans, emission levels, chemical regulation etc.; 2) Economic instruments; e.g. taxes and fees, deposit-refund systems and tradable permits; 3) Informative instruments; e.g. consumer advice, education and labelling; 4) Voluntary instruments; e.g. management systems such as ISO standards; 5) Dialogues and voluntary agreements; i.e. various types of agreements between government and industry, where the voluntarism depends on the threats behind, i.e. the rules for non-compliance; and 6) Industry self-regulation; initiatives like the Responsible Care, developed by the chemical industry in the USA.

Steering instruments can further be divided into sub groups according to the level of visibility:

*“Non-visible instruments”* are certifications of organisational processes such as ISO 9000 or adoption of guiding principles such as the UN Global Compact. Rights for the use of their logotypes can be obtained, although these logotypes seldom are applicable on products.

*“Visible instruments”* are various types of product labelling. The ISO 14020-serie has been developed to classify and spell out expectations of different types of environmental labelling:

- ISO 14021: Environmental labelling Type I (1999). Ex : NF Environnement or EU Flower. Verified by independent body and based on criteria.
- ISO 14024: Self-declaration environmental claims Type II (1999). Ex. Symbols or labels developed by a producer. The label may take the form of statements or graphics on products, product literature and advertising.
- ISO 14025: Environmental label Type III (2000). A label licensed by independent organisations, providing information on the possible environmental impact of a product. The label does not build on any criteria. (Mont, 2005)

This thesis focuses on the voluntary instruments and the informative instruments, all representing tools applicable in industrial management. During the empirical data collection, industry self-regulation was mentioned and consequently brought up in the analysis and recommendation of the thesis.

On the basis of theories obtained during the literature review, three main characteristics stand out as desired features of management for sustainable development:

- 1) Integration, i.e. along the product life cycle and supply chain.
- 2) Inclusiveness, i.e. inclusion of categories of concern covered by the concept of sustainable development.
- 3) Feasibility, i.e. priority of product ranges and indicators.

A review of available management tools, conclude that there are (at least) 21 CSR guidelines and management systems available for the food industry in France. These were analysed against the management characteristics mentioned above. On the basis of this analysis the following conclusions can be made:

- 1) Global Reporting Initiative (GRI) is full-bodied in terms of inclusiveness and integration, but does only provide indicators and no management system.
- 2) The ISO-serie is integrated and inclusive by providing management systems for several categories and in general applicable in a wide range of organisations, which opens up the possibility for integration. The ISO 9000 and 14000 are the most widely applied of ISO standards. The ISO 22000 on food safety is new and has the feature of integration all through the value chain. The ISO 26000 concerning Corporate Social Responsibility will be the last brick in the set of sustainability management systems but will not be available before 2008. Until then, companies need to complement with management systems of ethical concerns, such as SA 8000. Despite the current gap of the ethical category, ISO offers integration and inclusiveness through the synchronization in between series.
- 3) EUREPGAP is full-bodied in terms of inclusiveness, but is concentrated to the raw material stage and is consequently little integrated.
- 4) OECD Guidelines, Sullivan, UN Global Compact and International benchmark; are all-inclusive CSR guidelines but lack the operational management support and needs to be backed up by other systems.
- 5) Little inclusive are Caux Principles for Business and Social Accountability (SA) 8000 addressing the ethical category of concern. Also EFSIS, BRC and IFS are modest in inclusiveness in building entirely on quality (mainly food safety) of processing and packaging. These systems are however integrated on two stages, raw material provision and product manufacturing.
- 6) Good Manufacturing Practice (GMP) refers to food safety of industrial processes. While useful in many aspects, they might be imprecise due to its intended wide application and needs hence support from more operational systems.
- 7) There is a lack of nutritional management systems. National Programme for Nutrition and Health (PNNS) provides guidelines but does not assist product developers in the management of nutritional aspects.

An inventory of informative systems available on the French market was further made. Represented by six labels (ISO Type I, verified by third party and build on predefined criteria), a number of gaps in the map of information systems can be identified. The gap identification was made against the background of categories of the SHEEE-model.

- *Satisfaction*. Not applicable. All labels are by nature included in the satisfaction category on the basis of their pre-consumption informative feature.
- *Health*. The general absence of “*food safety*” labels can be explained by limited need due to exhaustive regulation. Concerning the “*nutritional*” part of health, there is further no label. There is room for a possible completion of a labelling scheme guiding the consumer in their search for nutritional features of wide importance such as fat, sugar and salt content.
- *Environmental* information are represented by two labels; the label of Agriculture Biologique (AB) (i.e. organic food) developed and administered by the French Ministry of Agriculture, and the Marine Stewardship Council (MSC) label developed and administered by a private organisation based in the United Kingdom. The current set of environmental labels has limitations on the level of vertical integration; i.e. while guaranteeing specific characteristics of raw materials, the performance of other stages of the life cycle such as the manufacturing stage or transport are not covered. There is further no national official symbol for fishery, such as the AB for agriculture. The AB label has a relatively high consumer awareness level (18%), which places AB in a second position after the quality label Label Rouge and before the Appellation d’Origine Contrôlée (A.O.C) label (12%).
- *Ethics*, is represented by the label of Fair Trade label Max Havelaar, which covers a number of product categories sourced from the southern hemisphere. It also embraces the economic criteria of long-term profit of raw material producers. There is room for improvement within the map of ethical labelling schemes, by extended geographical coverage, extended product coverage and a possible development of a national official symbol.

The information gained during the literature review can conclude that several scientific sources suggest a policy making based on five categories of concern (i.e. Satisfaction, Health, Environment, Ethics and Economy), and that the management situation is challenging in general and for SMEs in particular, with regards to inclusion, integration and feasibility of management. On the management side, the map of informative instruments is further not complete, which render difficult the communication with the consumer.

## **Key findings from empirical data collection**

### *Policy development*

Four major conclusions can be made from the empirical data collection, upon stakeholder preferences of categories of concern to include in product quality policies in respect of a sustainable development:

- 1) Five categories of concern, i.e. satisfaction, health, environment, ethics and economy, summarized in the SHEEE model, have found support from the interviewed stakeholders.
- 2) Nutrition can be regarded as a part of quality for sustainable development but with attention to specific nutritional aspects and flexible application. This refers to the health category.
- 3) Information is widely enhanced. This refers to the satisfaction category.
- 4) Encouragement of cultural and/or individual preferences. This refers to the satisfaction category as well as the economic dimension of sustainable development.

### *Management and implementation of policies*

It can be concluded that stakeholders do consider the lack of management tools as a hurdle for engagement. The entity of barriers and drivers for engagement in sustainable development as mentioned by stakeholders, are listed below:

Barriers: 1) Management tools, i.e. “*how can I do this efficiently?*”; 2) Expectations, i.e. “*what should be my goal?*”; and 3) Consumer information, i.e. “*how can I turn effort into value?*”

Drivers: 1) Market potential, i.e. consumer demand and image; and 2) Supply potential, i.e. long-term supply of raw material and cost reductions.

Concerning the management tools, the set of available voluntary instruments identified in the literature review was completed during the empirical phase by the SD21000 guideline, developed on request by the industry, and provided by the French standardisation agency, AFNOR. The stakeholders further describe available systems as more numerous than applied, i.e. the problem is centred to the quality of management systems rather than quantity. The stakeholders identify the following deficits of available systems:

- 1) Low feasibility, i.e. high robustness, low flexibility, heavy administration and multiple audits.
- 2) Lack of meaning, i.e. lack of reference, standards or consensus upon expectations.
- 3) Lack of communication facilities with consumers.

Stakeholders mean that the situation incites a passive attitude and a “*non-action*”, as the build-up of own management systems is considered as time consuming and difficult, i.e. cost-inefficient and risk being ineffective as no common standards are available.

Concerning the informative instruments, stakeholders identify the following strengths, weaknesses and areas of improvements of available labelling schemes:

Strengths (all referring to ISO Type I, i.e. criteria based and verified by third party):

- 1) Build credibility and consumer trust.
- 2) Incentive for quality improvements.
- 3) Drive monitoring and control.
- 4) Minimum level of guarantee by promising “*at least...*”.
- 5) Raise awareness.

Weaknesses:

- 1) The high number, which confuses and reduces consumer retention.
- 2) The difficulty to understand, due to little background information and limited on-pack communication conditions.

Points of improvement:

- 1) Quantity control by harmonisation and no further additions.
- 2) Quality control by favouring third part certification.
- 3) A back-up system of deeper-going communication channels such as company sites featuring a second layer of product quality information.
- 4) Improved background information, i.e. consumer awareness by public as well as private initiatives.

## Conclusions and recommendations

The report can conclude that five categories of concern, i.e. satisfaction, health, environment, ethics and economy, summarized in the SHEEE model, have found support from the interviewed stakeholders and could be suggested as a potentially applicable framework in industrial policy development of food quality favouring a sustainable development.

The crucial role of management tools for industrial adoption of sustainable development is confirmed by in the report and three principal steering instruments can further be recommended for enhanced industrial management in favour of sustainable development, operating alone or in combination:

*Voluntary instruments:* 1) Operational management systems (i.e. voluntary instruments) improved by the launch of less rigorous management systems attracting enterprises in general and SMEs in particular; and 2) Increased availability of standards for objective setting achieving increased organisational efficiency (i.e. centralised standardisation), meaningfulness (i.e. factual effectiveness) and motivation of people working with it (i.e. value creation of efforts). Legislation is by stakeholders not perceived as a reasonable standard.

*Industry self-regulation:* Industry self-regulation would incorporate operational management systems and standards for objective setting. It would further constitute a centre of support for professionals and amplify the trust vis-à-vis the consumer. Industrial self-regulation such as the “*Responsible Care*” developed by the US Chemical Industry, might serve as inspiration for interested parties.

*Informative instruments:* The report can recommend product labels verified by third party (i.e. ISO Type I) in combination with more extensive product information from the producers, enabled through off-pack communication, e.g. web sites. Advantages of such a combination would be consumer trust (i.e. control by external party), information value (i.e. beyond first degree information provided by labels), awareness raising (i.e. ISO label Type I), little bureaucracy (i.e. producer’s own) and endorsed quality improvement (i.e. ISO label Type I).

In accordance with the scope of this report and the focus on the business agenda, the administrative and economic steering instruments appear only in the form of drivers and barriers of industrial management. Against the background of diverse reactions from stakeholders upon the role and appreciation of regulation and economic steering, those instruments will not be recommended as sole instruments and will thus not take predominant roles in the final recommendations. Moreover, these instruments will not assist companies on their way to increased efficiency of industrial operations, and the need for voluntary instruments in the form of management tools will still be prevailing.

## Future research

Suggestions upon subjects for future research would include possibilities for industry self-regulation of the French food sector, and optimisation programmes of labelling schemes with regards to inclusion of categories of concern and integration within the product life cycle.

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# 1 Introduction

## 1.1 Problem description

Corporate social responsibility (CSR) entered the European public policy sphere by the European Commission's Green paper from 2001 with the dual aim of launching a debate about the concept CSR and identifying how to build partnership for the development of a European framework for its promotion. The document was followed by a Communication on CSR in 2002. (Commission Proposal COM(02) 347 final & French Ministry of Ecology and Sustainable development, 2005a)

CSR has in the European Union's Green Paper been defined as follows: *“A concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis”*(Commission Proposal COM(02) 347 final). Further, despite diverse approaches to CSR, there is large consensus on some main features such as:

- CSR is behaviour by businesses over and above legal requirements, voluntarily adopted because businesses deem it to be in their long-term interest.
- CSR is intrinsically linked to the concept of sustainable development; businesses need to integrate the economic, social and environmental impact in their operations
- CSR is not an optional *“add-on”* to business core activities, but about the way in which businesses are managed. (Commission Proposal COM(02) 347 final)

In France, the French national strategy of sustainable development includes the following CSR ambitions (French Ministry of Ecology and Sustainable Development, 2005a):

- Encouraging all companies to commit to sustainable development.
- Integrating sustainable development onto goods and services production and consumption methods.
- Developing innovation and company creation in fields of activity related to sustainable development.
- Development of companies' social and environmental responsibility, an essential condition of their proper governance.
- Implementation, at the State level, of an incentive financial system.

The new French financial law (nouvelle régulation économique – NRE<sup>1</sup>) from May 2001 states that companies on the French stock exchange market shall in their annual report declare their response to environmental and social consequences created by their activities. (French Ministry of Ecology and Sustainable Development, 2005c)

Increasingly, businesses are called on to explain their policies and achievements, quantifying performances in areas where data collection can be complex. At the same time growing pressure for short-term results has been driving constant efforts to achieve optimum balance of market demands and progress in all areas of corporate social responsibility. (WBCSD, 2003)

In a speech given this summer President of the World Business Council for Sustainable Development (WBCSD) - Björn Stigson points out that business needs to address two

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<sup>1</sup> Law number 2001-420 from the 15th of May 2001 concerning the NRE.

sustainable development agendas (WBCSD, 2005). The first is a “*public policy agenda*” driven by forces outside of business and deals with the framework conditions that are set by society for business. The second agenda is the “*business agenda*”, which focuses on how companies can manage change toward sustainable development. This “*business agenda*” is referred to in the Communication Proposal COM(02) 347 final, as “*enterprise policies*”, whose objectives are “*to ensure a balanced approach to sustainable development, which maximises synergies between economic, social and environmental dimensions*”.

Several are the guidelines developed to guide companies on their road, such as the United Nation (UN) Global Compact’s ten principles on human rights, environmental and social aspects; the Organisation for Economic Co-operation and Development (OECD)<sup>2</sup> principles of corporate governance; Global Report Initiative (GRI) for universal reporting; the ISO14000-serie and EU’s Environmental Management Audit Scheme (EMAS) for improved environmental management etc, all serving as steering instruments and frameworks for implementation. Despite the development of tools for facilitated understanding and implementation of sustainable development into business activities, one of the main challenges involved in effective adoption and execution of CSR is the collection of relevant information and guidelines (World Bank Group, 2005).

Many small and medium sized companies (SMEs)<sup>3</sup> experience that available monitoring and certification schemes often are developed for larger companies and that these systems are inadequately suited to their needs and create a counterproductive administrative burden. Moreover, SMEs often do not have staff with sufficient environmental and social knowledge and expertise to address problems and opportunities related to environmental and social issues. In countries within the OECD, 95% of businesses are SMEs and 60-70% of jobs are found in these businesses. SMEs are further often prevalent in industries with relatively high resources and emission intensity (i.e. brewing, food processing, fish farming, textile making and more). (UNEP, 2003)

SMEs of the French food sector<sup>4</sup> play an important role in representing 90% of the number of companies and 40% of the turnover (French Ministry of Agriculture, Food and Fishery, 2005).

Food is of concern to all people, in the form of food security (i.e. supply) and in the form of food safety (i.e. health). Food production is further a major human activity causing environmental problems, such as surface water and energy use and more. (Smil, 2000 as quoted by Aiking & de Boer, 2004) Concerns for corporate social and environmental responsibility in the industrial food sector have advanced alongside the health and safety concerns (Raynard & Forstater, 2002 as quoted by Cerne, 2003). The increasing prevalence of obesity and diabetes; contested subjects such as genetically modified food (GMO); or pathogenic issues related to beef and poultry build the fear of the general public and the concern for food safety and health. The dietary risks are listed as one of the top ten leading risks to health globally, according to the World Health Report of 2002. Against this

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<sup>2</sup> The OECD groups 30 member countries which share a commitment to democratic government and the market economy. The OECD has further relationships with some 70 other countries, non-governmental organisations and civil society. The organisation is known for its publications and its statistics. The overall work of the organisation covers economic and social issues including macroeconomics, trade, education, development, science and innovation. (OECD, 2005)

<sup>3</sup> Definitions of SMEs vary according to world regions and countries. The European Union classifies SMEs into “micro” (i.e. one to nine employees), “small” (i.e. up to 49) and “medium” (up to 249). The OECD categorises according to “very small” (i.e. up to 19), “small” (up to 99) and “medium” (i.e. 100 – 499). (United Nation Environment Programme – UNEP, 2003)

<sup>4</sup> In France, companies with less than 250 employees are classified as SMEs, in conformity with the EU classification. (French Ministry of Agriculture, Food and Fishery, 2005)

background, the Director-General of the WHO, Dr. Gro Harlem Brundtland, stresses that health should be mainstreamed in corporate social responsibility (CSR) initiatives. (WHO, 2003)

This report handles the second agenda of sustainable development - the “*business agenda*”, as referred to by the President of the WBSCD, or the “*enterprise agenda*” as referred to the Commission’s Communication on CSR. Developed for interested parties of the French food sector, the aim of the report is to clarify what could be relevant expectations upon manufacturing enterprises in terms of critical areas of concern to address in industrial policies of food quality in favour of sustainable development and to investigate the current ground and future horizons for enhanced management of such policies.

## 1.2 Purpose of report

Designed for interested parties, i.e. stakeholders of the industrial food industry in France, the purpose of this report is to identify and explain industrial food quality in favour of a sustainable development from an industrial policy development and management perspective.

This means:

On the industrial policy level, the aim is to present a step towards a definition of food product quality in favour of sustainable development, i.e. identify and explain critical categories of concern that would be relevant to address in industrial food policies in favour of sustainable development.

On the industrial management level, i.e. the initiation and implementation of policies, the importance of management tools (i.e. voluntary- and informative steering instruments) will be assessed. Supplementary steering initiatives for enhanced industrial initiation and implementation of policies will further be identified and explained.

## 1.3 Research questions:

Which are the categories of concern relevant to address in industrial food policies favouring a sustainable development and the conditions for enhanced initiation and implementation of such policies?

- 1) Which are the critical categories of concern to consider in policies of industrial food quality in respect of sustainable development?
- 2) Could the availability of useful management tools (i.e. voluntary- and informative steering instruments) be described as a crucial matter, i.e. driver or barrier, for industrial initiation and implementation of policies?
- 3) Which supplementary steering initiatives would be prone to enhance the industrial management in favour of sustainable development?

## 1.4 Scope and limitations of report

### *The French food sector*

The report is designed for application by food producers or distributors of private brand operating on the French market. This is reflected in the literature review which covers both global and French conditions; and further in the research questions that have been designed for local stakeholders in the search for answers applicable in a local context. With reference to

the globalisation and geographical extension of activities of the product life cycle, the importance of integrated product management along the product life cycle and supply chain, is encouraged in the report. This was further also emphasized by several stakeholders.

#### *Administrative and economic instruments*

Against the background of; 1) a common consensus that corporate social responsibility represents a set of actions beyond legal requirements; 2) the purpose of the report (i.e. industrial policy development and management); and 3) priority reasons in the research project; the administrative and economic instruments will be treated in a limited way. This means that no inventory or analysis of current administrative or economic instruments is presented in the report (as it is for voluntary and informative instruments) and that those instruments reappear only in the form of drivers or barriers for enhanced industrial performance.

#### *Challenges of food production and consumption*

For the reason of priority, in a context of a broad set of scientific disciplines covered by the concept of sustainable development and further multiplied by plural life cycle stages, the challenges of food production and consumption are presented in the conceptual context with no intention to cover all relevant information. Instead the aim has been to give a flavour of the prevailing challenges related to the provision and eating of many of our food products available on the market, hence an enriched understanding for the background of the various categories of concern brought up in the report.

#### *Information*

All consumer information referred to in this report excludes advertising.

## 1.5 Methodology description

### 1.5.1 Conceptual context and background of research questions

In the description of the conceptual context, theories have been used to summarize existing knowledge, explain relationships and formulate ideas that through the research questions could be supported or rejected by empirical data. The theories that have been used are principally those within industrial food production; products and product quality; along with sustainable development and corporate social responsibility.

It is a general view that policy development for sustainable development should be established in respect of conditions of the area of application, hence by stakeholder inclusion. Against this background it was found interesting to create and get verified by stakeholders of the French industrial food sector, the relevance of a model for food quality in favour of sustainable development, developed on the basis of multi-disciplinary scientific information. The model is the result of four principle sources; 1) an international multi-disciplinary research project concerning food production and sustainable development named FOOD21; 2) the Global Reporting Initiative reporting indicators 3) the Wuppertal Research Institute's support (Turcer, 2005); and 4) theories upon product quality. The resulting five categories of concern included in the model are summarized under the umbrella name SHEEE, which represents Satisfaction of consumers (Sub-category: Pre-consumption & Post-consumption), Health of consumers (Sub-categories: Safety & Nutrition), Environment (Sub-categories: Resources & Emissions – gaseous, liquid and solid), Ethics (Sub-categories: Human occupational and Animal welfare) and Economy (Sub-categories: Long term profit of raw material providers and producers of national food).

It is further stated by some researchers and international organisations, that the prevailing conditions for efficient industrial management of sustainable development, with regards to the availability of relevant management tools, are unfavourable and constitute a barrier for initiation and implementation of policies in favour of sustainable development.

The multi-disciplinary SHEEE model (i.e. five categories of concern in food quality for sustainable development) and the observed management issue are the foundation of the three research questions of this report introduced under paragraph 1.3.

### **1.5.2 Empirical data collection and analysis**

A qualitative approach, i.e. based on a limited number of cases, has been taken to get approved or disapproved the model of food quality policy in respect of sustainable development and the theory of prevailing management issues with regards to the availability of relevant management tools. The qualitative approach has been applied for the reason of understanding and explaining the complexity, captured from the elaborated answering.

12 stakeholders of the French industrial food sector and a total of 14 interviews constitute the base of empirical data, collected through personal, telephone or email interviews and analysed against the background of presented theories. The stakeholders are:

- 1) French Ministry of Agriculture, Food and Fishery.
- 2) French Ministry of Ecology and Sustainable Development.
- 3) AFNOR - the French standardisation organisation.
- 4) ANIA - the French industrial food association.
- 5) SAI Platform – a European agri-industrial organisation for sustainable development.
- 6) Consodurable – a French group of actors and web site representing public authorities, non-governmental organisations, consumer associations and environmental organisations.
- 7) Carrefour – a leading retailer and holder of private brand products.
- 8) Findus – a producer of frozen food and a national brand.
- 9) Institut National de la Consommation (INC) – a centre of expertise and information for consumers and their associations.
- 10) Claude Fussler - a French consultant and representative of the United Nations and their programme Global Compact.
- 11) The Wuppertal Institute – a research institute including sustainable production and consumption.
- 12) The World Wide Fund for Nature (WWF) France – a non-governmental environmental organisation.

All the interviews were structured, i.e. consistent set of questions presented in a consistent order, and was administered through a self-administered questionnaire. The three research questions (RQ) has been translated into a questionnaire of five questions (Q), according to the following scheme:

RQ1 = Q1

RQ2 = Q2, 3 & 4

RQ3 = Q5

Q1: How would you define a sustainable food product? Answer by giving examples of aspects that you / your organization consider as being the most significant ones. To facilitate your answer, you can take support in the attached list of aspects identified by scientists and the Global Reporting Initiative guideline. Note that those aspects are general and their importance can vary between geographical locations.

Q2: Which are the most relevant tools available for food manufacturers with the ambition of implementing product policies for more sustainable food products? Answer by giving examples of standards (law, international conventions, branch specific standards, labelling schemes, own standards) and management systems (ISO, EMAS or other) and by referring to their effectiveness (result) and feasibility (practicality and costs).

Q3: How would you describe the usefulness of available labelling schemes? Answer by referring to completeness (product-, life cycle phase-, and aspect coverage) and information value (consumer relevance, credibility, visibility and comprehension) of available labels such as (AB, NF Environnement & Agro-alimentaire, EU Flower, A.O.C, Label Rouge, Max Havelaar and others).

Q4: Which are the main drivers and barriers for industrial implementation? Answer by referring to stakeholder pressure, economic benefits, organizational values, organizational resources (financial, know-how and time) or other.

Q5: Which three initiatives would be likely to increase the production and consumption of food products in respect of sustainable development, in Europe and particularly in France? Answer by giving examples of initiatives that are feasible and that would make a significant change, such as initiatives within regulation, standards, management tools, consumer information or other.

In Appendix I the French version of the questionnaire and the list of aspects exposed to the respondents for facilitated answering of Q1 can be found.

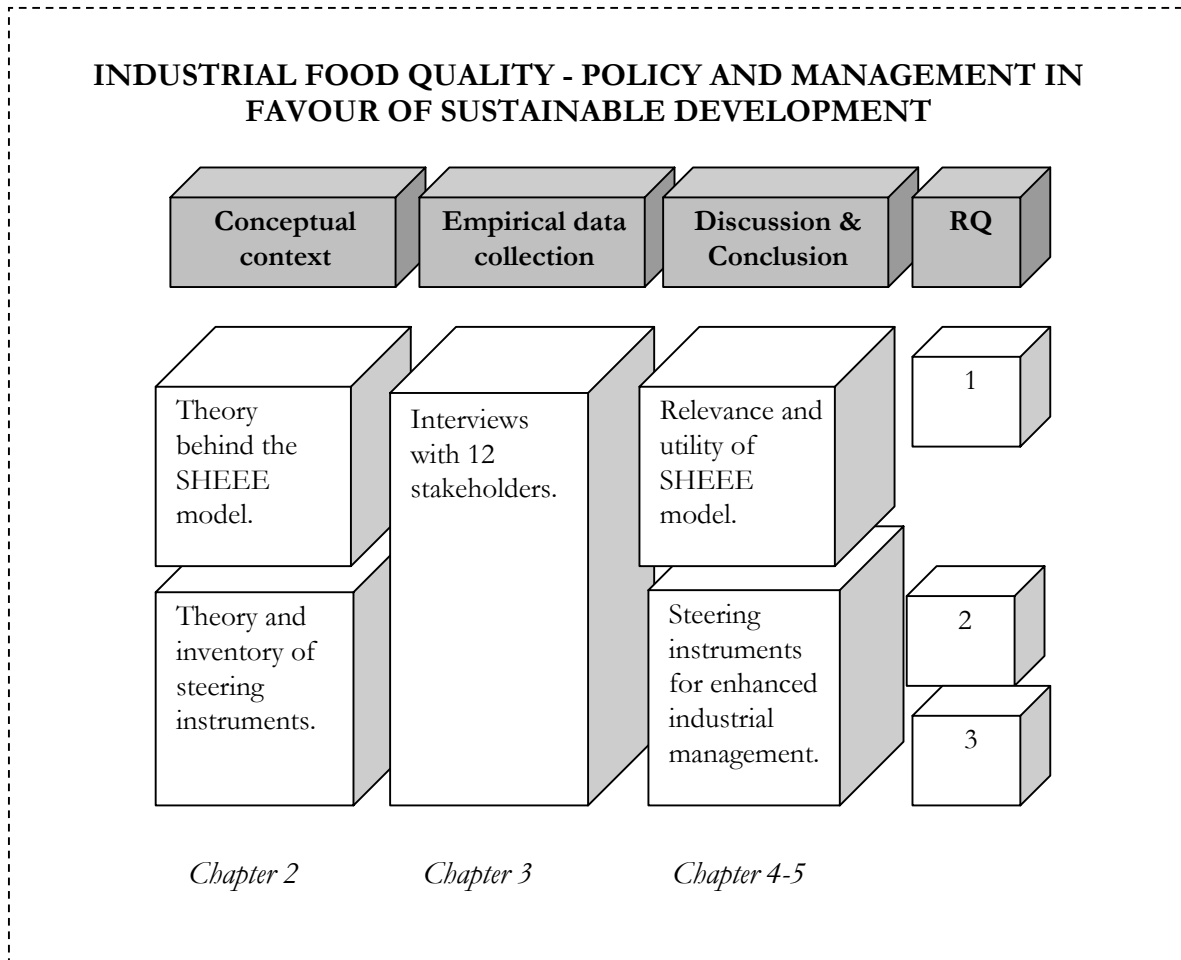
### **1.5.3 Discussion and conclusion**

The sum of empirical data has under the Discussion chapter (chapter four) been revised and discussed against a background of information and theories presented in the conceptual context. The conclusions (chapter five) have been made within the framework of presented research questions, and on the basis of the sum of data derived from the literature review and empirical data collection.

## **1.6 Research outline**

Figure 1.1 illustrates the three principal phases of the research project; theory, empirical data and conclusions; their linkage to the research questions; and what information that can be expected from each phase.





*Figure 1-1 Research outline.*

## 1.7 Validity of results

### 1.7.1 Internal validity

Internal validity can be described as the capability of the research structure to lead to clear conclusions (Budeanu, 2005).

The conversion of ideas formulated during the conceptual context, into instruments for empirical data collection, was made through the translation of three research questions into a questionnaire consisting of five questions (Q1-Q5), including one data sheet connected to Q1 for the facilitation of the respondent's answering and the analysis of the collected data. It needs to be pointed out that Q1 has turned out to be the most complex question to answer, as derived from the quality (completeness) of answers. In concrete terms, this means that three respondents did not consider themselves capable of answering the question at all and many respondents underlined the global and imprecise nature of their response. This is understood as the result of limited time, limited knowledge or limited feasibility of stimuli, alone or in combination. Consequently, a low validity of the empirical data upon accentuation of specific aspects cannot be excluded.

### **1.7.2 External validity**

External validity can be described as the possibility to generalize the research result to other contexts (Budeanu, 2005).

The results are primarily valid for food producers or distributors of private brands that market products to French consumers, sourced from internal- or subcontracted production facilities located in France. This refers back to the research question number one essentially referring to issues in France, due to a presumed predominant knowledge of respondents in national issues. However, in view of the geographical extension of supply chains and the delocalisation of production facilities the importance of integrated product management is encouraged in the report. Several respondents further also emphasized this.

## 2 Conceptual framework and theory

### 2.1 Sustainable development and corporate social responsibility

#### 2.1.1 Definition and scope of concern

In 1987 the report "Our Common Future" was published within the framework of the World Commission on Environment and Development (WCED)<sup>5</sup>. The report ties problems together and for the first time gives some direction for comprehensive global solutions to problems related to economic-, environmental- and social issues. It also popularises the term "sustainable development" defined as: development that meets the needs of the present without compromising the ability of future generations to meet their own needs. According to legal doctrine, this refers at least to the preservation of natural resources for the benefit of future generations and to the aim of exploiting those in a manner that is sustainable. (Faure, 2001)

In 1992 the UN Commission on Sustainable Development (UNCSD) was created to ensure effective follow-up of the 1992 United Nations Conference on Environment and Development (UNCED or "*the Earth Summit*") in Rio de Janeiro where world leaders 1) signed the Framework Convention on Climate Change and the Convention on Biological Diversity; 2) endorsed the Rio Declaration on Environment and Development<sup>6</sup> and the Forest Principles; and 3) adopted Agenda 21 - a 300-page plan for achieving sustainable development in the 21st century. (UN, 2005).

Prior to these commissions, a common concern of mankind had been established through the 1972 Stockholm declaration of the UN Conference on the Human Environment and the treaties clarifying concrete duty of states to prevent harm. This declaration also represents a shift from a rights-based system to protection and prevention. Further, the World Charter for Nature was adopted by UN General Assembly in 1982. (Tojo, 2004) Sustainable development is further introduced in Europe through the E.C. Treaty, as amended by of the Treaty on the European Union (also referred to as the Treaty of Maastricht) in article two<sup>7</sup>. (Faure, 2001)

Corporate Social Responsibility (CSR)<sup>8</sup> has in the European Union's Green Paper from 2001 on the subject been defined as follows: "*A concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis*" (Commission Proposal COM(02) 347 final). Further, despite diverse approaches to CSR, there is large consensus on some main features such as:

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<sup>5</sup> Our common future is often referred to as the Brundtland report, after the name of the Commissions chairperson Mrs. Gro Harlem Brundtland (Norway).

<sup>6</sup> The Rio Declaration , principle four, refers to sustainable development by stating: "*right to development must be fulfilled so as to equitably meet the developmental- and environmental needs of present and future generations*". (Faure, 2001)

<sup>7</sup> "*The community shall have as its task, by establishing a common market and an economic and monetary union and by implementing common policies or activities referred to in Articles 3 and 4, to promote through-out the Community a harmonious, balanced and sustainable development of economic activities, a high level of employment and of social protection, equality between men and women, sustainable and non-inflationary growth, a high degree of competitiveness and convergence of economic performance, a high level of protection and improvement of the quality.*"

<sup>8</sup> CSR is translated into French as RSE (Responsabilité Sociétale des Entreprises). The English term "social" is better translated into French as "sociétale" in order to embrace also the environmental perspective. (French Ministry of Ecology and Sustainable Development, 2005)

- CSR is behaviour by businesses over and above legal requirements, voluntarily adopted because businesses deem it to be in their long-term interest.
- CSR is intrinsically linked to the concept of sustainable development; businesses need to integrate the economic, social and environmental impact in their operations
- CSR is not an optional “*add-on*” to business core activities, but about the way in which businesses are managed. (Commission Proposal COM(02) 347 final)

CSR management system could assist enterprises in having a clear picture of the social and environmental impact; by targeting the significant aspects and helping them in managing them well. Regardless of sector, size, structure or maturity, companies would benefit from the inclusion of social and environmental issues into their daily operations. (Commission Proposal COM(02) 347 final)

A full adoption of CSR means that the company integrates CSR in their strategy, in their management systems and functions as well as their products and services (French Ministry of Ecology and Sustainable Development, 2005).

What constitutes CSR depends on the particular situation of individual enterprises and on the specific context in which they operate (Commission Proposal COM(02) 347 final). When designing the policies and management system, the scope and content of this work might differ depending on variable such as size of the company or type of business (products versus services), i.e. every company build their own tool suitable to their needs and resources. This means that the final tool can be built upon information, experiences and knowledge from various sources. What is important though is that the form and the structure can be used during a longer time period. This is important to achieve clarity and to enable internal and external comparisons over time. (Larsson, 2002)

Different levels of social concern are illustrated in Figure 2-1. People disagree about how far we should go. (Miller, 2004):

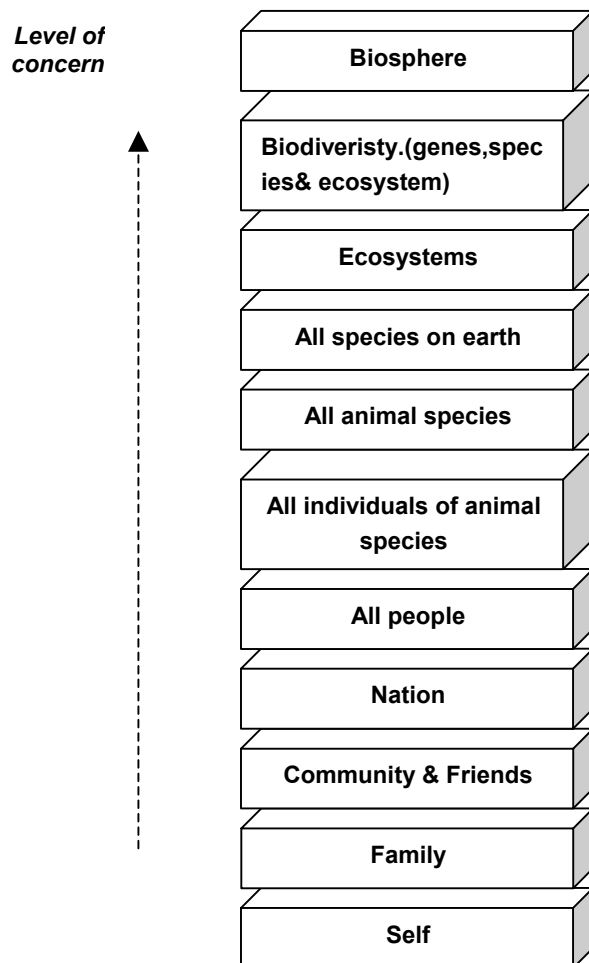


Figure 2-1 Levels of social concern. People disagree how far we should go. (Miller, 2004).

Finally, to close the paragraph about sustainable development and corporate responsibility, a citation from 1979: The French economist René Passet aimed for reorientation of economics by an article in *L'Economique et le Vivant* in 1979 stating: “*Defining the conditions which economic activity ought to respect, in order not to compromise the major adjustments of a natural milieu<sup>9</sup> to whose reproduction all others are subordinate. For any chosen sustainability problem, it is then necessary to specify the criteria by which durability and integrity will be judged*”. (Dougnet & O’Connor, 2003)

### 2.1.2 Sustainable development à la française

This paragraph will highlight specific characteristics of sustainable development appearing when translated into a given cultural context.

Sanches (2005) states that no clear behavioural pattern emerges at French national level vis-à-vis the environment and France is often rated as neutral or average in so called “*leader-laggard*” type of categorisations of countries, where northern countries often are considered as leading countries on the path to ecological modernisation. Sanches (2005) means that to understand this neutral attitude one needs to approach the national culture from a historical perspective. During the 17<sup>th</sup> century the prime minister of Louis XIV, Colbert, established the centralism

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<sup>9</sup> Milieu = environment.

and interventionism. Further, during the 18<sup>th</sup> century and the revolution, a secularisation and a hubristic approach to the environment were enhanced (Merchant, 2002, as quoted by Sanches, 2005). Sanches means that these forces have been contributing to a strong belief in science and reliance on the State.

Seen from a more recent perspective, the public interest for the environment was enhanced in 1968 and further developed during the 1970-80's into a field of technical intervention with focus on the different elements (i.e. air, water and soil). It was not until the 1990's in the light of the renovation of the European policy framework that a new environmental concern in a wider sense was established.

France has a rich environmental heritage<sup>10</sup>; still suggested preservation activities are less often driven by environmental arguments than by rural life and planning (*ruralité et aménagement*) triggered by the desertification of the countryside. Among the important policy initiatives that have been developed can be mentioned the Green Public Procurement Initiative launched in 1995; the TGAP (*Taxe Générale sur les Activités Polluantes* or General tax on polluting activities) approved in 1999<sup>11</sup>; and the eco-labelling schemes. Food labelling in France has a long tradition, through the 85 year old *Appellation d'Origine Contrôlée* (A.O.C) and the 40 year old *Label Rouge*, entailing an established structure and experience of certification expertise such as the French standardisation organisation called *Association de Normalisation Française* (AFNOR). However, environmental labels such as the French national label for organic agriculture, *Agriculture Biologique* (AB), have been struggling in strong competition from more well-established quality labels, which in addition benefit from an extensive feature attribution embracing material (i.e. small-scale, quality, *savoir faire*) and imaginary values (i.e. traditional values, *le bon vivant*). Although these representations change rapidly and the esteem of organic values augments constantly, the evolution could have been more striking by the support of strong environmental non-governmental organisations (NGO), playing the watchdog and raising awareness among the public. The NGOs have traditionally a weak position in France, due to relatively direct relations between the State and the citizens established through an interventional administrative system, which gives little space for intermediary bodies such as trade unions of NGOs.

Sanches (2005) means further that culture has been the main driver for the nation's reflecting upon consumption and new forms of interventionism. This response was manifested through the international trade negotiations upon cinema and food. The first dispute appeared during the Uruguay round on General Tariffs and Trade (GATT) in 1993 as a consequence of a suggestion made by the USA upon a liberalisation of the market of cultural goods. The French refuse, also supported by Canada, was later on recognised as the "*cultural exception*". In 1998, the dispute between Europe and the USA concerning hormone-treated beef ended up in by the World Trade Organisation's (WTO) disregard of the precautionary principle and claim that the European ban on American hormone-treated beef could was not justified. The American reaction in the form of hundred percent tax increase on imported European goods was supported by the WTO. The cases emphasize the importance of culture in the change of consumption patterns. In both presented cases, the products at stake were exposed to the threat of turning into commodities and subjects for consumption, while they unlike cars or

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<sup>10</sup> France is still a territory with a relatively low population density and is composed of small villages spread over 500 000 square kilometers of biodiversity rich land. In fact, France's surface represents 12% of the European territory and holds 40% of the continent's flora of species. (Sanches, 2005)

<sup>11</sup> The tax system established a double-dividend system where the revenues were reinvested in anti-pollution programmes. Despite this tax initiative, it is still claimed to be difficult to speak about comprehensive eco-tax system in France. (Sanches, 2005)

refrigerators have specific meanings attached to the utilization. Culture could thus be a vital factor in the establishment of more sustainable consumption policies and practices, equal to the expression of a social identity.

#### *Sustainable development and critical natural capital*

In order to better understand the exact concrete challenges of sustainable development, the French environmental institute, Institut Français pour l'Environnement (IFEN), developed and introduced in a report of 2002, the term “*critical natural capital*”, referring to natural resources and environmental services<sup>12</sup>, that are crucial, in the sense that their disappearance or degradation would disturb the development and well-being of present and future generations. The identification of critical natural capital is based on three steps: 1) the economic and social value of a natural resource; 2) its substitution; and 3) its threshold of irreversibility. (IFEN, 2002)

The report was partly based on a survey among administrative, scientific, business and associative representatives. The result of the survey indicates that the critical natural capital of France includes air, water, biodiversity and the landscape.

The result of this survey has been further analysed in an article by Douguet & O'Connor (2003) and will be presented in this final section about sustainable development in France.

To further explain the term “*natural capital*” and the connection to sustainable development from a French perspective, Douguet & O'Connor (2003) make some parallels to other terms such as “*natural patrimony*”. Natural patrimony is defined as “*a set of elements, associated with various categories of ecozones having territorial extension, and relating to the interests and uses of various human agents in the French society*”<sup>13</sup>. It can be stated that natural patrimony refers the building of natural wealth, which is a result of human investments in elements or ecozones of value. Closely related to natural patrimony is the term “*terroir*”. According to Douguet & O'Connor, this is untranslatable word that encapsulates symbolic and functional values in one by referring to the local spaces and soils and the symbolic value of goods and services. Examples of features are food, buildings and wider habitats, which in fact are the building blocks of the natural patrimony. The value of sustainable development passes hence through the perceived threats to the integrity of these patrimonial values and the collective transmission of meanings. Sustainability policies should thus build on social as well as environmental dimensions.

The conflict between the cultural value creation and the functional back up of the environment is what the analysis by Douguet & O'Connor (2003) is about.

To support the analysis, a categorisation of five environmental functions is introduced by Douguet & O'Connor (2003). The five functions are Noël & O'Connor (1989):

- 1) *Source* of resources, food, raw materials and energy.
- 2) *Sink*. A place of disposal of waste products and energy.
- 3) *Scenery*. Platform for scientific, aesthetic, recreational, symbolic and informational interest.

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<sup>12</sup> The terms “*renewable and non-renewable resources*” introduced in the figure, can be classified and explained as “*perpetual*” (ex. direct solar energy, winds, tides and flowing water); “*renewable*” (ex. fresh air, fresh water, fertile soil, plants and animals (biodiversity)); and “*non-renewable*” (ex. fossil fuels; metallic minerals such as copper, iron and aluminium; and non-metallic minerals such as clay, sand and phosphates). Further, the “*environmental services*” refers to services such as climate control, soil formation and renewal, waste removal and detoxification and more. (Miller, 2004)

<sup>13</sup> Patrimony is further referred to as something that is inherited from the past and transmitted to future generations.

- 4) *Site* for economic activity, which includes land use and space occupation.
- 5) *Life support*. Critical biophysical support for humans and other living organisms<sup>14</sup>.

It can be concluded from the survey result that high on almost every ranking are water, air, biodiversity and the landscape, which are all patrimonial components of the productive and aesthetic countryside, i.e. “*life support*” and “*scenery*”. Not perceived as critical, are aspects such as climate, energy resources and raw materials, which were also suggested in the multiple choice question presented to the respondents. Douguet & O’Connor underline that this should not be interpreted as those aspects are of little importance, but rather that they are of different importance, i.e. not a threat to the countryside in terms of qualitative degradation and decay. The analysis of the survey results, i.e. comparison between the respondents’ perceptions about critical natural capital and scientific data made by Douguet & O’Connor (2003) is presented in Table 2-1.

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<sup>14</sup> Biotic or living components are components such as plants, animals and microorganisms. Examples of abiotic, or non-living components, are water, air, nutrients and solar energy. (Miller, 2004)



Table 2-1 Perceptions about critical natural capital in comparison with scientific data (Dougnet & O'Connoer, 2003)

SURVEY RESULTS AND SCIENTIFIC DATA IN COMPARISON		
Aspect	Scientific data	Comment
<b>Forest assets</b>	Lack of pressure on French forests is partly due to import of wood from African sources. In effect, France might be importing sustainability. Further, planted forests consisting of the same type (i.e. fast-growing trees), same age and far removed from their natural conditions are more vulnerable to environmental changes such as tempests.	In coherence with survey results, i.e. relatively small threat.
<b>Energy</b>	France has relatively few primary energy resources within its territory; i.e. 0.1% of the world's primary energy reserves <sup>15</sup> . Energy supply is a vulnerably point for French economic stability, in producing 1.2% of the world's energy and consuming 2.5%.	Not in full coherence with survey results, i.e. there are reasons for concern due to the import dependency and nuclear waste.
<b>Climate/ Air quality</b>	Acid rain, green house gases (GHG) and CFCs are all objects for international agreements.  France has relatively light problems with acid rain compared to Northern European countries.  GHG is a global issue. Important nuclear production and reduction of coal usage have improved situation. Kyoto target of France: 0% increase of 1990's levels in 2010.  French companies, as a result of international protocols, have made adjustments of the use of CFC in the 1980's.	In coherence with survey results, i.e. reason for concern justified by transport fuel.
<b>Marine waters</b>	The geographical position makes France vulnerable to marine oil spill disasters. Examples are: In 1967 The Torrey Canyon spilling 117 000 crude oil in the English channel; 1978 The Amoco Cadiz releasing 200 000 tonnes light crude oil outside Bretagne; and 1999 The Erika letting out 30 000 tonnes of heavy fuel oil in Bretagne.	In coherence with survey results, i.e. reasons for concern confirmed by the exposure to oil spills.
<b>Food and water integrity.</b>	Increased concerns have been driven by issues threatening human health, such as the dioxin containing poultry from Belgium in 1999, which was a result of dirty waste water and sump oil entering the production process through animal feed <sup>16</sup> .  The French water resource suffer from more qualitative than quantitative scarcity due to: 1) Large scale irrigation practices, industrial uses and increased domestic consumption; and 2) Chemical contamination of groundwater and surface water and of foodstuffs themselves.	In coherence with survey results, i.e. reasons for concern.

The research made by Sanches (2005) and Dougnet & O'Connoer (2003) both accentuate the weight of adapting sustainable development to local cultural context, in particular for products with a certain meaning attributed to its use, such as film or food. This cultural dimension needs however to be balanced with scientific approaches as proven by the survey results of the IFEN study where perceptions and facts sometimes deviated.

<sup>15</sup> Coal: 50% of the coal consumed in France are imported and the national stocks are of size of 200 million tonnes, compared to Germany or the UK representing 20 000 million tonnes and 5000 tonnes respectively. Oil: Almost 100% of the oil is imported. (Dougnet & O'Connor, 2003)

<sup>16</sup> Elevated quantities of dioxin was found in chicken and eggs from a Belgian producer. Investigations revealed that this was the result of recycled oil (a mix of vegetal-, animal- and mineral oils) that was sold to producers of animal feed. These oils were carrier of dioxins and PCB. (Dougnet & O'Connor, 2003; & Feillet, 2002)

### 2.1.3 Drivers and barriers of corporate social responsibility

The following fundamental changes, identified by the Commission Proposal COM(02) 347 final, can be seen as drivers for recognition and implementation of CSR:

- *Globalisation.* Creating business opportunities as well as increased complexity, new responsibilities on a global scale.
- *Image and reputation.* Enhanced importance of image and reputation for competitive edge due to consumer's and NGO's request for information about how products and services are generated.
- *Investors.* As a consequence of the above, financial stakeholders ask for disclosure and transparency going beyond traditional financial reporting for better risk and success assessment and responsiveness to public opinion.
- *Competitive edge.* Increased value of knowledge and innovation, needed for competitive edge and retention of high skilled personnel.

Unfortunately the broad scope of aspects, numerous guidelines as well as limited resources and knowledge can lead to confusion. (Larsson, 2002)

This is supported by the World Bank (2005) stating, "*when organizations try to implement effective CSR programs one of the main challenges involved is the collection of relevant information and guidelines*".

Many SMEs experience that available monitoring and certification schemes often are developed for larger companies and that these systems are irrelevant or inadequately suited to their needs and create a counterproductive administrative burden. Moreover, SMEs often do not have staff with sufficient environmental and social knowledge and expertise to address problems and opportunities related to environmental and social issues. (UNEP, 2003)

### 2.1.4 The role of products in corporate social responsibility

This paragraph will pilot us through the role of products in the corporate social responsibility and theories of products in general and food in particular. Three principal product theories will be introduced which jointly enhance the complexity of product quality for satisfaction of needs of various stakeholders, including the environment.

Rondinelli et al. (2003) as quoted by Cerne (2003), mean that the principal concern regarding proactive CSR is the management of products, materials and processes that have a potentially negative impact on society and the matching with the CSR planning.

Some environmental problems are generated during the usage phase of products and cannot be managed with a process-oriented approach. This insight was a major driver for the European Commission's Green Paper of 2001 about Integrated Product Policy (IPP) (Mintcheva, 2005). The IPP emphasizes the importance of a holistic approach when addressing products' environmental impacts, i.e. covering the entire life cycle from raw material procurement to the end of life management. IPP is built upon three main pillars; 1) Better information flow and awareness raising; 2) Improved conditions for the actors of the market by clear rules, increased demand for sustainable products and internalisation of costs; and 3) Increased collaboration throughout the product value chain. Some state that food also

should be embraced by the IPP-perspective (Swedish Environmental Management Council, 2005). (Swedish Environmental Agency, 2005)

*The product seen as three levels – core, actual and augmented product*

A product is by Kotler et al. (2005) defined as “anything that is offered to a market for attention, acquisition, use or consumption and that might satisfy a want or a need”. A product can hence be a pair of Adidas sport shoes, a Renault truck or a U2 concert. A product can further be described as an entity of three levels, as illustrated in Figure 2-2 (Kotler et al., 2005). The starting point of product development is to satisfy the core consumer need - the prime driver behind efforts in any product design. The next step is the formation of the actual product and finally and potentially the augmentation. Together this will build that bundle of benefits that best can please the market.

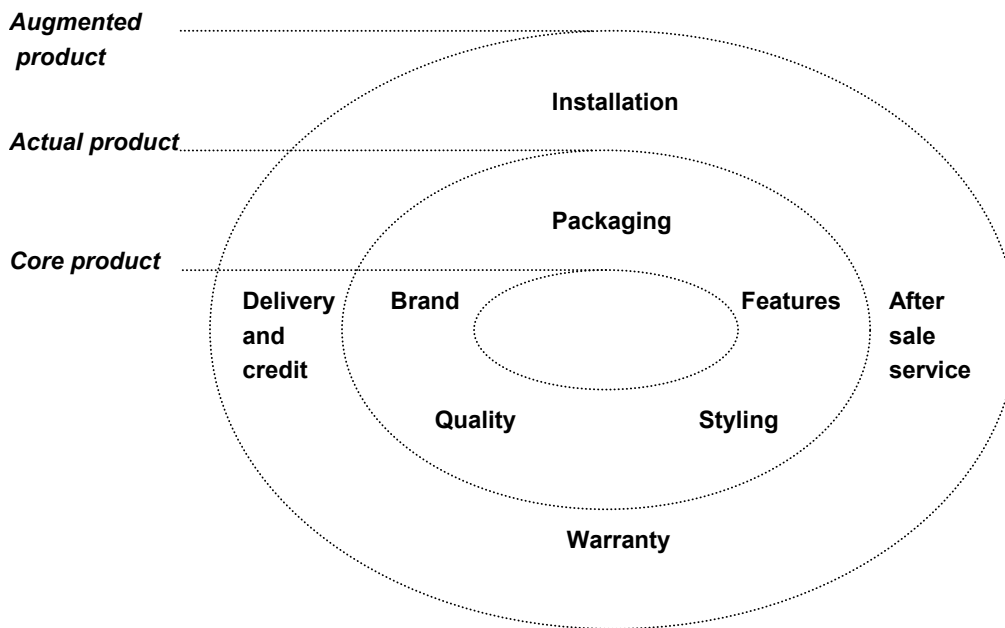


Figure 2-2 A product and its three levels - each adding further consumer value. (Kotler et al., 2005)

The product attributes, i.e. the actual product will be now be described further (Kotler et al., 2005).

- *Product quality.* Product quality is one of the major positioning tools. Quality has a direct impact on product performance and it closely linked to consumer value and satisfaction. In its narrowest sense, quality can be defined as “*freedom from defects*”. But most consumer oriented firms go further and define quality in terms of “*consumer satisfaction and retention*”.
- *Features.* A product can be delivered with varying sets of features; shifting from stripped down models to models with series of value adding characteristics.
- *Style and design.* Style and design are other ways of adding value to a product. Style describes the appearance of a product, whereas design also contributes to a product’s usefulness. Some companies have integrated style and design with their corporate culture, such as the car manufacturer SAAB.

- *Brand.* A brand is a name, term, sign, symbol, design or a combination of these, that identifies the maker or seller of the product or service. It is an important part of the product and can add value to a product. Today a product without brand is a rarity. Commodity products such as salt are packed in branded containers. Also fruit and vegetables are branded, such as Chiquita bananas or Del Monte pineapples.
- *Package.* The package may include three layers. First layer is the product's primary container (such as a food tray or a tooth paste tube); the second layer is packaging normally thrown away when the product is about to be used; and a third layer serving as a shipping container. Labelling and printed information appearing on or with the package is also a part of the package.
- *Labelling.* The role of labelling is triple; product identification (brand), description (i.e. content, nutritional values, user recommendations, as well as who, where and when it was produced) and finally promotion (i.e. graphics).

#### *The product seen as a life cycle*

In contrast to the static picture of the product previously introduced, a product can also be seen as a life cycle. This cycle is in general long and complicated and covers the wide area from the extraction of natural resources, design, manufacturing, assembly, marketing, distribution, sale, use and the waste management stage. Naturally, the process entails impact of desired or undesired nature in diverse functional and geographical contexts, which needs to be managed on design and operational level. Figure 2-3 illustrates the food product life cycle, its multiple stages and intervention points.

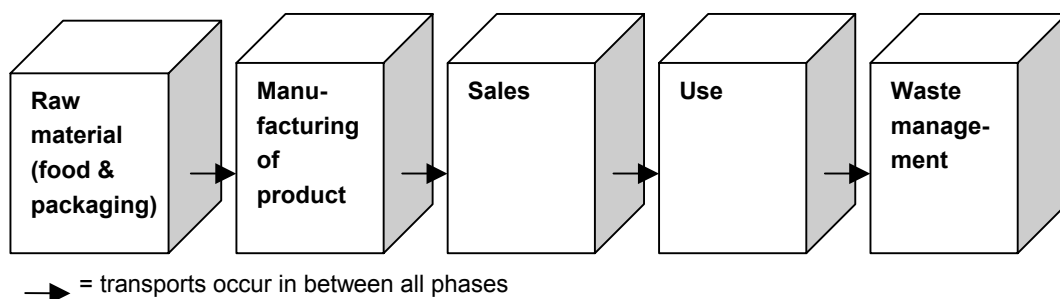


Figure 2-3 A food product seen from a life cycle perspective (FOOD21, 2004).

#### *The product seen as a carrier of value and information in the supply chain*

A product can further be seen as a carrier of value and a subject for information requirements (Eastham et al., 2001). For the product design, this demands a mutual reconciliation of forces and expectations from sources appearing at various stages in the supply chain. Supply chain management refers to the “*integration of business processes from en user through original suppliers that provides products, services and information that add value for customers*” (Eastham et al., 2001). Further, supply chain management is concerned with the sharing of information “*in order to save time, reduce costs, increase effectiveness and add value*” in the light of more dynamic markets, complex supply chains, importance of accurate consumer targeting and consumer satisfaction (Eastham et al., 2001). The basic structure of the food supply chain is illustrated in Figure 2-4.

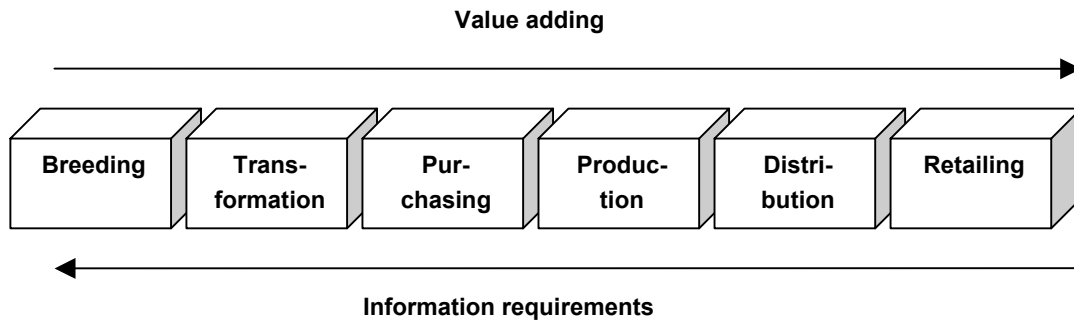


Figure 2-4 The basic structure of the food supply chain referring to the product as a carrier of value and information which needs to be addressed on product design level. (Eastham et al., 2001)

After this introduction to product theory in terms of the role in corporate social responsibility and rich flora of quality parameters to address for stakeholder satisfaction; the nature and impacts of food production and consumption will be presented in the next paragraph for an enriched understanding for the food industry and the relevance of an inclusive scope of societal concern.

## 2.2 Human food supply and food industry

### 2.2.1 Food chains and feeding of organisms

All organisms, whether dead or alive, are potential sources of food for other organisms. Decomposers eat plants and animals after they die. Hence, there is little waste in the natural ecosystems. The sequence of organisms is called a food chain. Every organism in the ecosystem is assigned to a feeding level, or trophic level from the Greek word “*trophus*”, which means “*nourishment*”. The levels consist of 1) Producers (i.e. plants); 2) Primary consumers (i.e. herbivores such as hares); 3) Secondary consumers (i.e. carnivores such as foxes) and 4) Tertiary consumers (i.e. top carnivores such as wolves). Each trophic level in a food chain contains a certain amount of biomass, which is the dry weight of all organic matter obtained in its organisms. The chemical energy stored in the biomass is transferred from one trophic level to another. Food chains rarely have more than four levels. This is explained by the energy loss occurring with each transfer, i.e. usable energy is degraded and lost to the environment as low-quality heat due to: 1) Only a small portion of what is eaten and digested is actually converted into an organism’s bodily material or biomass; and 2) The quantity of usable energy available to each successive trophic levels declines. The loss of each level is equal to 80-95%, hence only 5-20% is transferred to the next level. Translated into absolute figures and assuming 10% ecological efficiency (i.e. retained at each level) and 90% loss, the picture could look as follows: A plant contains 10 000 units of energy from the sun, 1000 units are left for the herbivores and only 100 for the carnivores. This reasoning is interesting from the point of view of human consumption, i.e. if people eat at lower trophic levels by consuming grains, vegetables and fruits directly, rather than letting them pass through other trophic levels, the energy content will be significantly higher. The energy loss is further the reason for the limited number of trophic levels and also explains why there are so few top carnivores such as eagles, tigers or white sharks. (Miller, 2004)

## 2.2.2 Human needs

Humans need to eat to live. Food and drink that are consumed enable the consumer to cover three basic needs:

- *Energy.* 2000 to 2500 calories per day for adults, in order to balance the function of organs; and physical and mental activities.
- *Nutrition.* Amino acids, fat, minerals, vitamins etc. are needed to assure growth of organism, take care of destroyed cells, and fulfil biological functions such as cell division stimulation by amino acids or blood pressure regulation by chemical mediators created from fat acids etc.
- *Water.* About two litres per day, from food and drinks, to compensate losses from waste elimination by the digestion process (i.e. urine/faeces), respiration and transpiration.

### *Undernutrition, malnutrition and overnutrition*

People who cannot grow or buy enough food to meet their basic energy needs suffer from undernutrition. Chronically undernourished people consume between 100 and 400 fewer calories per day than they need to maintain body weight and undertake light activity.

People who are forced to live on the low-protein high-carbohydrate diet consisting only of grains such as wheat, rice or corn often suffer from malnutrition, i.e. deficiencies of protein and other key nutrients.

Many of the world's desperately poor people, suffer from both under- and malnutrition. Those people are disease prone and adults are too weak to work productively or think clearly. About 20% of the people in developing countries were chronically under- or malnourished in 2000.

An increasingly number of people in developed countries suffers from overnutrition; a condition in which food energy intake exceeds energy use and causes excess body fat (i.e. obesity). Too many calories and too little physical activity, alone or in combination, can cause overnutrition. In fact, people who are underfed and underweight and those who are overfed and overweight face similar health problems, such as lower life expectancy, greater susceptibility to disease and illness and lower productivity and life quality. Overnutrition is the second leading cause of preventable deaths after smoking, mostly from heart disease, cancer, stroke and diabetes. (Miller, 2004).

## 2.2.3 Evolution from gathering to industrial production

### *From gathering and hunting to agriculture and cooking*

Long ago man obtained food by hunting, fishing and gathering. Agriculture or plant production constituted a considerable change in food supply. The invention of the use of fire in food preparation, approximately 500 000 years ago served as an opening to a set of new food products. Several, particularly starchy plant parts could be made more easily digested by heating and many animal food products became more attractive for consumption. Pieces of food were initially put in hot ashes or on hot stones. This heating process was later improved by the development of equipment such as the spit and grid as well as the invention of pottery making that made it possible to cook food above the fire. Pots further turned out to be very useful for storing foods. (Jongen & Meulenberg, 2001)

### *Storage and preservation*

Storage of food and its preservation were a matter of life and death due to the periodicity of crop production. Heating of foods improved their preservation potential. However, heat treatment alone was insufficient since this only resulted in a temporary reduction of the number of micro-organisms and not in their permanent exclusion. Smoking foods was a better form of preservation due to two simultaneous effects, drying and the application of chemical compounds with a preserving effect. Drying in open air was practised too, preferably in the sun. Cold storage was possible in some regions. Later on, salt and sugar became available as preservatives. Mostly preservation methods were combined. (Jongen & Meulenberg, 2001)

### *Baking and fermentation*

Milling of grain was the next important development in the food preparation. This practice allowed the separation of grain and chaff. Very soon many uses for flour were developed, including making porridge or bread. During storage porridge and dough could start to ferment. Fermenting porridge eventually yielded beer. Fermented dough or sourdough rose during baking and produced more attractive bread. Gradually many other fermented food products were developed such as wine, cheese, yoghurt and sauerkraut. Fermentation contributed to preservation but it also improved taste. These historical developments in technological possibilities for food preparation and processing have eventually led to the range of food products available to the present day consumer. (Jongen & Meulenberg, 2001)

Miller (2004) summarises current status of modern global food production as a result of five areas of development: 1) Improved equipment (farm machinery, fishing boats and gear); 2) Increased water supply through irrigation; 3) Inorganic (industrial) chemical fertilizers and pesticides; 4) Densely populated feedlots for cattle, pigs and chicken; and aquaculture ponds and ocean cages for fish and shell raising; and 5) High yield varieties of wheat, rice and corn.

### *Industrial production*

Some decades ago, a certain homogenisation of food production took place. This development occurred when traditional methods were replaced by mechanized, large-scale industrial production processes. Uniformity in the consumer need, formed the basis of the success of the products that the newly developed industries offered. In the course of time, industries started to diversify their supply of products. Diversification was further stimulated by increasing prosperity after World War II. Advances in technology facilitated the high volume production, with no violation of productivity levels. (Jongen & Meulenberg, 2001)

The French food industry before the 1960s is described by Nefussi (1990) as a sector occupied by the transformation of agricultural produce. During the 1960s it gradually became autonomous from agriculture and imposed its own technical standards on farm output in the setting of a contract-based economy. Marketing of food and product differentiation gained further increasing importance in the light of the commercialisation of processed foodstuffs adapted to the growth of modern forms of retailing and distribution. In France, the productivity gain of the food industry was recognised by an hourly productivity growth of 7.5% per year during 1964-1971, which was higher than other industrial sectors (6.1%). Despite the growth of the food industry; the annual growth rate in capital intensiveness during 1964-1977 was 4.6 % in the food industry as against 5% in the rest of the industry. The number of operating firms further decreased by 10 000 during 1960 and 1975.

The productivity has further entailed a remarkable price reduction. In 60 years time prices have been reduced by 50% in the USA (1940: 21% of income spending; 2004: 10-12% of income spending). This pattern has however developed differently among countries; in Japan

18% of the income is still spent on food and 40-70% in developing countries. (Jongen & Meulenberg, 2001)

## 2.2.4 The French food sector

The food sector (IAA)<sup>17</sup> embraces all the stages from agriculture and fishery to distribution. The food industry transforms raw material to food products or animal feed. The majority (70%) of agricultural output is processed in some way. Besides the transformation of raw material, it assures essential services along the food chain such as; 1) production of food products of high quality with regards to conservation, hygiene, safety and consumer satisfaction; 2) preparation, packaging and expedition of products to distribution centres; 3) provision of new products enabled through research; and 4) consumer information and promotion. (French Ministry of Agriculture, Foods and Fishery, 2004)

The food sector is the leading industrial sector in France seen to turnover and the second largest with regards to number of employees. It is further an important employment sector in rural areas. The turnover reached 124 billion euros in 2003 through the operations of about 3000 private companies or co-operatives (with more than 20 employees or a turnover higher than 5 million euros) and close to 400 000 employees.

Small or medium sized enterprises (SME)<sup>18</sup> play an important role; with its weight of 90% of the number of companies and 40% of the turnover. The success of SMEs often refers to specialisation in a specific market segment or niche. The market is further enriched with another 10 000 enterprises with less than 20 employees.

The concentration varies among types of market segment. Examples of concentrated segments are potato transformation, water and refined oils where the four leading companies jointly represent 70% or more of the turnover of the segment. Less concentrated (i.e. 30-50% of turnover) are milk, butter as well as fruit and vegetable transformation. Examples of modestly concentrated segments (i.e. <30%) are cheese, fish, beef cattle and poultry. (French Ministry of Agriculture, Foods and Fishery, 2004)

## 2.2.5 Regulatory framework

Food regulation within the European Union (EU) has taken a “*farm to fork approach*”, built on safe food and the consumers’ right to information. The EU food law aims at ensuring a protection of human life and health, including the protection of animal health and welfare, plant health and the environment. This integrated “*farm to fork approach*” is considered a general principle for EU food safety policy. The General Principles of Food Law (Articles 5 to 10) entered into force on 21 February 2002. Existing food law, including its procedures, must be adapted by 1 January 2007 in order to comply with the general framework established by Regulation/EC/178/2002. The food law establishes the rights of consumers to safe food; and to accurate and honest information. It incorporates elements related to product food safety such as the management of risk analysis, alert system, transparency, traceability, labelling and claims upon specific product features. More information about the principal elements of European food law can be found in Appendix II.

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<sup>17</sup> IAA = Industrie Agro-Alimentaire. Translation from French to English the author or this report.

<sup>18</sup> Companies with less than 250 employees are classified as SMEs.



## 2.3 Challenges of food production and consumption

This paragraph will introduce a perspective of food product quality based on a concern for needs of various stakeholders including the environment, i.e. food product quality for human, animal and environmental satisfaction. The paragraph embraces multiple steps of the life cycle and brings up a number of points for consideration applicable in product development and operational activities throughout the industrial food chain. All potential concerns will be far from covered but each life cycle phase a subject for reflection. Before entering into the life cycle phases, a short introduction will be given in the form of objectives for future global food supply and attention to noticeable environmental pressure caused by the food supply chain.

Historically humans have depended on three systems for their food supply: croplands (mainly grain production equal to 76% of the world food supply), rangelands (meat production from grazing livestock equal to 17% of the world food supply) and oceanic fisheries equal to 7% of the world food supply). To feed the world population of 9,3 billion projected by 2050 we should strive for improvements on the supply- and execution levels, with the following dual objective (Miller, 2004): 1) Increased and equitably distributed food supply; and 2) Environmentally and socially sustainable execution. (Miller, 2004)

A range of sources has reframed focal areas of environmental nuisance caused by the food supply chain. Two of them will be introduced as an opening of this paragraph, serving as a trace for the continued reading about challenges of food production. The first source is UNEP and their six identified key environmental impacts of agricultural products (UNEP, 2001 as quoted by Mintcheva, 2004):

- 1) Depletion of natural resources
- 2) Land degradation and land contamination
- 3) Water contamination
- 4) Carbon dioxide (CO<sub>2</sub>) and other air emissions
- 5) Hazardous and urban waste
- 6) Food and bio-safety issues (i.e. genetically modified organisms)

The second source is an example of a food life cycle analysis (LCA)<sup>19</sup>, made upon tomato ketchup. The critical areas of environmental concern in the tomato ketchup chain are illustrated in Figure 2-5. (Swedish Institute for Food and Biotechnology, 1998, as quoted by Mintcheva, 2004)

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<sup>19</sup> See footnote 62 for further information about LCA. This LCA was performed in Sweden. It concerned a tomato ketchup sold in 1 kg plastic bottle (polypropylene with five layers) made of tomato paste imported from Mediterranean countries. A lower validity of results when applied to other geographical contexts and other food value chains (ex. chilled and frozen product who require energy for storage during the entire chain) can not be excluded, still the results serve the enriched understanding for environmental pressure caused by food production.

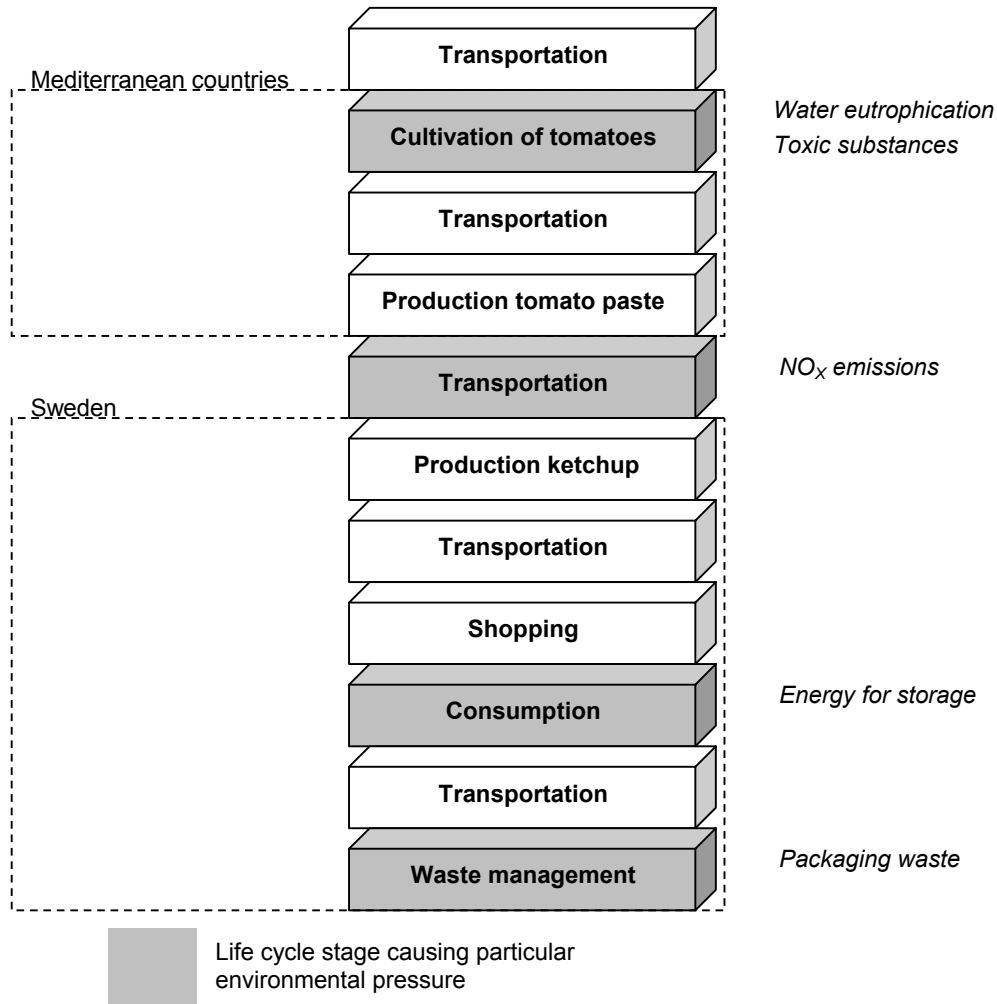


Figure 2-5 Critical areas of environmental pressure caused by the tomato ketchup supply chain as identified by a life cycle analysis made by the Swedish Institute for Food and Biotechnology in 1998. (Mintcheva, 2004)

### 2.3.1 Food raw material provision – agriculture, livestock and fishery

#### *Agriculture*

The productivity of agriculture is a function of size of cultivated area and the yields per unit of area. During the past last 50 years most of the increase in global food production is due to increased yield per unit of area. This process is called the first green revolution and can be summarised in three points: 1) Monoculture (i.e. selectively bred or genetically engineered high-yield varieties of key crops such as rice, wheat and corn; 2) Large inputs of fertilizers, pesticides and water; and 3) Multiple cropping (i.e. several crops grown per year on one piece of land). The positive outcome of this land use efficiency, i.e. saving of large areas of forests, grasslands, wetlands and eroded mountain terrain, is the contribution to a kept biological diversity. Figure 2-6 gives the current split of land use of the earth's surface (Miller, 2004).

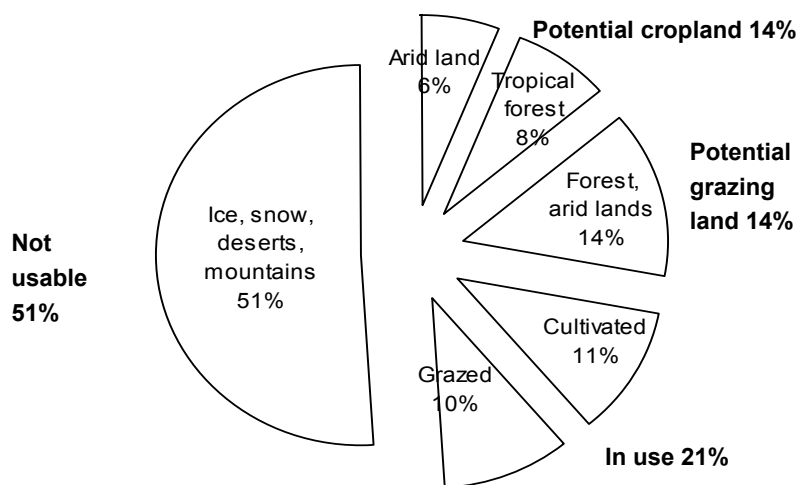


Figure 2-6 Current and potential usage of the Earth's land surface. (Miller, 2004)

One type of more sustainable agriculture is organic farming, in French called “*agriculture biologique*”. Organic farming is the result of EC Directives of 1991 and elements of the Codex Alimentarius<sup>20</sup> from 1999. Organic agriculture means: 1) No inorganic fertilizers (replace by manure or organic waste); 2) No pesticides (replaced by biological methods); 3) No GMO<sup>21</sup>; 4) No pharmaceuticals used in animal feed; 5) No adding of chemical substances to the soil during last two to three years; 6) No sewage water residues<sup>22</sup>; 7) No deep ploughing, soil aeration and an active flora promoted. The production phase is further little developed, i.e. interdiction of some additives and ionizing radiation. Two main advantages with organic agriculture are: 1) Environmental protection, i.e. little natural resource degradation (air, water, soil) and conservation of biological diversity; 2) Human health, i.e. reduction of substances such as pesticides that are harmful due to its body accumulation, nitrates and pharmaceutical residues in foods of animal origin. On the other side, airborne pollution such as dioxins are equal to traditional products. (Feillet, 2002) Currently organic farming is practiced on less than 1% of the world's croplands. In the United States the area corresponds to 0.2% whereas in some European countries it reaches 6-10% (Miller, 2004). In France, organic agriculture is applied to 1% of the cultivated area, which means 316 000 hectares and 8000 producers<sup>23</sup>. The market is steadily increasing; statistics indicate that the market grew with 25% yearly since 1995 and that in 2001 30 % of the French people bought foods from organic agriculture. On the producer side the picture is highly fragmented with a high number of small producers. (Feillet, 2002) Table 2-2 lists central features of low-input sustainable agriculture and fishery (Miller, 2004).

<sup>20</sup> Codex Alimentarius is an example of a good manufacturing practice (GMP) presented under the paragraph about voluntary steering instruments.

<sup>21</sup> Advantages and disadvantages of GMO are listed in Appendix III.

<sup>22</sup> “Residue sediments” are residues from water treatment stations, remaining after treatment of urban domestic sewage water. Their status of something inbetween waste and commercialisation permits this application. (Feillet, 2002)

<sup>23</sup> The governmental target is one million hectares and 25 000 producers. (Feillet, 2002)

Table 2-2 Examples of practices for sustainable or low-input agriculture and fishery. (Miller, 2004)

Low input agriculture and fishery practices
High-yield polyculture <sup>24</sup> , crop rotation and perennial crops rather than annual.
Soil conservation (avoidance of soil erosion, salinization and overgrazing).
Irrigation efficiency and use of more water efficient crops.
Organic fertilizers instead of chemical.
Integrated pest management and biological pest control rather than chemical.
Prevention of overfishing.
Subsidies for more sustainable farming and fishing.

Feillet (2002) identifies two major barriers for the practice of organic agriculture in France: 1) Increased production costs (20-30% more costly than traditional products); and 2) Delay from French farmers to respond to demand.

An alternative to organic agriculture is what in French is called “*agriculture raisonnée*”<sup>25</sup>. This practice aims for balancing the economic objectives with consumer expectations and environmental protection. Its main features are the rejection of systematic application of fertilizers and pesticides; instead it aims for “*the proper dose at the proper moment*”. The formal objective of this practice is to “*manage, in the best possible manner and with respect to its exploitation, the positive and negative environmental effects of the agricultural activities, while assuring the food product quality and the maintenance or improvement of the financial profit of the development*” (Paillotin, 2000 as quoted by Feillet, 2002). This practice is voluntary and is not regulated by law.

#### *Livestock*

Between 1950 and 2000 world meat production increased five times and per capita production doubled. Meat production is projected to double another time between 2000 and 2050 as affluence rises in middle-income developing countries and people begin consuming more meat. Experts believe most of the production will come from densely populated feedlots, where animals are fattened for slaughter by feeding on grain grown on cropland or meal produced from fish. Feedlots account for about 40% of the world’s meat production and more than 50% of the world’s poultry and pork. In general an animal is fed in a feedlot for a few months before being slaughtered. Higher efficiency and increased meat supply is positive, but to the expenses of factors such as: 1) Water pollution from flooded animal waste reserves; and contamination of drinking water wells from nitrates in animal wastes.; 2) Supply of

<sup>24</sup> Polyculture refers to a complex form of intercropping in which a large number of different plants maturing at different times are planted together. Advantages include less need for fertilizer and water because the root systems are at different depths; and protection from wind and water erosion because the soil is covered with crops year round.(Miller, 2004)

<sup>25</sup> Reasoned agriculture. Translation made by the author of this report.

animal feed, from grain (animals in feedlots do not consume natural grasses) and fish; 3) Energy and emissions; 4) Diseases such as mad cow that since 1985 infected cows in 12 European countries including Great Britain, Ireland and France; and hoof-and mouth disease that since 2000 has infected cattle, pigs and sheep in Europe and Brazil; and 5) The effect of globalisation of trade, i.e. increased transports and its effect on animal welfare. Further information about transports can be found under paragraph 2.4.3. (Miller, 2004)

### *Fishery*

Fishery can be defined as “*concentration of particular aquatic species suitable for commercial harvesting in a given ocean area or inland body of water*” (Miller, 2004). The fishing industry has, as well as agriculture, lived a technological evolution and the equipment that today are in use covers techniques and tools such as satellite positioning equipment, sonar, nets of important sizes, spotter planes and ships that can process and freeze the catches.

Four major harvesting methods are applied for 50% of the world’s harvests. Those are listed and described in Table 2-3. Examples of species of commercial importance are listed in Table 2-4.

*Table 2-3 The four major harvesting methods in the world’s fishing industry. (Miller, 2004)*

<b>Method</b>	<b>Type of species</b>	<b>Technique</b>	<b>Over fishing and by-catch</b>
Trawler fishing	Demersal fish and shellfish (mostly bottom dwelling); especially shrimps.	Funnel-shaped net scraping the bottom. The catch volume in one gulp is equal to 12 jumbo-jets.	The large mesh of the nets permits small fishes to escape but can capture and kill species as seals and endangered sea turtles. Only large fishes are kept, other fishes and aquatic species thrown back into the sea, dead or dying. By-catch of shrimps can be eight times the weight of the shrimps kept.
Purse-seine fishing	Pelagic (surface dwelling) species such as tuna, feed near the surface or in shallow areas.	Once located the tuna school is surrounded by a large purse-seine net which is closed like a drawstring to purse to trap the fish.	Dolphins, which swim on the surface above tuna schools.
Longlining	Open water species such as sword-fish, tuna and sharks.	Fishing vessels put lines up to 130 km long, hung with thousands of baited hooks.	Also hook pilot whales, dolphins, endangered turtles and sea-feeding albatross.
Drift-net fishing		Fish are caught by drifting nets of a size of up to 55 km length and 15 meters depth below surface. A UN ban from 1992 of the use of nets longer than 2.5 km in international waters should be viewed in the light of voluntary compliance, difficult monitoring and increased use of long-lines with similar effects.	Can lead to over-fishing of the desired species. Trap and kill important quantities of non-targeted fish and marine mammals (dolphins and seals), turtles and seabirds.

Table 2-4 Examples of marine species fish and shellfish with high commercial importance. (Miller, 2004)

FISH		SHELLFISH	
Demersal (mostly bottom dwelling)	Pelagic (surface dwelling)	Crustaceans	Mollusks
Hake	Sardine	Krill	Oyster and Clam
Haddock	Anchovy	Shrimp	Octopus
Cod	Herring	Lobster	Squid
	Mackerel	Crab	
	Tuna		

55% of the annual commercial catch comes from the ocean, out of which 99% is taken from plankton rich waters close to the coastline. The other 45% comes from aquaculture (33%), where marine and freshwater fish are raised in ponds and underwater cages and from inland freshwater fishing (12%) i.e. from lakes, rivers, reservoirs and ponds. Out of the world's harvest, 30% is used for feeding fish (i.e. in aquaculture), feeding of other animals or for producing oils.

During 30 years time (1950 - 1982) the annual commercial catch increased five times. Fish is a renewable resource as long as it is not harvested to a point where the reproduction of the species is threatened. Overfishing is defined as “*the taking of so many fish that too little breeding stock is left to maintain numbers, i.e. a harvest of a species that exceeds its sustainable yield*”. Some alarming key data (Miller, 2004):

- 25% of the annual catch is by-catch and thrown back to the sea dead or dying.
- According to FAO 75% of the world's 200 commercially valuable marine fish species are either overfished or fished to their estimated sustainable yield.
- Cod fishing in Newfoundland collapsed in 1992. Despite a ban in 2002 the cod population has still not recovered.

Prolonged fishing can entail commercial extinction, defined as “*when the population of a species declines to the point at which it is no longer profitable to hunt for them*” (Miller, 2004). Fishing fleets then move to a new species or a new region. Ways of avoiding overfishing and commercial extinction is therefore to establish the annual sustainable yield, i.e. the size of the annual catch that could be harvested indefinitely without a decline in the population of a species. Table 2-5 further indicates that the fish catch has increased 35 times during the last century. The table also presents data upon other areas of development during the last century.

Table 2-5 Increase factors related to the development of the twentieth century (McNiel, 2000, as quoted by Johansson et al., 2003).

Development during the twentieth century	
Item	Increase factor 1890-1990
World population	4
World urban population	13
World economy	14
Industrial output	40
Energy use	16
Air pollution	5
Carbon dioxide emissions	17
Marine fish catch	35
Pig population	9
Irrigated area	5
Forest area	0.8 (=20% decrease)

### 2.3.2 Industrial food manufacturing

Food production is complex and a challenge in many aspects for the reach of desired quality preferably with minimal undesired effects. Food technology comprises the combination of food process engineering and food science<sup>26</sup> (Jongen & Meulenberg, 2001). Food process engineering refers to the use of chemical engineering principles in unit operations, i.e mass, energy and momentum principles<sup>27</sup>. A unit operation is a basic process such as filtration, crystallisation, extraction, centrifugation, fluid flow, pasteurisation etc. By mass transfer means the extraction of oil from oil seeds or during distillation. By energy transfer means processes such as pasteurisation or sterilisation (explained further down) in heat exchangers. Finally, momentum transfer refers to procedures such as the pumping of fluids or flows in pipes. The complexity of food processing requires often a simultaneous application of these three transfer principles. Food safety and hygienic factors play further a central role in food engineering and may be a crucial factor of concern in production processes. For example the risk of unclean equipment (ex. membranes and heat exchangers) can require particular design of equipment and process. (Jongen & Meulenberg, 2001) A clarification upon where food technology appears in the food chain is illustrated in Figure 2-7.

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<sup>26</sup> Food technology: A combination of food science and food process engineering. Food technology also includes the economic aspect of processing. Food science: Studies of physical, chemical, biochemical and microbiological properties of food. Food process engineering: The design of processes, where knowledge about properties and changes is necessary. (Jongen & Meulenberg, 2001)

<sup>27</sup> Application of mass, energy and momentum balances, a combination called transport phenomena (Jongen & Meulenberg, 2001)

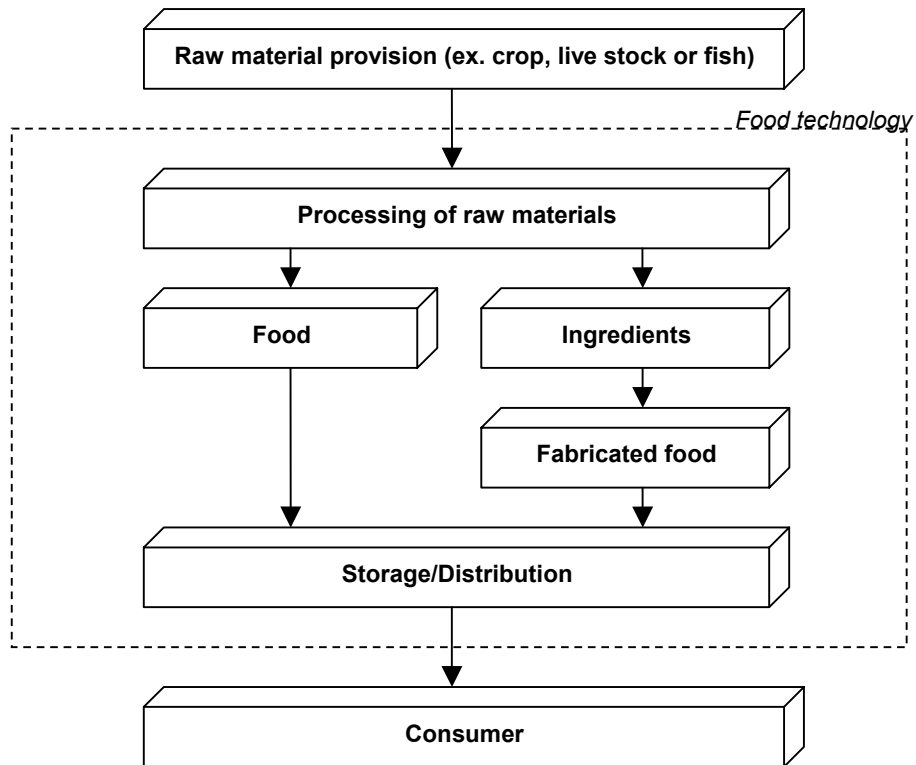


Figure 2-7 Food technology refers to the combined food engineering and food science, applied in raw material processing, food product manufacturing and distribution. (Jongen & Meulenberg, 2001).

The goal of food technology is to convert raw materials to products at the lowest possible cost. Figure 2-8 illustrates four major types of food technology processes linked to this conversion.

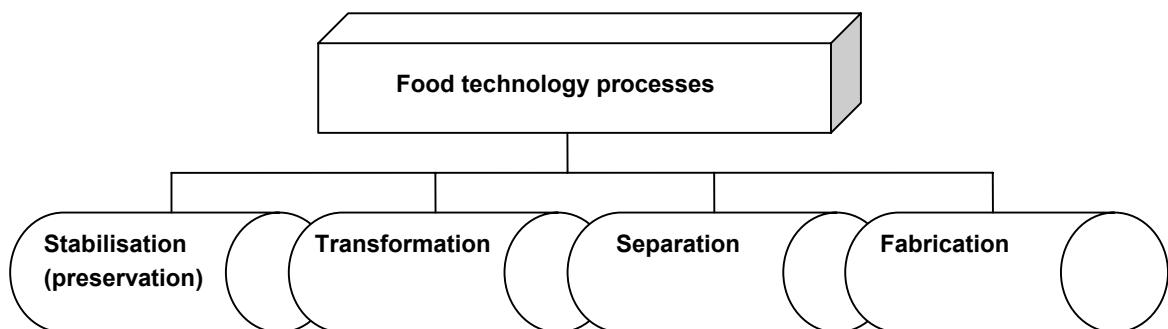


Figure 2-8 Food technology processes covers four principal techniques for the conversion of raw material into fabricated food products; stabilisation, transformation, ingredient or component production and fabrication of final product. (Jongen & Meulenberg, 2001)

- *Stabilisation.* Stabilisation serves to bring food in a (pseudo) stable state, i.e. assure that the stability of the food is greater than its lifetime. It involves four types of stabilisations:



- *Microbial stabilisation.* 1) Removal or elimination of pathogenic micro-organisms; and 2) Prevention of spoilage due to micro organisms such as, souring of milk, mould growth in bread, yeast fermentation in fruit juices. A common solution is heating. Such as pasteurisation (i.e. minimal heat needed to ensure absence of pathogens) and sterilisation (i.e. zero tolerance of micro-organisms and complete microbial stability). (Jongen & Meulenberg, 2001) Besides heating, other solutions such as ionizing radiation<sup>28</sup>; high-pressure processing/pascalization, low-temperature storage i.e. chilling or freezing<sup>29</sup>; chemical preservatives; modification of atmosphere; control of water activity; and compartmentalisation can be applied. (Adams & Moss, 2000)
- *Chemical stabilisation.* Chemical reactions might have a change upon the quality of food and should be avoided. Examples are 1) The Maillard reaction that is a non-enzymatic browning reaction causing change in colour, odour, nutritional aspects and potentially creation of compounds of potential toxicological harm); and 2) Fat oxidation, even this affecting flavour and nutritional quality.
- *Biochemical stabilisation.* Enzymes in raw materials, from vegetal or animal origin, can cause deterioration of materials and can be avoided by limitation or destruction of enzymes. Potentially side-effects are those such as protein or fat breakdown, and enzymatic browning.
- *Physical stabilisation.* Food is desired to be physically stable, in order to avoid phase separation (i.e. demixing) or dry-out (i.e. change in consistency) etc. Packaging plays a central role for all preservation technologies and has a direct impact on food quality, serving as a barrier between the food and its environment (ex. protection from oxygen).
- *Transformation.* Raw materials are transformed into food by processing. Examples of processing are: fermentation (using microorganisms or enzymes, i.e. cheese, olives, tea leaves, cocoa, beer, wine); extrusion (ex. snacks from starch based raw materials); emulsification<sup>30</sup> and extraction (ex. fruit juices).
- *Separation.* A process for obtaining components or ingredients from raw materials. Examples are starch from potatoes or maize, milk proteins from milk, sugar from sugar canes or beets, oil from soybeans or olives. Two major types of separation:

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<sup>28</sup> A technology developed during the 1940-50's, described as a stabilisation technique through the inactivation of micro-organisms and enzymes. Too high radiation can cause chemical damage to the food itself. The technique is applied mainly to sterilization of spices or to prevent unwanted physiological changes in stored fruits and vegetables. Consumers have not fully accepted the technique due to association with radioactive foods. (Jongen & Meulenberg, 2001) The level of radiation proposed for foods are not sufficient to induce radioactivity in the product and there is no evidence that consumption of irradiated foods is harmful. Food irradiation facilities do require stringent safety standards to protect workers. (Adams & Moss, 2000)

<sup>29</sup> Freezing is the most successful technique for long-term preservation of food, since nutrient content is well retained and the product resembles the fresh material more than in appertized foods (i.e. type of heat processing where the only organisms surviving are non-pathogenic). The freezing point of foods is below that of water; and starts between -0.5 and -3 degrees Celcius (C). Some water may still remain unfrozen at a temperature of -60 degrees C. The storage temperature used is normally -18 degrees C. Below -10 degrees C, microbial growth is impossible and no microbiological risk is posed, although residual microbial or endogenous enzyme activity can persist and spoil a product by change of texture and other qualities such as colour. (Adams & Moss, 2000)

<sup>30</sup> Many fabricated foods are emulsions, ex. infant food, clinical foods, ice-cream, sauces etc. Three types exist: 1) oil-in-water emulsion where oil is dispersed in the liquid phase (mayonnaise); 2) water-in-oil i.e. water is dispersed in a lipid phase (margarine); and 3) multiples emulsions. Specific emulsifiers are needed for both the formation and stabilisation of emulsions. (Jongen & Meulenberg, 2001)

Phase separations (i.e. filters, membranes and centrifugation) and molecular separation (i.e. crystallization and distillation).

- *Fabrication.* Today traditional foods such as bread or cheese can be seen as a fabricated product. Those traditional foods can even be changed, such as cheese made of vegetal fat instead of milk; or replacement of milk protein by soy protein.

### *Packaging*

Packaging is important to keep processed foods stable. It can be made by using traditional packaging types such as canning or bottling or using aseptic packaging technology in the form of cartons and pouches. Aseptic packaging means that the product is packed, free from undesirable micro-organisms (that have been removed or eliminated), in packaging material that is also free from undesirable micro-organisms. (Jongen & Meulenberg, 2001)

Controlled atmosphere (CA) and modified atmosphere (MA) packagings refer to packagings in which the metabolic processes of the food are controlled through gas composition. The CA technique utilises the gas composition of the ambient air, which is controlled and maintained on the original level through out. CA is mainly used for bulk storage and transport of fruits and vegetables. MA uses another gas composition than that of the ambient air without active control of the composition; instead the composition of the gas inside the package is the result of the balance between metabolic rates of the food and diffusion characteristics of the package. MA is applied for fresh pasta; cooked and chilled meat; seafood; prepared salads and more. (Jongen & Meulenberg, 2001)

For environmental reasons, research aims for developing edible coatings made of proteins, starches and waxes for use as biodegradable films to package foods. Due to moisture sensitivity, those are not always applicable on dry, frozen or semi-moist foods. (Ohlsson, 1994, as quoted by Jongen & Meulenberg, 2001)

### *Food additives*

Food additives are further used in food production for reasons such as preservation and sensory qualities, as developed further down. The definition of food additives is “*any substance not normally consumed as a food in itself and not normally used as a characteristic ingredient of food whether or not it has nutritive value, the intentional addition of which to food for a technological purpose in the manufacture, processing, preparation, treatment, packaging, transport or storage of such food results, or may be reasonably expected to result in it or its by-products becoming directly or indirectly a component of such foods*” (European Council Directive 89/107/EEC, as quoted by the European Food Information Council - EUFIC, 2005). Additives that are commonly used in food production in Europe include additives that (EUFIC, 2005):

- 1) *Maintain freshness and prevent deterioration.* The aim is to increase the shelf-life of the product by protecting foods against oxidation or micro-organisms. Two major categories exist:
  - a) Antioxidants (for the prevention of oxidation, entailing rancidity or discoloration)
  - b) Preservatives (for the limitation, retardation or elimination of growth of micro-organisms)
- 2) *Promote sensory qualities by enhancing certain characteristics, improving texture or helping food processing.*
  - a) Taste and texture modifiers (i.e. emulsifiers, thickeners, sweeteners etc.)

- b) Colours (for the reduction of colour loss due to exposure to light, air, temperature changes, moisture; compensation for natural variations<sup>31</sup>; enhancement of naturally occurring colour)

It is the technical purpose that determines the classification as a food additive. Once classified the additive is given an E-number, which symbolises the approval by the EU and serve as a common labelling system. Additives are heavily regulated and the general criteria concern the usefulness of purpose, the safety and the avoidance of consumer mislead<sup>32</sup>. The evaluation of purpose and scientific safety assessment<sup>33</sup> is in Europe managed by the European Food Safety Authority (EFSA). On international level the Joint Expert Committee on Food Additives (JECFA) with representatives from the Food and Agriculture Organization (FAO) and the World Health Organization (WHO).

#### *Improved industrial processes*

In Appendix IV, a described by Johansson et al. (2003) a case of a food plant producing frozen pancakes can be found, serving as an example of how food technology can improve processes with regards to superior environmental and financial performance. In concrete terms, the material, water and energy efficiency is stressed and the principal sources of environmental nuisance and intervention points for progress pointed out.

As described by Johansson et al. (2003) the causes of potentially harmful long-term influences on humans, animals and nature of industrial activities can be difficult to trace back to their roots. This is however what is needed to be done to improve procedures. Often nuisance are related directly or indirectly to material flows, which are causing potential trouble due to three factors listed below (Johansson et al., 2003):

- *Quantity of flows.* Some examples are CO<sub>2</sub> emissions, fresh water consumption and non-renewable resource consumption.
- *Quality of flows.* Examples are toxic and chemical content of material.
- *Equity of flows.* This refers to uneven distribution of material welfare, uneven access to energy, water and other resources.

These causalities can appear somewhat simplistic but serve as a good rule of thumb. In reality, the picture is often more complex and parameters such as the quality of finished products, consumption pattern or societal services, play their role. (Johansson et al., 2003)

The principal challenges of food production, in favour of sustainable development, are 1) To identify the causes of harmful impacts in an integrated context (outside the factory borders); and 2) To find simple solutions. The sources of undesired impacts can be classified into five principal groups, all beginning with the letter “M” (Johansson et al., 2003):

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<sup>31</sup> Masking or disguising inferior quality, are not acceptable uses of colours according to EUFIC (2005).

<sup>32</sup> In 1989 the European Community adopted a framework directive 89/107/EEC which specifies criteria for assessment of additives. Three specific directives were developed: 1) 94/35/EC on sweeteners; 2) 94/36/EC colours; and 3) 95/2/EC on additives others than colours and sweeteners. Together they provide a list of classified additives, specifications on which foods they can be used in and maximum levels. The Codex Alimentarius Commission which develops guidelines for food safety globally has further a General Standard for Food Additives (GSFA) which serves as an international standard for world trade. (EUFIC, 2005)

<sup>33</sup> The safety assessment is based on toxicological data and the maximum level of additive that has no demonstrable toxic effect is determined. This is called the non-observed-adverse-effect level (NOAEL), used to determine the acceptable daily intake (ADI), which refers to the amount of a food additive that can be consumed daily over a lifetime without any adverse effect on health. (EUFIC, 2005)

- *Man.* All workers and managers; and factors such as knowledge, training, certification capabilities, attitudes and alternates.
- *Methods.* The process workflow, procedures and standard operating procedures.
- *Machines.* All equipment and control instruments and their adjustments, maintenance and capability.
- *Materials.* All expendable inputs to the process.
- *Measurements.* Information about energy and material flow to concerned people.

### 2.3.3 Food transports

Transport is an important source of energy use. In Europe, transports represent 21% of total energy use, as indicated in Table 2-6, which lists global energy consumption per region and sector.

Table 2-6 Energy consumption of some principal societal activities. (World Resource Institute, 1998, as quoted by Johansson et al., 2003)

ENERGY CONSUMPTION BY SECTOR 1995					
	Industry	Transport	Agriculture <sup>34</sup>	Commercial- and public services	Residential
<b>World</b>	38	27	3	19	8
<b>Europe</b>	36	21	4	27	7
<b>North America</b>	27	38	1	18	13
<b>Asia</b>	49	20	4	14	5

About one third of all transports in the world are food related (Smil, 2002, as quoted by FOOD21, 2004).

Data from the United States indicate that food travels long distances, an average piece of food eaten in the United States has travelled 2100 km (Miller, 2004).

In 40 years time (1961- 1999) the amount of exported food in the world increased four times, as indicated in Table 2-7. Western European trading of agriculture products with different regions in the world, is further presented in Table 2-8.

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<sup>34</sup> Agriculture and public services can be difficult to distinguish and a total of the three is more accurate. (World Resource Institute, 1998, as quoted by Johansson et al., 2003)

Table 2-7 World food exports (million tonnes of food) have increased dramatically over the past 40 years. (WTO, as quoted by Millstone & Lang, 2003)

FOOD EXPORTS (million tonnes of food)			
1961	1999	Evolution	
190	774	584	+ 307%

Table 2-8 The imports and export values of Western European countries show that the import rate is higher than the export rate; and dominated by imports from Latin America and export to Asia. (WTO, as quoted by Millstone & Lang, 2003)

WESTERN EUROPEAN TRADE BALANCE				
Total flow of agricultural products in and out of Western Europe year 2000. US\$ billions.				
Region	Import	Export	Share of total import (%)	Share of total export (%)
Africa	10.4	7,6	15	14
Asia	14.8	14.7	21	27
Eastern Europe & CIS	9.2	10	13	18
Latin America & Caribbean	18.3	3.5	26	6
Middle East	2.1	6.3	3	11
North America	14.8	13	22	24
Total	69.6	55	100	100

#### *Transports of living animals*

Also living animals are transported. Around 44 million cattle, pigs and sheep are traded around the world annually. Main reasons for animal transports are: 1) Cultural (ex. halal<sup>35</sup>); 2) Economic (ex. costs related to breeding, slaughter or transformation); 3) Environmental (ex. fattening in Netherlands restricted due to anti-pollution laws); and 4) Image (ex. claims such as home-killed or home-produced). Significant<sup>36</sup> world trade ways of cattle are presented in Table 2-9. (Millstone & Lang, 2003)

<sup>35</sup> Five million live sheep and one million cattle exported from Australia to South East Asia and the Middle East to meet the demand for live animals slaughtered according to procedures of halal in which the animals are not stunned before slaughter. (Millstone & Lang, 2003)

<sup>36</sup> “Significant” refers to 10% or more of the world export, as defined by the author of this report.

Table 2-9 Significant trade ways (i.e. 10% or more of world import or export as defined by the author of this report) of living cattle showing that the leading countries of export and import are France and the USA respectively. (Millstone & Lang, 2003)

<b>CATTLE TRADE WAYS</b>		
<b>Export share per country of the 10 million individuals annually traded worldwide (%)</b>		
<b>(N.A = not available)</b>		
	<b>Import</b>	<b>Export</b>
<b>Australia</b>	N.A	15
<b>Canada</b>	N.A	10
<b>France</b>	4	17
<b>Italy</b>	19	N.A
<b>Mexico</b>	N.A	10
<b>USA</b>	24	3

Within the European Union, most trade and transport goes from Northern to Southern countries. Many of these journeys can take up to 50 hours. Some transports are even longer, such as horses from Lithuania to Sardinia, where the transport can last up to 90 hours. Every year 800 000 lambs and sheep are exported from the United Kingdom to the continent. 1,5 million pigs are exported from the Netherlands to Italy and Spain for slaughter or further fattening. 100 000 thousand horses are imported every year from Central and Eastern Europe by Italian abattoirs. Long transports can cause physical- and mental suffering or even death of animals. In the USA long transports in between states are common. Although regulations stipulate a five hours rest period every 28 hours, around 1% of the cattle arrive at destination unable to stand. Also European transports there are severe issues of overcrowding, high summer temperatures, lack of water and proper ventilation, which leads to that animals become exhausted, dehydrated and stressed. Many animals are injured, collapse or die. Main transport routes in Europe are listed in Table 2-10. (Millstone & Lang, 2003)

Table 2-10 Main transport routs of animals within European borders or around the Mediterranean coastline (Stevenson, 2000, as quoted by Millstone & Lang, 2003).

<b>EUROPEAN TRANSPORT ROUTES</b>		
<b>Animal</b>	<b>Exporters</b>	<b>Destinations</b>
<b>Cattle</b>	Ireland, France & Germany	Spain, Italy & Lebanon
<b>Sheep</b>	United Kingdom & Spain	Spain & Greece
<b>Pigs</b>	Netherlands	Italy (Sardinia)
<b>Horses &amp; donkeys</b>	Lithuania & Romania	Italy

### *Green house gas emissions*

Trade related transportation is a fast growing source of green house gas (GHG) emissions<sup>37</sup>. Air freight and sea freight are not included in national inventories and in the Kyoto protocol<sup>38</sup>, entail little incentive for reduction of emissions. Moreover, the prices of sea transports fell by 70% between 1980 and 2000; and the prices of air borne freights are reduced by 3-4% every year (Jones, 2001, as quoted by Millstone & Lang, 2001). Prices do not include costs for side-effects on human-, animal- and environmental health.

Table 2-11 lists carbon dioxide emission levels from different types of vehicles, indicating that aircrafts emit 80 times more carbon dioxide than ships and eight times more than lorry, per tonne-kilometre.

*Table 2-11 Vehicles and carbon dioxide emissions. Air crafts emit 80 times more carbon dioxide than ship and eight times more than lorry per tonne-kilometre. (Jones, 2001, as quoted by Millstone & Lang, 2001)*

<b>Average carbon dioxide emissions. Grammes per tonne-kilometer. Year 2000.</b>	
Aircraft (1500km)	800
Lorry (35 tonnes)	100
Ship	10

### *Refrigeration and chlorofluorocarbon (CFC)*

During transport and storage of food, some hazardous compounds have traditionally been used for refrigeration, i.e. microbial preservation. Refrigerating fluids are defined as<sup>39</sup>: fluid that, by the modification of pressure, may evaporate and condense in temperatures close to the surrounding temperature, enabling a production of cold by capturing the heat from the room/space and removing it to the outside (ADEME, 2005). Examples of refrigerating fluids are the chlorofluorocarbons (CFCs), which are compounds of carbon (C), chlorine (Cl) and fluorine (F) atoms. An example is Freon -12 (CCl<sub>2</sub>F<sub>2</sub>) until recently widely used as 1) coolant in refrigerators and air conditioners; 2) aerosol propellant; and 3) foaming agent for making some plastics. They are classified ozone depleting substances (ODS). (Miller, 2004)

The production, market introduction, use, recuperation, recycling and destruction of CFC and hydrochlorofluorocarbons (HCFC) is regulated on European level (regulation 2037/2000 of the 20 June 2000) and on French national level by obligations for professional holders of equipment containing refrigerating fluids. In short the law says: 1) from 1 January 2000 there is a ban on market introduction and use of CFC as refrigerating fluid or solvent; 2) from 1 January 2001 the ban covers further the use of CFC for maintenance of refrigeration- and air condition equipment; 3) from 1 January 2002 there is a ban on the use of HCFC as a solvent with exception of aeroplane- and aerospace application; and 4) from 1 January 2004 HCFC is not allowed in the production of refrigeration-and air conditioning equipments.

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<sup>37</sup> The main green house gases are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), water vapour (H<sub>2</sub>O) and CFCs (chloro fluoro charbons). (Miller, 2004)

<sup>38</sup> The Kyoto protocol aims for the reduction of green house gases and serves as a major international action against the global warming, by the creation of tradable emission permits. It aims to reduce GHG by 5% by 2008 compared to the levels of 1990. Every nation has its own target. At the writing of this report in July 2005, the USA and China, important sources of emissions, had not ratified the protocol.

<sup>39</sup> Translation from French to English made by the author of this report.

There is a scientific consensus that we should immediately stop production all ODSs, as even with immediate action, the scientific evidence indicate it will take about 50 years for the ozone layer to return to the 1980s levels and about 100 years for recovery to levels before 1950. More information about the CFC substitutes can be found in Appendix V.

### 2.3.4 Food consumption

#### *Food safety*

Unfortunately eating is not done without risks and that is something that humans are aware of since a long time. Along with the historical evolution, humans have learnt by a trial and error process, which food from vegetable- and animal origins made at their disposal that is good and less good. Emerging from this process is a record of food that is not harmful to humans and that could serve as a reference for evaluation of new food. This piece of work has been accomplished within a time period of 400 generations or 10 000 years. Risks related to food consumption are various and can be classified and regrouped on various bases. Three examples of classifications will be introduced.

According to the HACCP approach there are three major types of hazards associated with food production (Jongen & Meulenberg, 2001): 1) Microbiological hazards (ex. bacteria, funghi, protozoa or algae); 2) Chemical hazards (ex. pesticides in plant raw materials or mycotoxins<sup>40</sup>); and 3) Physical hazards (ex. stones or fish bones).

Feillet (2002) approaches food risks from the perspective of origins, and regroups the risks into three principal sources of origin:

- 1) Biological sources (caused by functioning of cells in which genes and proteins play central roles)
  - a) GMOs<sup>41</sup>
  - b) Composition of meat products related to raising conditions (ex. BSE<sup>42</sup>: antibiotics and hormones<sup>43</sup>; dioxin contaminated meat)
  - c) Pathogenic micro-organism
  - d) Mycotoxins and allergies<sup>44</sup>

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<sup>40</sup> An example of a mycotoxin is the aflatoxin found in peanuts (Jongen & Meulenberg, 2001).

<sup>41</sup> According to a study in 2003 by the US National Academy of sciences two major conclusion upon GMO can be made (Miller, 2004): 1) There is no a strong evidence suggesting that genetically engineered crops cause environmental harm; 2) The lack of evidence does not mean that the crops do not cause environmental damage because the US does not have in place a system for systematic monitoring of agricultural and natural ecosystems.(Miller, 2004) A well known example is the genetically modified corn and the monarch butterfly. It seems that under some circumstances, corn modified to include the protein *Bacillus thuringiensis* (Bt) a toxin for pests, also harms monarch butterflies. Harm to untargeted species is an example of the fear of the environmentalists. (Hunter et al., 2002) Advantages and disadvantages of GMO is presented in Appendix IV.

<sup>42</sup> Bovine Spongiform Encephalopathy, commonly known as the mad cow disease. The name refers to the sponge-like changes to the brain of infected cattle. The factors of the development of BSE are still an area for further research, but some theories are based on the proteins found in the brain and other body tissues of animals and humans. The route of transmission of BSE is still not proven although it is thought to be the contamination from cattle feed based on bone meal produced from BSE-infected carcasses. (Feillet, 2002 and EFIC, 2005)

<sup>43</sup> The use of antibiotics and growth hormones in livestock farming can be used to help prevent the effects of the spreading of diseases in herd and for promoting growth. Low residues of the antibiotics may build up in the fatty tissue, kidneys and liver of animals, however these are not thought to pose risks to human health (EFIC, 2005). Treatment of hormones increase the number of hormones in the body of the animal and the residues may be present in measurable quantities of the animal tissue (mainly muscles) depending on hormone, gender and age (Feillet, 2002). The use of hormones to boost growth of cattle and milk production of cows is banned in the EU since 1998 for the reason of the risk to human health and due to the provocation of hormonal disturbances by some hormones, but is still practiced in the USA, Canada and Australia. (EFIC, 2005).



- 2) Environmental sources
  - a) Contamination of toxic molecules during the food chain such as dioxins, nitrates, residues from pesticides and heavy metals.
- 3) Food technology sources (i.e. fabrication or conservation)
  - a) Undesired elements (ex. glass, metal or stone)
  - b) Ionising radiation
  - c) Temperature of cold chain

The above categorization is closely related to the list of food born risks made by the European Commission; regrouped by Feillet for the reason of simplification and feasibility. The European Commission's list consists of the following 10 categories: micro-biological, chemical, foreign bodies, labelling, sensorial divergences, adulteration, terrorism, packaging, radiation and others. (Feillet, 2002)

### *Nutrition*

Regarding nutrition, the burden of disease attributable to nutritional matters is often more important than esteemed. Data indicates that 4.5% of the DALYs<sup>45</sup> in the EU countries (EU15) are lost due to poor nutrition and 3.7% due to obesity<sup>46</sup>. There is an international consensus that saturated fatty acids contribute to the augmentation of cholesterol levels<sup>47</sup>, and hence coronary heart diseases, which is the leading cause of mortality in the WHO European region. Further, 80% of the prevalence of diabetes can be attributed to overweight or obesity. All in all, cardiovascular diseases, cancer and diabetes account for 30% of the DALYs annually lost in the WHO European region. (WHO, 2002)

According to data from the International Obesity Task Force (IOTF)<sup>48</sup> 15% of the French children between 5 and 11 years are overweight. Figure 2-9 illustrates the development of overweight among children (5-11 years) in various countries and over the past decades.

<sup>44</sup> An allergy is an intolerance provoked by an allergen (i.e. protein in the offending food.) that activates the immune system, including a release of antibodies and body chemicals. The symptoms can appear as respiratory, skin or gastrointestinal allergic reactions. Examples of allergens are crustacean, fruits, peanuts and more. Some additives have been shown to cause allergic reactions, for instance 1) colours such as carmine or tartrazine (E102 yellow food colour) and carmine (E120 or red cochinnille); 2) inorganic sulphites (E220-228) used to control microbial growth in fermented beverages; and 3) monosodium glutamate (MSG) (flavour enhancer) and aspartame (sweetener). EUFIC states that the causality of allergic reactions made by MSG and aspartame has not been scientifically proven. An intolerance is different from an allergy in that it involves the metabolism and not the immune system (ex. lactose or gluten). Within the EU there is an obligation to label ingredients liable to cause allergies. (EUFIC, 2005)

<sup>45</sup> DALY or Disability-Adjusted Life Years, is a measure developed by the WHO, the World Bank and the Harvard University. It indicates the overall burden created by a disease, by combining the years of a) potential life lost due to premature death from the disease and b) years of productive life lost due to the disability caused by the conditions. (WHO, 1999)

<sup>46</sup> The prevalence of overweight and obesity is commonly assessed by using body mass index (BMI), defined as the weight in kilograms divided by the square of the height in metres (kg/m<sup>2</sup>). A BMI over 25 kg/m<sup>2</sup> is defined as overweight, and a BMI of over 30 kg/m<sup>2</sup> as obese. These markers provide common benchmarks for assessment, but the risks of disease can increase progressively from lower BMI levels. (WHO, 2005)

<sup>47</sup> Cholesterol is a type of fat present in certain foods. Cholesterol is also to a large extent created by the human body itself and is needed for certain biological functions. A high cholesterol level in the blood is however a major cardiovascular risk. There are good and bad cholesterol (HDL and LDL) with different effects on the risks. (French National Nutritional and Health Programme (Programme National Nutrition Santé - PNNS), 2002)

<sup>48</sup> IOTF is part of the International Association for the Study of Obesity, a federal body of obesity research associations in 50 countries and regions including the European Association for the Study of Obesity (EASO). EASO has the role of a non-governmental organisation. (IOTF, 2005)

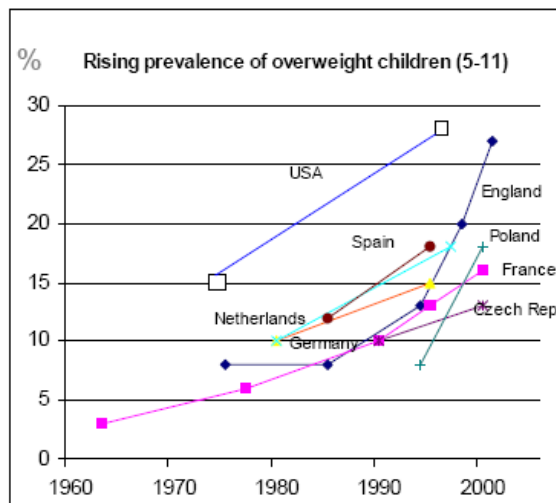


Figure 2-9 Prevalence of overweight among children 5-11 years old. (WHO, 2002)

Data from 2003 indicates further that 11% of the French men and women suffer from obesity (i.e. BMI >30). (IOTF, 2005<sup>49</sup>)

According to the French National Nutritional and Health Programme (PNNS) a meal or a product is considered as fat if containing more than 10% of fat, i.e. 10g fat out of 100g product (PNNS, 2003).

The PNNS (2003) further recommends the following for a balanced diet:

- *Fruit and vegetables*: At least five per day<sup>50</sup>.
- *Bread, cereals, potatoes and dry vegetables*: At every meal and according to appetite.
- *Milk and milk products such as yoghurt or cheese*: Three portions per day.
- *Meats, poultry, fish or egg*: One to two portions per day.
- *Fat*: Limited consumption.
- *Sweet products*: Limited consumption.
- *Beverages*: Water with preference.
- *Salt*: Limited consumption.

#### *Consumers' view upon food quality and risks*

A ranking of the perceived importance of risks is listed below (ANIA/CSA, 2000, as quoted by Feillet, 2002). The magnitude of risks as perceived by French consumers was in 2000 led by the BSE<sup>51</sup> and may today look slightly different on some points.

1) BSE	27%
2) GMO <sup>52</sup>	14%
3) Water pollution from nitrates	9%

<sup>49</sup> Data from French self-reported survey. (IOTF, 2005)

<sup>50</sup> The frequency refers to portions, which sizes are individual to every person.

<sup>51</sup> For more information see footnote 42.

<sup>52</sup> Advantages and disadvantages with GMO are presented in Appendix III.

- 4) Listeria in food<sup>53</sup> 9%
- 5) Dioxine in food<sup>54</sup> 8%
- 6) Food chain temperature 7%
- 7) Poor conservation at home 2%

According to a survey about quality of food and information, conducted in 2001 by the National research centre for the study and observation of living conditions (CREDOC) after request by the National Institute of Consumption (INC)<sup>55</sup>, 70% of the French consumers link food consumption with risks.

The same study clarifies which quality parameters of food products that are of key importance to the consumer; starting not surprisingly with taste (80%) and is further followed tightly by nutritional value (58%) and the absence of risks (52%). Natural or organic character (43%) gets a total score that is higher than that of the guarantee of origin (40%). The results are illustrated in Figure 2-10 and are based on the respondents' first or second choice of quality parameter.

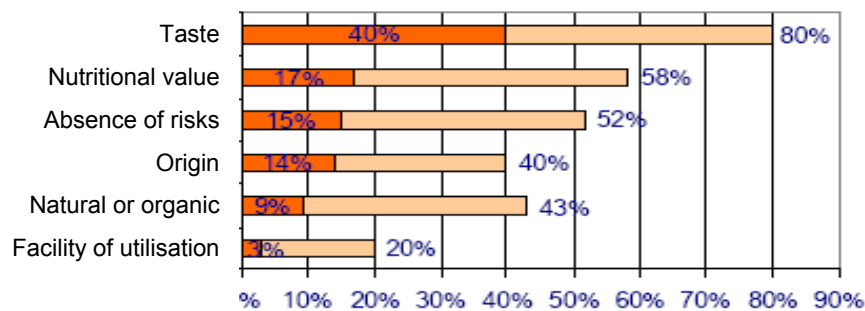


Figure 2-10 The quality parameters scored as the respondents' prime or second choice are lead by taste and followed tightly by the importance of nutritional value. (CREDOC, 2001)

Other key data derived from the survey are:

- 50% of the population does not feel sufficiently informed about product quality.
- 20% has a total confidence in quality labels<sup>56</sup> and another 50% are rather confident.
- 75% reads always or often information on the packaging.

<sup>53</sup> Listeria is a "popular" group of pathogenic micro-organisms, because it is dangerous and well covered in media. The origin is essentially food with long conservation periods and that are eaten without reheating such as cheese made of fresh milk and products such as cured meats. The listerias are sensitive to heat and are destroyed during cooking. It is a mortal infection in 20-30% of the cases and luckily rare, i.e. 4-5 deaths per million inhabitant. In France there was an epidemic in 1992 where 279 persons were ill and 85 persons died due to consumption of pork tongue in jelly (langue de porc en gelée) or cured meats (charcuteries en coupe). Further in 1993 and 1999 similar epidemics have occurred. (Feillet, 2002)

<sup>54</sup> Further information about dioxins can be found in paragraph 2.3.5.

<sup>55</sup> CREDOC = Centre National de Recherche pour l'Etude et l'Observation des Conditions de vie. INC = Institut National de la Consommation. Translations from French to English made by author if this report.

<sup>56</sup> Quality labels referred to were labels such as Label Rouge, Agriculture biologique (AB), Appellation d'Origine Controlée (A.O.C) and Norme Francaise, all presented further on in this report (2.6.5). Label rouge holds the highest awareness of 43% (non-prompted), followed by AB of 18% and A.O.C of 12%. (CREDOC, 2001)

The type of on-pack information consulted, besides the “best before date”, is lead by origin of production and followed by the ingredient list. The total list of responses is presented in Figure 2-11.

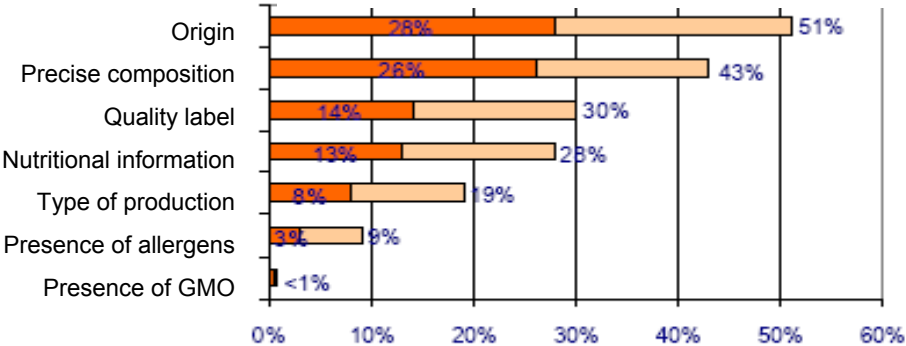


Figure 2-11 Derived from respondents’ prime or second choice, and besides the “best before date”, the origin and precise composition of product are the type of information most often consulted. Quality labels and nutritional information are further read by one third of the population.(CREDOC, 2001)

It can be concluded on the basis of these data that French consumers are concerned about product quality (mainly taste, nutritional value and security of foods) and half of the population do not feel sufficiently informed about product quality. Few have trust in labels and in their search for information on the packaging, they look (besides “best before date”) for transparency with regards to origin, precise composition and nutritional information.

**2.3.5 Waste management of food products**

Waste can be classified into three major types of wastes (Lindhqvist, 2004): 1) Municipal solid waste (MSW), even called household waste. This category includes also waste collected in a similar way such as solid waste from offices or smaller shops; and 2) Industrial waste - a category that is in general not collected by the same type of organisations as the municipal solid waste; and 3) Hazardous or toxic waste.

Packaging material is an important part of the MSW. In France the packaging volume has increased from 10.6 million tonnes to 12.3 million tonnes between 1994 and 2001 - equal to a 2% annual growth or 16% increase over the entire period. This is explained by a combination of population growth and increased amount of packaging per person. This is the result of smaller households and restructuring of meals, which push further the need for smaller units and hence more packaging material per quantity of product content. (ADEME, 2003)

The European Council Directive 94/62/EC of 15 December 1994 on packaging and packaging waste covers all packaging placed on the market in the Community and all packaging waste, whether it is used or released at industrial, commercial, office, shop, service, household or any other level, regardless of the material used (European Union, 2005a). In a directive of 2004 (Directive 2004/12/EC), the former directive has been amended by an

establishment of criteria clarifying the definition of the term packaging<sup>57</sup>. Directive 94/62/EC states that the Member States shall take measures to prevent the creation of packaging waste, and promotes initiatives that might include national programmes and that are likely to encourage the reuse of packaging. (European Commission, 2005a)

The Directive's requirements cover three areas: 1) Reduction at source and minimisation of weight and volume; 2) Reduction of the use of heavy metals and other hazardous substances; and 3) Possibility of recovery at end of life stage. The requirements of the Directive are since 1998 translated into the French law. (ADEME, 2003)

The Member States must according to the Directive 94/62/EC introduce systems for the return and/or collection of used packaging to attain the targets listed in Table 2-12.<sup>58</sup>

Table 2-12 Packaging waste recovery - European Community minimum targets and performance levels in France (EU, 2005a & ADEME, 2003)

<b>TARGETS AND PERFORMANCE LEVELS FOR USED PACKAGING RECOVERY, FRANCE</b>				
<b>(% of packaging weight. Billion units.)</b>				
	<b>Packaging units/ year /household (billion units)</b>	<b>Target EU (Directive 94/62/EC) 30 June 2001</b>	<b>Performance France 2001</b>	<b>Target EU (directive 94/62/EU) 31 Dec. 2008</b>
<b>Recovery or incineration with energy recovery</b>	-	50-65%	59%	60%
<b>Recycling</b>	-	25-45%	44%	55-80%
<b>-Glass (i.e. beverage, marmalade, infant food, cosmetics)</b>	9	15%	51%	60%
<b>-Paper &amp; board (i.e. frozen food, washing detergents, beverages, yoghurt, electronics)</b>	23	15%	61%	60%
<b>-Metals (i.e. beverage, cans, spray, bottles)</b>	8	15%	52%	50%
<b>-Plastics<sup>59</sup> (i.e. beverage, cleaning, yoghurt &amp; chilled food)</b>	45	15%	14%	22.5%

Recycling is facilitated by separation at source, by households or firms, of reusable and recyclable materials such as glass, paper, metals, certain types of plastics and compostable materials<sup>60</sup> such as food and garden waste.

<sup>57</sup> Clear examples are given in Annex I of the Directive. An example of a non-packaging is a tea bags. Examples of packagings are the film overwrap around a CD case and labels hung directly on or attached to a product. (European Commission, 2005a)

<sup>58</sup> In France, the two private organisations Eco-Emballages and Adelphe have been established for the take-back and recycling of packaging after the regulation 92-377 of 1 April 1992, stating that "every producer, that within the framework for professional activities, pack or get packed products for national market release, has the responsibility for eliminating wastes emerging from consumer abandon of packaging material, hence from the municipal household wastes". (Eco-emballages & Adelphe, 2005)

<sup>59</sup> Plastics can be difficult to separate and hence to recycle because; they exist in many forms, have sometimes many layers of different plastics, and may contain heavy metal compounds (i.e. for stabilization or colouring) that must be removed before recycling. Due to the small amounts recovered of each type and low prices of virgin material (i.e. due to low oil prices), recycling is not always financially viable. (Miller, 2004)

The need for waste treatment or land filling can be reduced by a decreased waste flows, enhanced reuse and recycling. Table 2-13 lists negative impacts of waste incineration and land filling, such as emissions of dioxins and heavy metals.

Table 2-13 Impacts of incineration and landfilling of wastes. (Lindbqvist, 2004)

	AIR	WATER	SOIL
<b>Incineration</b>	<ul style="list-style-type: none"> <li>• Acid compounds, ex. sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and hydrogen chloride (HCl).</li> <li>• Dioxins (chlorinated hydrocarbons).</li> <li>• Heavy metals.</li> </ul>	<ul style="list-style-type: none"> <li>• Surface water contamination by hazardous substances.</li> </ul>	<ul style="list-style-type: none"> <li>• Bottom- and fly ashes from combustion (equal to 25% of the initial weight and 10% of initial volume) being landfilled.</li> </ul>
<b>Landfilling</b>	<ul style="list-style-type: none"> <li>• Methane (CH<sub>4</sub>) and carbon dioxide (CO<sub>2</sub>) emissions</li> <li>• Odour</li> <li>• Rodents</li> <li>• Explosions (due to gases such as methane)</li> </ul>	<ul style="list-style-type: none"> <li>• Leaching of pesticides, nitrates and heavy metals.</li> </ul>	<ul style="list-style-type: none"> <li>• Land use</li> <li>• Leaching and accumulation of hazardous substances in the soil.</li> </ul>

About 90% of the dioxin human exposure happens through consumption of food (Miller, 2004 & Feillet, 2002). In France, estimations made by the national agency for food safety, AFSSA, ranks the sources of contamination as follows: 1) Milk products and butter (39%); 2) Fish and shellfish (26%); 3) Meat products (15%); 4) Fruit and vegetables (9%); 5) Eggproducts (6%); and 6) Cereals (3%) (AFSSA, 2000, as quoted by Feillet, 2002). Dioxins are a group of approximately 75 different chlorinated hydrocarbon compounds. They are resistant chemicals that stay in the environment for decades, mainly in human fat tissues and in the soil. Exposing chlorine containing compounds (such as salt (NaCl) and hence many types of food, or poly vinyl chloride (PVC)) to high temperatures creates conditions that can produce dioxins and related compounds called furans. Dioxins and furans are created in industrial processes and waste incineration. Waste incineration stands alone for 70% their release into the atmosphere. They can also occur naturally, for example in forest fire. (Miller, 2004)

95% of human in-take of heavy metals comes from food. Mineral elements (i.e. metals and metalloids) present in food can be classified in: 1) Elements necessary for the functioning metabolism, ex. cobalt, copper, iron, flour and iod; and 2) Toxic elements, ex. aluminium, arsenic and the three heavy metals cadmium, mercury and lead. Humans absorb heavy metals

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<sup>60</sup> Composting means that bacteria and fungi are used to decompose waste and recycle organic matter in the ecosystem. This occurs naturally in nature by 1) breaking down (i.e. biodegrading) dead organic material to get nutrients; and 2) releasing non organic compounds into the soil and water where they can be taken up as nutrients by producers. This happens in the presence or absence of oxygen, in processes called aerobic respiration and anaerobic respiration or fermentation. (Miller, 2004) 30-40% of the MSW generated in the European Community yearly consists of food and garden waste and another 20- 30% of paper and cardboard waste, depending on local factors such as food and drink habits, climate and degree of industrialisation. In total 60-70% of MSW could be considered as biodegradable waste (Data from the Environmental assessment report No. 2. 1999 updated 12.9.2002 provided by the European Environment Agency, as quoted by European Commission 2005c).

through inhalation or consumption and transfer to the blood, the liver, the kidneys, the brain, the skeleton etc. Heavy metals have cumulative effects observed in humans, months or years after consumption. The current levels in France are in general not threatening to human health, but people living close to emission sources might get doses potentially harmful. Vegetables and fruits are important sources of heavy metals. Cereals is the prime source of cadmium, and fish and shellfish the one of mercury. Finally drinks (mainly wine) are the principal origin of lead. (Feillet, 2002) Heavy metals are elements and can not be destroyed. They are only possible to catch for safe placement or reuse. (Lindhqvist, 2004)

## 2.4 The SHEEE model – food quality in favour of sustainable development

### *Food quality*

Kotler et al. (2005) define product quality on two levels. In its narrowest sense product quality can be defined as “*freedom from defects*”. Kotler et al. mean however that most consumer oriented firms go further and define quality in terms of “*consumer satisfaction and retention*”.

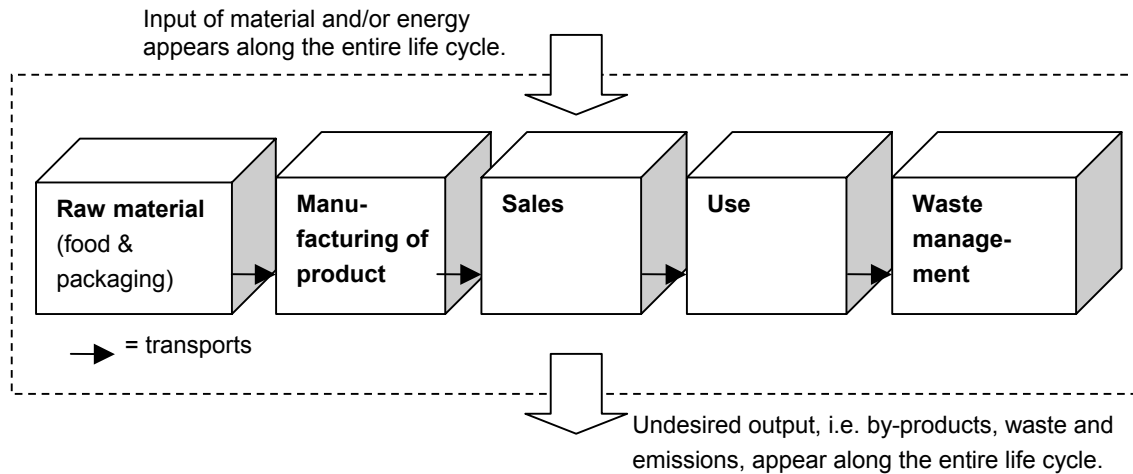
Steenkamp (1998 & 1990) as quoted by Jongen & Meulenberg (2001), defines perceived quality of food products as “*a one-dimensional overall evaluative judgement about the product’s fitness for use with respect to its intended purpose relative to alternatives*”.

There is further the distinction between quality expectation and quality experience. Expectations are formed upon informational stimuli prior to consumption, which are valid for the product’s quality performance upon consumption (Monroe & Krishnan, 1985 as quoted by Jongen & Meulenberg, 2001). The information is built upon one or several quality cues, which can be of an intrinsic (i.e. part of the physical product) or extrinsic type (i.e. related to the product but not a physical part of it such as brand name or price). Quality cues are weighted differently by the consumer and often intrinsic values are given more importance (Steenkamp, 1989 as quoted by Jongen & Meulenberg, 2001).

### *Food quality in favour of sustainable development*

In 1997 an international research program covering the entire food chain started in Sweden under the name of “*FOOD21*”. Natural and social scientists investigate the sustainability of the agricultural food chain, searching for preventive solutions rather than corrective measure on non-sustainable issues. The aim has been to identify optimum circumstances and develop systems for a sustainable food chain providing consumers with high quality products. Also the United Nations Environment Programme (UNEP) has been aiming for constructing a theoretical framework for what is meant by sustainable food production and consumption.

Figure 2-12 gives an overview of the food chain seen from a life cycle perspective and identifies objectives for food production in respect of sustainable development, as presented by FOOD21. The vertical arrows represent the input and undesired output of the food production system.



## **ASPECTS**

### ***ENVIRONMENTAL ASPECTS***

#### ***Natural resources***

Fossil energy

Nitrogen

Phosphorous

Heavy metals

Soil structure

Water

Biological diversity

#### ***Emissions***

Nitrogen emissions

Phosphorous emissions

Pesticides

Greenhouse gases

Pharmaceutical residues

### ***ETHICAL ASPECTS***

#### ***Human occupational welfare***

Production methods

Farmers

#### ***Animal welfare***

Animal health and natural behaviourFocus

Animal feed

Medication

### ***HEALTH ASPECTS***

#### ***Safety***

Consumers

#### ***Nutrition***

Primary produce

### ***ECONOMIC ASPECTS***

Farm holdings

Manufacturers

## **OBJECTIVES**

Progress towards independence

Optimised utilisation of the soil's organic nitrogen pools

Minimised extraction from non-renewable deposits

No accumulation in soil

No irreversible soil compaction

Use of surface and ground water adjusted in line with supply

Maintenance and improvement

No pollution of air and water

No eutrophication of surface water

No residues in soil or water, progress towards independence

No net emissions, carbon sequestration in agriculture soil

No residues in soil and water

Accepted by producers and consumers

Satisfactory social situation and no unnecessary exposure to hazardous substance or risk for injury

Quality that promises health

Progress towards animal husbandry with minimal use of drugs

Confidence in the safety and quality of food

Good and nutritious food without hazardous contaminants

Profit for continued development of holdings

Long-term competitiveness of national food products

Figure 2-12 The food product life cycle and objectives for a sustainable food chain. (FOOD21,2004)



Eastham et al. (2001) state that ethical food is more than organic food, as all organic food should not fulfil the criteria of ethical food. Organic food might for example not have been traded in a fair way or could have compromised on food safety. The food supply chain traces food from breeding to consumption, therefore there will be factors at any stage that will influence the product and are considered as factors for policy- and managerial concern at governmental, intergovernmental and industrial level. Nine key aspects of ethical food have been identified:

- 1) Distribution/Transport
- 2) Animal welfare
- 3) Management practices
- 4) Fair trading
- 5) International policies
- 6) Health issues
- 7) Biotechnology (GMO)<sup>61</sup>
- 8) Environment
- 9) Agricultural methods and policies

The theory of food for sustainable development developed within the framework for the research project FOOD21 identifies five central categories of concern for food products favouring a sustainable development. Although regrouped differently, the categories of concern identified by Eastham et al. are similar to those identified by FOOD21 research group. Table 2-14 puts the theory developed by FOOD21 (2004) in comparison with Eastham et al. (2001).

*Table 2-14 The theories of FOOD21 (2004) and Eastham et al. (2001) in comparison shows many similarities in identified categories of concern of food policies for a sustainable development.*

<b>CATEGORIES OF CONCERN AS IDENTIFIED BY FOOD21 (2004) AND EASTHAM ET AL. (2001)</b>	
<b>FOOD21</b>	<b>EASTHAM ET AL.</b>
Health (Safety and Nutrition)	Health
Environmental concern (Resources and Emissions)	Environmental concern, Agriculture methods Distribution, Biotechnology
Ethical concern (Human occupational and animal welfare)	Animal welfare, Fair trade
Economy (Farmers and manufacturers of national food products)	Fair trade, Agriculture methods and policies
	Management practices, and International policies setting the framework

There are theories upon food product quality that speak about environmental and social concern in analogous terms as the FOOD21 and Eastham et al.. Jongen and Meulenberg (2001, p.28-29) give three statements that capture the aspects of health, environment, ethics and origin, which are similar to theories presented by FOOD21 and Eastham et al. The statements are:

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<sup>61</sup> Advantages and disadvantages of GMO are presented in Appendix III.

- “Procedures, such as quality certification, Integral Quality Care Programs, and Hazard Analysis of Critical Control Points (HACCP) are applied to maintain and guarantee product quality.”
- “Product quality is also pursued by environmentally and animal friendly production methods.”
- “Differentiation of food products on the basis of region of origin is another way of improving the food quality image”.

Jongen & Meulenbert (2001) further identify four principal goals of food production:

- *Safety*. The production of microbiologically safe food products with sufficient shelf life (i.e. no reduction in quality during a certain period, the length of which depends on the type of product).
- *Taste*. The production of tasty and digestible food products.
- *Nutrition*. The production of food with a high nutritional value which contain the essential components to maintain and if possible improve human health.
- *Environment*. More recently the production of food using environmentally friendly methods (sustainable production methods).

On the way towards a definition of food product quality in favour of sustainable development, the multi-disciplinary scientific sources presented so far in this report, build a platform for the research question upon potential categories of concern. The categories identified are five and can be summarised in the form of a model named “SHEEE”, as presented in Table 2-15. The model is a framework of categories of concern potentially applicable in the development of industrial food policies in favour of a sustainable development. The model is an attempt to render concrete and food specific, the generic terms of corporate responsibility and sustainable development. The aspect of satisfaction is based on quality theories of addressing consumers’ expectations before consumption, as well as their experience after consumption. The means assisting the consumer in making informed choices while providing pleasure through intrinsic product characteristics such as taste, texture and colours. The aspect of satisfaction serve companies by including post consumption experience and hence the value of pleasure as well as serving as a framework and minimum level of concern.

Table 2-15 The SHEEE model is a model based on multi-disciplinary sources and represents a framework of categories of concern for industrial food quality in favour of sustainable development.

FOOD PRODUCT QUALITY FAVOURING SUSTAINABLE DEVELOPMENT – THE SHEEE MODEL		
	CATEGORY	DESCRIPTION
S	Satisfaction	Consumer satisfaction: <ul style="list-style-type: none"> <li>• Pre-consumption, i.e. information.</li> <li>• Post-consumption, i.e. experience.</li> </ul>
H	Health	Products in respect of: <ul style="list-style-type: none"> <li>• Food safety.</li> <li>• Response to nutritional needs.</li> </ul>
E	Environment	Environmental concern: <ul style="list-style-type: none"> <li>• Natural resource use.</li> <li>• Emissions and wastes.</li> </ul>
E	Ethics	Business procedures in respect of: <ul style="list-style-type: none"> <li>• Human occupational welfare.</li> <li>• Animal welfare.</li> </ul>
E	Economy	Long-term profit build-up: <ul style="list-style-type: none"> <li>• Farmers and fishermen.</li> <li>• Producers of national food.</li> </ul>

## 2.5 Integrated management and steering instruments

Until this point of the report, the categories of concern relevant for inclusion in industrial food policies in favour of a sustainable development have been suggested and an enriching background of this suggestion has been introduced in the form of challenges of food production and consumption. The following section will engage in the conditions for industrial implementation with focus on voluntary and informative steering instruments, jointly constituting the set of management tools at hand for enterprises.

### 2.5.1 Integrated and inclusive management

The Wuppertal Institute is working on impact assessment and management models based on an integrated product approach, which has been applied to several industrial sectors, such as the textile industry and the food industry. The overall objective is to create feasible tools for effective management and long-term value creation.

The management model relies upon three main data sources: 1) LCA (existing or new)<sup>62</sup>; 2) Internal business data (quantitative data and identified management issues); and 3) stakeholders.

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<sup>62</sup> In accordance with the European Commission's Green Paper from 2001 about Integrated Product Policy (IPP), impact assessment covering the entire life cycle from raw material procurement to end of life management should be committed. Some state that food also should be embraced by an IPP perspective (Miljöstyvningsrådet, 2005) Life-cycle assessment (LCA) should be recognised by its ability to provide a framework for development of new products and in serving companies in saving natural resources, energy, minimising pollution and improving the quality and stream of produced

The management model consists of five stages:

- 1) *Scoping*. Scoping is a selection of product chains/ranges for eco-efficiency improvement. This is a strategic decision based on tangible (ex: financial profit) or non-tangible (ex: employee motivation) benefits and strategic importance.
- 2) *Impact assessment*. Focus area selection by identification and multiplication of aspects and life cycle stages.
- 3) *Solutions*. Ex: cleaner production, mechanical improvements (ex. turn of a tap), design (ex. reheating time of a pizza) or education.
- 4) *Feasibility*. Technical, financial and organizational factors.
- 5) *Performance indicators*. Indicators for performance evaluation and further improvements.

The identification, integration and management of product related impacts all along the value chain can be a challenge seen from a perspective of different local environmental conditions. One example is coffee supplied from various continents, where local environmental conditions may vary considerably, i.e. land use can be an issue in Latin America but might not of equal importance in other places. The challenge is hence to match the development of global value chains with local issues. Many companies are exposed this situation while the issue is poorly addressed in available management systems. The Global Reporting Initiative (GRI) is currently looking into developing practices for geographical boundary settings. (Tuncer, 2005)

Gerbens-Leenes et al. (2003) mean that the deficit of internationally accepted reporting standard concerning what, when and where to report, makes it delicate to consider sustainability. They mean in effect that the first step towards sustainability is the measuring tools for the industry enabling suitable reporting. The second step is the development of a system-based approach for all the companies that contribute to the end product, i.e. prevention of transfer of negative operational effects in between companies. It can be stated that this is coherent with suggestions found within in the concept of IPP and supply chain management.

Gerbens-Leenes et al. further refers to integration in terms of the inclusion of the three areas of concern that constitutes the concept of sustainable development. They mean that much of the research until this point have been focussing on isolated issues such as climate change or related fossil energy. Instead sustainability issues should be managed by interplaying and avoidance of problem shifting and the authors mean that today there is no measuring method covering the three areas of sustainable development.

Concretely speaking the authors has been working within a multi-disciplinary research project on sustainable corporate performance. Their contribution has been the introduction of an environmental management method based on a small set of environmental indicators, namely land-, water- and energy use, which are to be applied by a system- oriented approach. This is developed against a background of 1) food production requires the input of natural capital

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waste. It also serves as a basis for eco-labelling, NGOs and authorities. Despite several advantages, LCA carries some limitations such as complexity and non-completeness, as well as risk of subjective judgements (EEA, 1997).

such as land and water but also of energy provided by the natural capital; 2) avoiding a local approach to environmental corporate performance (unique production sites); and 3) avoiding great number of indicators with little usefulness for the sustainability of an entire system. The lack of a such a system-based approach is considered as one major reason for the little understanding of environmental implication of food production, in a context of different production methods, transportation modes and distances which heavily influence the environmental pressure of a final food. (Gerbens-Leenes et al., 2003)

Mintcheva (2005) states that in the view of the development of parallel theories of supply chain management<sup>63</sup> and environmental policy integration, it stands more and more clear that for food production with simultaneous environmental protection, a holistic approach to management is required. As a consequence of intensive development in the last century of the agro-food industry, food production has been progressively increasing the pressure on the environment. The trends in the food industry and the environmental policy integration (EPI) is poorly matched. More precisely, Mintcheva means that the EPI introduced by the EU it has only made progress in certain areas such as transport, while others such as agriculture has been lagging behind. Mintcheva concludes on the basis on a study of the supply chain of tomato ketchup, that the IPP instruments for environmental policy integration remain sectoral or branch oriented, i.e. agriculture, energy, transport etc and is not sufficient for addressing the environmental problems in the food chain. Further, it is pointed out the lack of labels for food products, at least on EU-level. The internationalisation of food chain is also brought up and the stressing of the fact that environmental problems of food production are not managed on the level of unique production sites.

The integration of impacts occurring all along the product life cycle is further brought up by Brorson & Larsson (1999). They emphasize that a company affects its environment in an indirect way through the activities of its suppliers and sub-contractors, such as raw material providers and transport companies. As a part of the management system a company must deal with these indirect activities. Naturally, this raises the question of how far along the chain the responsibility of the company should reach. They mean that there are no apparent limits but that in those areas where the company have an influence it should be a part of the management system.

On the basis of introduced theories three main desired management characteristic stand out:

- Integrated approach, i.e. along the product life cycle and supply chain.
- Inclusion of categories of concern, i.e. those captured in the concept of sustainable development.
- Feasibility of management tools, i.e. priority of product ranges and indicators.

The paragraph has further highlighted the opaque border between environmental management and management of occupational health and safety, reflecting the interrelationship between the environment and human health.

As a closing of the paragraph, an overview of the various categories of concern and their occurrence in the product life cycle is introduced in Figure 2-13. It can be concluded that environmental, health (product safety) and ethical (human occupational) categories of concern

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<sup>63</sup> Environmental supply chain management is defined as: a set of supply chain management policies held, actions taken, and relations formed in response to concerns related to natural environment with regard to the design, acquisition, production, distribution, use, reuse and disposal of the firm's good and services (Hagelaar & van der Vorst, 2002, as quoted by Mintcheva, 2003)

occur in the almost entirety of life cycle phases and an integrated management is reasonable. The overview is a suggestion and further cross-links cannot be excluded<sup>64</sup>.

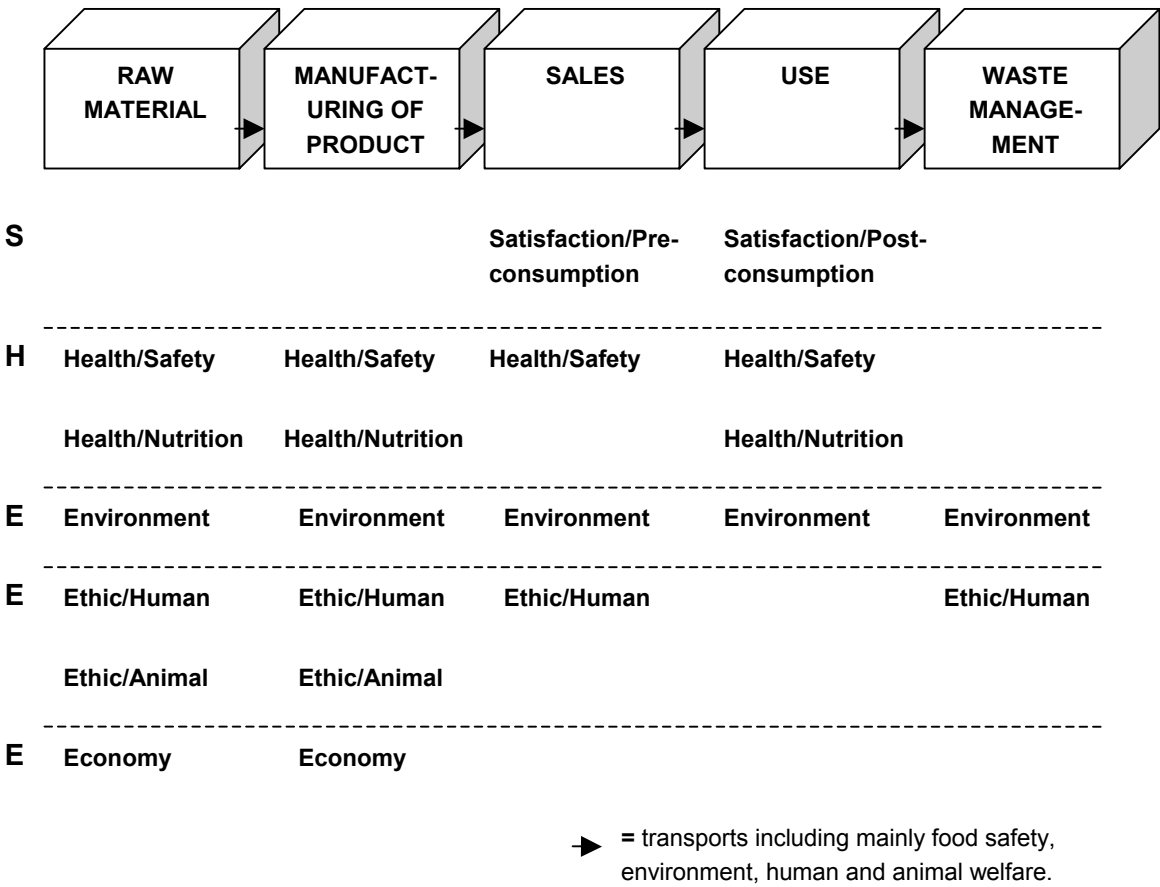


Figure 2-13 Overview of the categories of concern, their occurrence and need for management along the product life cycle. The overview is a suggestion and further cross-links can not be excluded.

### 2.5.2 Introduction to steering instruments

There are several types of steering instruments (also called policy instruments). Those can be classified into groups and developed by various initiators such as governments or industries. No generally accepted classification has been developed. Six main categories have been selected in accordance with a classification made by Dalhammar (2005).

- *Administrative instruments.* Those are regulatory tools such as bans, requirements of environmental health and safety (EHS) information, extended producer responsibility (EPR) and recycling and recovery quotas, quality requirements, emission levels, material requirements, chemical regulation, obligatory labelling such as energy labelling etc. Administrative instruments leave little flexibility to operators and are often referred to as command- and control instruments (Faure, 2001).

<sup>64</sup> Economy is suggested in the two first phases of the life cycle, on the basis of the objectives identified in the research project FOOD21, although it could be extended to the entirety of life cycle.

- *Economic instruments.* Examples are taxes and fees, deposit-refund systems and tradeable permits. In the view of low flexibility of administrative instruments, economists promote economic instruments, providing operators with goals which are to be achieved through various means (Faure, 2001).
- *Informative instruments.* These are tools such as consumer advice, education, environmental labelling (type I-III)<sup>65</sup>, warning labels etc.
- *Dialogues and voluntary agreements*<sup>66</sup>. These are various types of agreements between government and industry for example product panels<sup>67</sup>.
- *Industry self regulation.* Includes initiatives like the Responsible Care<sup>68</sup>, developed by the chemical industry.
- *Voluntary instruments* Product oriented environmental management systems such as ISO standards, Eco-labelling Type I – III, voluntary inclusion of environmental criteria in voluntary product standards etc.

The difference between organisation and product oriented instruments could further be seen as more visible or less visible instruments, in the view of external stakeholders such as consumers.

- *Non-visible instruments* are certifications of organisational processes such as ISO 9000 or ISO 14001 or use of guiding principles such as the Global Compact. Specific rules for the use of their logo types can be obtained, but often those logo types cannot be used on the product. ISO proposes the following solutions to organizations that want to communicate its certification visually in the form of a logo in advertisements, in company literature, on company flags or vehicle fleets:
  - Certified organizations cannot use ISO's logo, adapt or modify the ISO logo.
  - One option is to use the organization's own logo, adapting it by embedding the information about that the organization is certified to ISO 9001 or 14001
  - A second option is to create a new logo with this information. For either of these options, the logos should not be designed in a way that could be interpreted as being ISO's logo.
  - A third option is to apply to for the usage of the certification body logo that audited the organization. The logo belongs to the certification body and can only be used within the framework of a permission and respect of application guidelines. A possible extra benefit could be that if the certification body is accredited, the authorized usage of the logo of the accreditation body might be obtained. (ISO, 2005)

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<sup>65</sup> More information about eco-label schemes are presented further on in the report.

<sup>66</sup> These are agreements between the government and industry. If they are voluntary depend on the threats behind, i.e. the rules for non-compliance (Dalhammar, 2005).

<sup>67</sup> Product panels are consumer panels giving input to criteria development. (Dalhammar, 2005)

<sup>68</sup> Responsible Care is a performance initiative of the USA chemical industry, which reduced emissions by 70% and resulted in an employee safety record four times better than the average of the manufacturing sector. It helps America's leading chemical companies go beyond government requirements and communicate results to the public. Applied tools are: management practices; independent auditors; and performance tracking. Key categories of concern are: Environmental impact; Employee-, Product- and Process safety; Facility security; Product stewardship – Managing product safety & public communication; Accountability through Management System certification; and contribution to Economy. (Responsible Care, 2005)

The visibility is further not linked to the actual performance of the product; i.e. a non-labelled product can be of equal or superior quality of the labelled product. (French Ministry of Ecology and Sustainable Development, 2005b)

- *Visible instruments* can be various types of product labelling. The ISO 14020-serie has been developed to classify and spell out expectations of different types of labelling:
  - ISO 14021: Environmental labelling Type I (1999). Ex : NF Environnement or EU Flower. Verified by independent body, awarded to products fulfilling criteria corresponding to the best environmental performance within each product group.
  - ISO 14024: Self-declaration environmental claims Type II (1999). Ex: Private brands. Self-declared labels used by manufacturers to indicate the environmental aspects of a product or service. The label may take the form of statements, symbols or graphics on product or packaging labels, product literature, advertising or similar.
  - ISO 14025: Environmental label Type III (2000). A label licensed by independent organisations, serving as a report card and providing information on the possible environmental impact of a product, leaving it to the consumer to decided which product is best. (Mont, 2005)

The principal food labels of France, based on pre-defined criteria and certified by third party (i.e. ISO Type I) will be introduced under paragraph 2.6.5. Graphic illustrations of those labels are presented in Appendix VI.

### **2.5.3 Principal voluntary and non-visual instruments**

A number of global instruments for corporate responsibility have been developed. The term global instrument is here defined as “*a standard that provides guidance to international business in relation to non-financial performance and practices*” (OECD, 2001). According to a study conducted by OECD (2001), there are seven global instruments that are among the most prominent initiatives determining individual company initiatives. Those are built upon normative frameworks of international declarations and treaties. Further, eight key areas of concern have been distinguished and could be addressed by companies<sup>69</sup>.

The eight key areas of concern are the following:

- 1) Accountability
- 2) Business conduct
- 3) Community involvement
- 4) Corporate governance
- 5) Environment
- 6) Human rights
- 7) Consumer protection
- 8) Labour relations

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<sup>69</sup> OECD collaborated with Business Social Responsibility (BSR), a business association that advises companies in their design of CSR programmes.



A comparison between categories of concern identified by multi-disciplinary sources, reframed in the SHEEE model, and those covered by global principal management systems for corporate responsibility indicates coherence. This comparison is presented in Table 2-16 Satisfaction, refers to pre-consumption satisfaction, i.e. product information. Consumer protection is covered in a wider sense and not adapted to any specific industrial sector.

Table 2-16 Categories identified by scientific sources (SHEEE model) are similar to those identified by the the OECD for inclusion in corporate responsibility management.

COMPARISON OF CATEGORIES IDENTIFIED IN THE SHEEE MODEL AND THE OECD	
SHEEE categories	Categories for corporate responsibility management identified by the OECD (2001)
Satisfaction <ul style="list-style-type: none"> <li>• Pre-consumption</li> <li>• Post-consumption</li> </ul>	-
Health <ul style="list-style-type: none"> <li>• Safety</li> <li>• Nutrition</li> </ul>	Consumer protection <sup>70</sup>
Environment	Environment
Ethics <ul style="list-style-type: none"> <li>• Human occupational welfare</li> <li>• Animal welfare</li> </ul>	Accountability Business conduct Human rights Labour relations
Economy <ul style="list-style-type: none"> <li>• Raw material producers</li> <li>• Manufacturers</li> </ul>	Corporate governance Community involvement

Those eight groups can be broken down into 54 specific issues, which will not be further described in this report.<sup>71</sup>

All the guidelines are based on a normative framework of international declarations and treaties. Those are (OECD, 2001):

- *The Universal Declaration of Human Rights* stating that “every individual and organ of society” has the responsibility to strive “to promote respect for these rights and freedoms” and by “progressive measures, national and international, to secure their universal and effective recognition and observance”.
- *International Labour Organization (ILO) Conventions* are established norms covering all aspects of working conditions and industrial relations. Some of the most important

<sup>70</sup> Consumer protection could also refer to product information (i.e. satisfaction pre-consumption).

<sup>71</sup> These can be found by turning to the source of OECD (2001) presented in list of references.

cover key labour standards such as freedom of association, right to organise and to collective bargaining, minimum age.

- *ILO Declaration on Fundamental Principles and Rights at work* is based on the key labour standards mentioned in the Conventions. It contains a mechanism for annual review of the progress made by member states that did not yet ratify the labour standards conventions.
- *ILO Tripartite Declaration of principles concerning multinational enterprises and social policy* serve as guidelines to governments, employers and employees concerning employment, training, working conditions and industrial relations.
- *The 27 principles of the Rio declaration* define rights and responsibilities of nations concerning human development and well-being. The Declaration was negotiated in 1992 and build on the concept of sustainable development.

The seven global guidelines identified by OECD (2001) are the following<sup>72</sup>:

- 1) *Caux principles for business* issued in 1994. They “seek to express a world-wide standard for ethical and responsible corporate behaviour and are offered as a foundation for dialogue and action by business and leaders world-wide”. The principles are sponsored by the Caux Roundtable comprised of senior business leaders from Europe, Japan and North America. There is no formal mechanism for corporate commitments. (OECD, 2001)
- 2) *Global Reporting Initiative (GRI)* is an independent<sup>73</sup> institution whose mission is to develop and disseminate globally applicable sustainability reporting guidelines. The guidelines are for voluntary use by organisations in reporting on the economic, environmental, and social dimensions concerning their activities, products and services. The GRI incorporates the active participation of representatives from business, accountancy, investment, environmental, human rights, research and labour organisations from around the world. (GRI, 2005). The GRI does not provide recommendations on business conduct, but a framework for reporting. This framework is in turn built on norms for business conduct. (OECD, 2001)
- 3) *Global Sullivan Principles* issued in 1999. A standard developed by multinational corporations. The principles include eight broad directives on labour, business ethics and environmental practices. The principles were written by the Reverend Leon Sullivan, whose original Sullivan principles provided guidelines for companies doing business in South Africa during the period of apartheid. Companies need to write an annual letter to Reverend Sullivan restating the company’s commitment and progress. (OECD, 2001)
- 4) *OECD Guidelines for multinational enterprises* revised in 2000. The guidelines are recommendations addressed by governments to multinational enterprises. Observance by the companies is voluntary but the governments sign a binding decision to

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<sup>72</sup> Many of these guidelines have been developed for multinational companies, but can be used as guiding principles also for smaller companies by adapting them to individual needs.

<sup>73</sup> GRI started in 1997 and became independent in 2002. It is an official collaborating centre of the United Nations Environment Programme (UNEP) and works in cooperation with UN Secretary-General Kofi Annan’s Global Compact. (GRI, 2005).

participate in the implementation and promotion of guidelines of companies operating in or from their territory.

- 5) *Global Compact. The Global Compact (GC)* is a network of the GC office and six UN agencies<sup>74</sup>. It is a voluntary corporate citizenship initiative with two objectives: mainstream the ten principles (see below) in business activities around the world; and catalyse actions in support of UN goals. The UN Secretary General Kofi Annan called on world business leader to embrace and enact a set of nine principles. Hundreds of companies, international labour and civil society organizations are engaged. The GC offers capacity building through policy dialogues, learning, local structures and projects. It is not a regulatory instrument, meaning that it does not monitor or enforce the behavior of companies, but relies on public accountability, transparency and self-interest of companies, labour and civil society to initiate actions in pursuing the ten principles upon which the GC is based. The principles are classified into the areas of human rights, labour, the environment and anti-corruption. (UN Global Compact, 2005)
- 6) *Social Accountability 8000 (SA 8000)* issued in 1998. A voluntary monitoring and certification standard for assessing labour conditions in global manufacturing operations. It is designed by the inspiration of quality- and environmental auditing processes developed by ISO standards. The developer of the standard is the Social Accountability International (SAI), a U.S.-based, nonprofit organization. (OECD, 2001 and SAI, 2005)
- 7) *Principles for global corporate responsibility – benchmarks*; revised in 2000. The purpose of the standard, is to provide a point of reference for stakeholders in evaluating the CSR performances of an organization. The standard contains nearly 60 principles. The developing body is a group of religious non-profit organizations in the United Kingdom and the United States. (OECD, 2001) GRI has been established as one of the leading and most generally accepted guidelines. (Larsson, 2002)

Other voluntary instruments of importance are presented here after, all with a narrower scope, i.e. higher level of specialisation with regards to area of concern and/or business sector.

*The ISO 9000 and ISO 14000 families* are among ISO's most broadly known standards. ISO 9000 and ISO 14000 standards are currently implemented by 634 000 organizations in 152 countries. They have become international references for quality- and environmental management requirements in business-to-business relations. (ISO, 2005) The ISO 14000 serie consist of five standards divided into the subgroups of organisational- and product oriented standares. The three organisational oriented are: 14001 Environmental management; 14010 Environmental audit; and 14031 Environmental indicators. The two product oriented are: 14040 LCA and 14020 Environmental labelling. ISO 9000 and 14001 are standards for companies' quality- and environmental aspects. The overall structure of the two systems is based on policies, manuals and instructions. The management steps of the systems can be described as five: 1) Policy development; 2) Planning; 3) Implementation and operation; 4) Checking and corrective action; and 5) Management review. There are many similarities between the two standards and can thus be integrated. (Brorson & Larsson, 1999)

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<sup>74</sup> At its core are the Global Compact Office and six UN agencies: the Office of the High Commissioner for Human Rights; the UN Environment Programme; the International Labour Organization; the UN Development Programme; the UN Industrial Development Organization; and the UN Office on Drugs and Crime.

*ISO 15161 is a guideline for the application of ISO 9001 for the food and drink industry.* This guideline also provides information on how to link ISO 9001 with HACCP (see further down).

*The Eco-management and Audit Scheme (EMAS)* is a voluntary regulation enacted by the European Commission in 1993 (EC/1836/93). Businesses from the industrial sector can voluntarily participate in the European environmental management and Audit scheme. Historically the system has been adapted for industrial sites, whereas the revised planned version will extend the application in other sectors such as services, trade and public sector. The company can design the EMAS system to meet its own needs or use national, European or international standardised systems approved by the EU commission. ISO 14001 is an approved system. (Faure, 2001 & Brorson & Larsson, 1999)

*OHSAS 18001* is a specification that was launched in 1999 after creation by the world's leading national standards- and certification bodies; and specialists. It is applicable to any organisation and provides a control system by policies and procedures, i.e. OHS policy; planning; implementation and operation; checking and corrective action; management review; and continual improvement. It does not state specific performance criteria, nor does it give detailed specifications for the design of a management system. It consists of 18001 and 18002 and embraces further BS8800<sup>75</sup>. The importance of managing OHS is recognised by all interested parties such as employers, employees, customers, suppliers, insurers, shareholders, the community, contractors, and regulatory authorities. OHSAS 18001 is compatible with ISO 9001 and ISO 14001, in order to facilitate the integration. (The BS 8800, OSHAS and OSHA Health and Safety Management Group, 2005)

*ISO 26000 about social responsibility* is expected for publication first in 2008. ISO's work aims to add value, rather than replace existing inter-governmental agreements with relevance to social responsibility, such as the United Nations Universal Declaration of Human Rights, and those adopted by the International Labour Organization (ILO), and other UN conventions. The challenge is to take account of the existing global principles, standards, guidelines and knowledge into our work and at the same time be creative in the development of this guidance document. (ISO, 2005)

*ISO 22000 Food Safety and Management Systems* is a new standard ready for release during the autumn 2005, developed in the light of more global trading with food and an increased need for harmonized standards for treatment and production of food. This standard that will cover the entire industrial food chain from feed producers, machines manufacturers, packaging producers, food manufacturers and retailers. It will be possible to integrate this system with ISO 9001 or ISO 14001 or use on its own. Further, the implementation of HACCP and ISO 9001 is seen as recommended in order to handle requirements demanded by the new ISO standard. (Det Norske Veritas, 2005 and AFNOR, 2005)

*Hazard Analysis and Critical Control Point (HACCP)* is a tool for analysis and management of risks. It is mainly used by producers of food or food packagings. Originally developed to control microbiological hazards, the approach can also be used to identify and assess hazards of chemical (ex. pesticides in plant raw materials) and of physical nature (ex. bones in fish). It can be linked to ISO 9000. (Det Norske Veritas, 2005 and AFNOR, 2005) The EU adopted

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<sup>75</sup> BS8800 is a guide to OHS management systems and explains how the various elements in developing an OHS management system can be integrated and maintained in everyday management. (The BS8800, OSHAS and OSHA Health and Safety Management Group, 2005)

the HACCP approach in Directive 93/43 which means that the approach shall appear in the national legislation of all member states. (Jongen & Meulenberg, 2001)

*International Food Standard (IFS)*. The aim of the IFS is to create an evaluation system for companies supplying retailer branded food products with uniform formulations, uniform audit procedures and mutual acceptance of audits. Supplier audits have long been an inherent part of retail and industry and audits were in the past carried out by the retailers' quality assurance departments. Demands of consumers, rising incidence of claims for damages, globalisation of commodity flow and auditing costs are drivers for change. A common frame of reference on food safety, the IFS standard, was developed by German distributors (Hauptverband des Deutschen Einzelhandels - HDE group). Joined by the French retailers (Fédération des entreprises du Commerce et de la Distribution - FCD group) they accomplished a forth version, available from March 2004. The standard embraces management of quality system, management's responsibility, resource management, product realisation; and measurements, analysis and improvements. The standard is today demanded by the majority of French and German retailers, for manufacturing of their private label food products. (IFS, 2005 and AFNOR, 2005)

*The British Retail Consortium (BRC)*. The BRC Food Technical Standard traditionally used to evaluate manufacturers of retailers private label food products has evolved into a Global Standard used not just to assess retailer suppliers, but as a framework for supplier assessment and manufacturer of some branded products. The majority of UK and Scandinavian retailers will only accept business with suppliers with the BRC Global Standard certification. BRC published the first issue of the Packaging Standard in 2002, followed by Consumer Products Standard in August 2003. (BRC, 2005 and AFNOR, 2005)

*European Food Security and Inspection Service (EFSA)*. A quality management system mainly for food-, drink- and allied industries, certified by third party. EFSA has two main products: Manufacturing/Processing (Food processing and packaging; Quality and Safety systems; Retail food service such as store inspection) and Agriculture (Livestock/Poultry, Cereals, Dairy, Fish etc). (EFSA, 2005)

*EUREPGAP* was established in 1997 by retailers belonging to Euro-Retail Produce Working Group (Eurep) and their retail customers. Eurepgap is now a set of normative documents suitable to be accredited to internationally recognised certification criteria such as ISO Guide 65. The overall aim to by integrity, transparency and harmonisation of global agricultural standards reduce the risks of agricultural production. This includes the requirements of safe food, produced in a way that respects all aspects of sustainable development; the worker's occupational health and safety; worker's welfare; environmental- and social protection. Eurepgap's scope concern the practices on the farm, whereas other standards take over further on in the supply chain. The standards are openly available and free to obtain form the Eurepgap website and include four main food related groups. Those are Integrated Farm Assurance, Fruit and Vegetables, Integrated Aquaculture Assurance and Coffee Reference code. (Eurepgap, 2005)

*GFSI (Global Food Safety Initiative)* is a programme within the CIES - The Food Business Forum, the only independent global food business network. It serves the CEOs and senior management of 175 retailer and 175 supplier member companies, and their subsidiaries in 150 countries. The mission of GFSI is to strengthen consumer confidence in the food they buy in retail outlets. This is to be achieved by implementing and maintaining a scheme to benchmark food safety standards (for private label products) as well as farm assurance standards, by facilitating mutual recognition between standard owners and by ensuring world-wide integrity

in the quality and the accreditation of food safety auditors. (GIFSI, 2005) Due to its nature of framework for benchmark rather than tool for management of industrial performance, this initiative will not be included in the analysis further on, yet worth attention.

*The public procurement initiative* is a result of two EU Directives, presented in April 2004 and to be implemented in February 2006, recognising public procurement as a possible contributor to sustainable development. The initiative is intended to guide the purchaser in identifying relevant aspects and contribute in helping mainly the public purchasers but also other actors (including private purchasers) on their way to providing the society with more products produced with little negative environmental impact. The criteria for food developed cover suppliers quality system (control and traceability); guidance to ecological products; protein based products (incl meet produced in a way supporting biological diversity and open landscapes) and milk; fish (species protection, fishing methods, traceability); fruit and vegetables; cereals; coffee; food transports (type of vehicle and way of driving); packagings; and meal service. (Swedish Environmental Management Council, 2005; Frenander, 2005; and French Ministry of ecology and sustainable development, 2005b)

*Codes of good manufacturing practice (GMP)* are procedures in a food factory, which consistently generate products of acceptable microbiological quality, monitored by laboratory and in-line tests. A code of GMP must include details of the process that are necessary to achieve the goal such as; times or temperatures; details of equipment; plant layout; disinfection and hygiene practices; and laboratory tests. GMPs have been created by national regulatory bodies, international organisations (ex. Codex Alimentarius Commission<sup>76</sup>), trade associations and more. They can be applied by manufacturers as a basis for quality management and may also be used by external inspectors. The drawback of the codes is the low precision level, in the form of phrases such as “*appropriate cleaning procedures*” followed by no definition. Furthermore they may fail in ranking factors and processes of importance. (Adams & Moss, 2000)

*Programme National Nutrition Santé (PNNS)*. In a context of recommendations from scientific experts, the French Minister of Health and other concerned ministers and institutions, initiated in 2001 a five years long programme for health and nutrition, with the aim of improving the health of all citizens living in France, by providing recommendations concerning food and physical activities. The key partners in the development and implementation of the national programme are besides ministers, Social Insurance Office (Caisse nationale d'assurance maladie des travailleurs salariés - CNAMTS), Institute for National Prevention and Education of health (Institut National de Prévention et d'Education pour la Santé -INPES), scientists, agencies, private food sector and more. The programme serves as practical guidelines for decisions and activities of food producers as well as an instrument awareness rising among the general public. The axes of the program are the following; increased consumption of fruit and vegetables; higher consumption of calcium based food, reduced fat consumption, increased carbohydrate consumption; recommendations of two daily portions of meat, fish and egg, reduced sugar and sugar based product intake; and finally increased physical activity. (PNNS, 2005)

The voluntary instruments, i.e. management systems, at present available for a food manufacturer will hereafter be evaluated against the categories of concern included in the SHEEE model on the basis of inclusion and integration discussed in paragraph 2.6.2.

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<sup>76</sup> Codex Alimentarius plays a central role in international trade, by establishing norms necessary for international trading. The Codex Alimentarius Commission develops policies, norms etc; WTO base the SPS and TBT on the norms. (Feillet, 2002)

### *Inclusion*

It can be concluded that in term of inclusion of categories; EUREPGAP is the only system covering all categories, with the exception of the nutritional part of health. Further, the ISO-serie can be combined (ISO 22000, ISO 9000 and ISO 14000) for improved but still not full inclusion due to the lacking categories of economy, nutrition and ethics. Therefore, the planned ISO 26000 will be necessary for improved inclusion. EFSIS is a system for food security and might not be intended for extended scope. The other general CSR management systems are further at hand; although one of them builds on a set of indicators and others are not adapted for specific food sector application.

### *Integration*

In terms of integration, i.e. multiple life cycle stages, the ISO 22000 is the only management system applicable at any step in the entire food value chain. EFSIS cover both the raw material- and manufacturing stages. The ISO-series and GRI are further applicable in a wide set of organisations.

Against the background of inclusion and integration of management systems, the following ranking could be suggested:

- 1) GRI is full-bodied in terms of inclusiveness and integration, but does only provide indicators and no management system.
- 2) The ISO-serie is integrated and inclusive by providing management systems for several categories and in general applicable in a wide range of organisations which opens up the possibility for integration. The ISO 22000 is new and has the feature of integration all through the value chain. The ISO 26000 will be the last brick in the set of sustainability management systems but will not be available before 2008. Until then, companies need to complement with management systems of ethical concerns, such as SA 8000. One drawback might be the lack of norms, and one advantage might be the certification by accredited third party. All in all, despite the gap of the ethical category, ISO offers integration and inclusiveness through the synchronization in between series.
- 3) EUREPGAP is full-bodied in terms of inclusiveness, but is concentrated to the raw material stage.
- 4) OECD, Sullivan, Global Compact and International benchmark; are all inclusive CSR guidelines but lack the operational management support and needs to be backed up by other systems.
- 5) Little inclusive are Caux and SA 8000 addressing the ethical category of concern. Also EFSIS is modest in inclusiveness in building entirely on quality (safety) of processing and packaging. This system is however integrated on two stages, raw material provision and product manufacturing.
- 6) GMP refers to food safety in the factory. While useful in many aspects, they might be imprecise due to its intended wide application.
- 7) There is a lack of nutritional management systems. PNNS provides guidelines but does not assist product developers in the management of nutritional aspects.

## 2.5.4 Principal informative and visual instruments

*Label NF Agro-alimentaire* is a voluntary certification for product quality, built on French, European and international norms. It covers product features such as composition, consistency and type of production. The label covers today only superior quality cooked ham (*jambon cuit supérieur*)<sup>77</sup>. (Consodurable, 2005)

*Eco-label Agriculture Biologique (AB)* is a label owned by the French Ministry of Agriculture. It guarantees that 95% of the ingredients used are produced according to principles for organic food defined by the EU. The requirements are further: no pesticides, no industrial fertilizers, no antibiotics in animal feed, no traces of chemical compounds in the soil since two to three years, no application of sewage water residues and no genetically modified organisms. The food manufacturing phase is only included through restrictions on a number of additives and interdiction of ionizing radiation. (Feillet, 2002)

*Label Rouge*, created by the law of 1960 and under the responsibility of the Ministry of Agriculture, Food and Fishery, is a food product certification built upon predefined criteria concerning superior quality, linked mainly to production conditions. Certified products shall be of such quality that it is distinguishable by the consumer in terms of taste and image. The technical criteria for every product group classified, is developed and re-evaluated regularly by the supply chain in question, such as chicken, duck, goose, foie gras, veal, porc and more. The certification is made by an accredited third party. The geographical origin of the product can be included in the certification, according to the legislation of Indication Géographique Protégée (IGP) within the framework of the regulation CEE 2081/92. (French Ministry of Agriculture, Food and Fishery, 2005)

*Appellation d'Origine Contrôlée (A.O.C)* signifies a product whose characteristics are linked exclusively to the environment of the geographical origin of the product. The National Institute of Appellations of Origin (INAO)<sup>78</sup>, a public service institution, administrates and controls the compliance of certified products. 467 A.O.C labels have been issued within the wine sector, 47 in cheese and milk sector and 25 agricultural products. Further, the INAO has been given, by the legislation, the role of identifying products potentially corresponding to the criteria of an IGP, the first step in the process of protecting the quality of products with origins within the European Community. (French Ministry of Agriculture, 2005)

*The Marine Stewardship Council (MSC)* is an independent, global, non-profit organisation whose role is to, via a certification programme, recognise well-managed fisheries. The MSC promotes equal access to the certification programme irrespective of the size, scale, type location or intensity of the fishery. It recognises further the need to respect the interests of people dependent on fishing for food and livelihood. 12 fisheries have currently been certified, among others Alaska Pollock - Bering Sea and Aleutian Islands; Alaska Pollock - Gulf of Alaska; Alaska Salmon and New Zealand Hooki. (MSC, 2005)

*Fair trade label Max Havelaar*. The label guarantees that the product is produced and commercialized according to international standards for fair trade, and is controlled and managed by Max Havelaar France and Fairtrade Labelling Organizations (FLO). Fair trade contributes to sustainable development by providing better commercial conditions for marginalised producers, mainly in the Southern hemisphere, by securing their rights. Coffee,

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<sup>77</sup> Due to its limited presence, this label will not be included in the analysis of the report.

<sup>78</sup> Institut National des Appellation d'Origine. Translation from French to English made by the author of this report.



Thea, Bananas, Chocolate, Fruitjuice, Sugar, Rice, Honey and Cotton are covered by the label scheme. (Max Havelaar France, 2005)

*The Green Dot.* This symbol in the form of a green spiral is a guarantee for packaging take back after consumer usage. The system was initially established in Germany through the packaging ordinance of April 1991 - a voluntary industry initiative, valid for sales packaging and running in parallel with the municipal waste management system (the dual system) (Lindqvist, 2004). The French application was established through the regulation of 1 April 1992. The take back system is in France administrated by two private organisations, namely Eco-emballages and Adelphe. Eco-emballages was created in 1992 by the public administration together with the industry and was in 2004 further given the responsibility of collection and recycling of sorted packaging household waste. Adelphe was created in 1993 by initiative of the wine- and spirit sector. The responsibilities and services provided by Adelphe have progressively been extended and include today all sectors and types of packaging materials (i.e. steel, aluminium, paper/ board, plastic and glass). In 1993 the release of a packaging on the French market was connected to a fee of 0,15 Euro centimes. Today this fee is equal to an average value of 0,6 Euro centimes. In the end of 2004 the Pro Europe, an association reunifying European countries around the Green Dot and packaging collection, sorting and recycling; consisted of 24 member states representing 400 million citizens. The symbol is auto-declarative (ISO type II). (ADEME, 2005; Eco-emballages, 2005 & Adelphe, 2005)

On the basis of this inventory, a number of gaps in the map of information systems certified by third party can be identified. An evaluation of the set of available labels will be made against the background categories of the SHEEE-model.

- *Satisfaction* can be linked to labelling schemes on the basis of pre-consumption information. In this sense, any label featuring any benefit could be relevant in the satisfaction category.
- *Health* category has no label for safety with the exception of MSC which guarantees traceability up-streams from the production phase. The general absence of safety labels can be explained by heavy regulation.

Concerning the nutritional part of health, there is further no label for guiding the consumer in the search for features related to nutritional aspects such as fat, sugar, salt or other contents of significance. Such labels can be found in some other countries. In Sweden there is for example a symbol in the form of a keyhole that gives guarantees upon factors such as fat, type of fat, fibres, salt and sugar. Australia has a similar system with same level of inclusiveness. Other countries with symbols with nutritional guidance are the United Kingdom (with a symbol of a traffic light) and several other countries. (Reuterswärd, 2005)

- *Environmental* information consists of the French official AB symbol and the MSC symbol developed and administered by a private organisation.<sup>79</sup> The current set of environmental symbols has limitations on the level of vertical integration, i.e. while guaranteeing specific characteristics of raw materials the performance of other stages of the life cycle such as the manufacturing stage is not covered by any label scheme.

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<sup>79</sup> One aspect of environmental dimension, the one of waste management, is partly covered by the Green dot system, which guarantees that producing company participates, i.e. pay the fees, to the packaging collection system that takes care of the packaging after consumer usage. This is however an auto-declarative symbol and the reason for its exclusion from the list.

- On *ethical* level, the private initiative Max Havelaar, with a certain number of product categories mainly sourced from the southern hemisphere represents alone the ethical visible information exposed to consumers. It also covers the economical promises of long term profit and survival of raw material producers.
- The *economic* category is represented by Max Havelaar, A.O.C and Label Rouge (can be completed with origin guarantee), which defend regional and national foods and their long term exploitation and survival.

The identified gaps with potential need for improvement can be summarized as follows:

- *Health*: Possible completion with symbol for nutritional guarantee.
- *Environmental* information: 1) Vertical integration, i.e. guarantee about other phases of the chain such as the production phase or transport; 2) Potentially a complementary symbol with less strict requirements than AB, but still good environmental practice, i.e. agriculture raisonnée with the prerequisite of standardised criteria; and 3) Potential completion by public (i.e. national official) alternative for fish, such as AB for agriculture products.
- *Ethical* information: 1) Extended geographical coverage, i.e. raw material providers and producers operating outside the southern hemisphere; 2) Extended product category coverage, which will probably come with time; and 3) Potential completion by public initiative, such as AB<sup>80</sup>.

### 2.5.5 Other initiatives

In 2004 a web site developed by the association *Consodurable* was launched. Consodurable is a group of actors representing public authorities, non-governmental organisations, consumer associations and environmental organisations. The general direction of competition, consumption and fraud (La Direction générale de la concurrence, de la consommation et de la répression des fraudes - DGCCRF) is also a member of the administration. The aim of Consodurable is to inform consumers about products and services favouring sustainable development and to create synergies between consumers and producers in order to obtain new initiatives within sustainable development. Consodurable develops and administers the web site, disposing relevant information about sustainable consumption. The site presents information communicated by the producers or professional organisations about their activities, guiding consumers in their choice. (Consodurable, 2005)

### 2.5.6 Respons to imperfect information

The consumer has the right to information, according to the E.C. Treaty. The information should further be accurate and accessible to be useful. As consumers show a growing preference for socially and environmentally responsible products and services, access to

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<sup>80</sup> An attempt to establish a standard for the concept “*fair trade*” (in French: “*commerce équitable*”) has been made by AFNOR, on request from the French Administration. Presented on 17 March 2005, the norm was not satisfying to all stakeholders. The criticism, as presented in a letter to Minister of standardisations (Pierre Valla), by the organisations such as Max Havelaar, and Artisans du Monde, was based upon three principal points of concern: 1) No inclusion of compulsory presence of at least one fair trade organisation; 2) No partnership with organised producers or organisation (instead of individuals); 3) No emphasis of guidance towards independence or other social responsibilities – as the text was presented, only the prices are in focus and not the capacity building for future autonomy. The background to the norm is the concern from fair trade organisations over the application of auto-declared claims in marketing activities of private companies. Also the retailers have a stake in the development of a norm, as fair trade has developed into an element for enhanced competitive advantage. (*Commerce équitable – polémique autour du document de l’AFNOR sur le commerce équitable*, 2005, April 27)

relevant information about the social and environmental conditions of production is crucial to help them in making informed choices. Such information is available in different forms and from various sources, including claims made by the producer, information from consumer organisations and third party verified labels. (Commission Proposal COM (02) 347 final)

The following three initiatives are potential responses to imperfect information:

- 1) *Regulations on green marketing claims.* Adherence to commonly agreed criteria for making and assessing social and environmental claims of a self-declaratory character (i.e. private brands and other auto-declaratory initiatives) would contribute to improve the effectiveness and credibility of these claims. Monitoring of claims by European Member States and stakeholders is essential. The Commission is finalising guidelines for making and assessing environmental self-declared claims by producers or distributors, based on the ISO 14021:1999 standard (see further down), with the objective of preventing misleading claims and encouraging good ones. (European Commission, 2002 and Mont, 2005) The status of the EU process can be summarized as follows: On 16 July 2003, the Commission adopted a proposal (COM 2003) 424) for a regulation upon nutrition and health claims made on foods. The main objectives were to enhance the consumer protection (i.e. informed choices) and the legal security of economic operators (i.e. fair competition and innovation protection). The European Parliament held its first reading vote on the Commission's proposal on 26 May 2005. On 3 June 2005, EU health ministers unanimously endorsed the Commission's proposal during a first reading vote at the health council, including the provision for nutrient profiles and the authorisation procedure. A common position is expected in autumn 2005 and second reading is expected to be finalised at the beginning of 2006. (European Community, 2005)
- 2) *Initiatives verified by independent bodies.* Consumers also receive information through recognition schemes, such as listing of awards, prizes or labels which identify good practices on specific subjects. The EU-Ecolabel (EU flower) and NF Environnement are examples of third party verified product labelling schemes. They are however only available for a limited range of product categories and for most consumer products, relevant social and environmental information is not easily accessible. Furthermore, those labels do not cover food products. (European Commission, 2002 and Mont, 2005)
- 3) *ISO standardisation.*
  - a) Organisation oriented, ex: Environmental management (ISO 14001), Environmental Auditing (ISO 14010) and Environmental Performance indicators (ISO 14031).
  - b) Product oriented, ex: Life cycle assessment (ISO 14040) and Environmental labelling (ISO 14020). (Brorson & Larsson, 1999; and Mont, 2005)

### **2.5.7 Potential consequence of imperfect information**

Quality and uncertainty pose some problems for the theory of markets and it is claimed that trust is important in economic models and constitutes a prerequisite for trade and production. The difficulty of distinguishing good quality from bad quality is inherent in the business world and something consumers are exposed to daily.

Asymmetry in available information, is established when the seller knows more about the quality than the buyer. Asymmetrical information between seller and buyer may entail the drive out of high quality goods in favour of low quality goods. Simply stated, bad products drive out good products because they manage to sell at the same price. But the bad products sell at the same price as the good products only because it is impossible for the buyer to tell the difference between good and bad goods, only the seller knows. (Angelof, 1970)

Angelof (1970) uses an example of cars to describe the theory of quality uncertainty and market mechanisms. The cars used in the example exist only in four types<sup>81</sup>: good, bad (called lemons in the USA), old and new. A new car may be a good one or a lemon and naturally the same is true for old cars. When buying a new car the buyer does not know whether it is a good one or a lemon, the buyer only has a vague idea of the probability. After owning a car for a while, the car owner get a more precise idea about the probability that the car is a lemon, based on an estimate that is more accurate than the original one. The car owner will now have more information about the quality than the buyers and may at this time be stuck in a delicate situation of not obtaining the true value of the car and not obtaining a new car of expected value. Consequently most cars traded will be lemons and good cars may not be traded at all. Hence, bad cars tend to drive out good cars.

An analogy can be made to any market or any goods, where lack of awareness in combination with poor product information might entail flat development curves with regards to quality of marketed products.

## 2.6 Summarising platform for the empirical phase

The suggested framework of five categories of concern to address in industrial policies of food quality in respect of sustainable development will be enriched by empirical data collected from stakeholders of the French food industry through their support, rejection or modification of categories. The five categories of concern are: Satisfaction (Pre-consumption information & Post-consumption retention.), Health (Safety & Nutrition), Environment (Resources & Emissions), Ethics (Human occupational & Animal welfare) and Economy (Long term profit of raw material providers and producers of national food).

The prevailing conditions for efficient and effective industrial management of sustainable development are unfavourable in terms of usefulness of available management tools (i.e. voluntary- and informative instruments). This situation is a potential barrier for industrial initiation, implementation and maintenance of sustainable development management and a subject for possible upgrading and progress. This presumed issue will be tested in the empirical phase and hence supported, rejected and/or elaborated by empirical data.

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<sup>81</sup> Citation Angelof (1970, p. 489): “*Suppose for the sake of clarity rather than reality that there are only four types of cars.*”

## 3 Empirical findings

### 3.1 Critical categories of food quality in favour of sustainable development

#### 3.1.1 Presentation of result from empirical data collection

In this phase of the research categories of concern the SHEEE model has been tested on 12 stakeholders. The interview material exposed to the stakeholders for the facilitation of answering and analysis, consisted of a list of aspects based on the FOOD21 research and completed by the GRI set of indicators, which was suggesting more detailed aspects than the categories of the FOOD21 framework and hence further assistance to respondents. The purpose of the first question (Q1) was to get confirmed by French stakeholders the SHEEE model, by the support, rejection and/or accentuation of categories.

The result of the interviews with each stakeholder will be presented in this paragraph. Longer sections will be designated stakeholders with extensive policy programs for quality, which call for further amplification. In the end of the paragraph, a summary of results of the empirical data collection will be made.

#### *Ministry of agriculture, food and fishery*

The Interministerial Committee of Agriculture and Foods (Comité Interministériel de l'Agriculture et de l'Alimentation) identifies in a report presented at the European FAO conference in Montpellier 2004, seven points that together represent food quality and which are listed further down. This food quality definition was obtained from the French Ministry of Agriculture, Food and Fishery as the response to Q1. Food quality is regarded as a concept that goes beyond the research of food security, even though this dimension is fundamental and crucial for any food policy development. Food quality is further regarded as a multidisciplinary concept funded on a variety of competences and incorporated in the strategy of sustainable development. The report refers to the ISO 8402 norm that defines quality as: "*the ensemble of characteristics of a product, a process or a service that gives it the aptitude to satisfy explicit or implicit needs*". (Interministerial committee of agriculture and food, 2004).

- 1) Response to the expectations and the evolution of consumers, in particular in the form of pleasure and taste that is strongly linked to cultural elements.
- 2) The capacity to assure the functions related to nutrition and public health.
- 3) Maximal food security.
- 4) Good practices of transformation and production.
- 5) Concern of environment and animal welfare.
- 6) Guarantee of origin and specific characteristics of certain products.
- 7) Transparency of information in order to enable the consumer to make choices of products that correspond to their desire and nutritional needs.

It can be concluded that the views presented above reflect the categories identified in the SHEEE model.

#### *Ministry of Ecology and Sustainable Development*

All the five categories included in the SHEEE model find support from the stakeholder. Consumer pleasure (i.e. satisfaction post-consumption), water resources, pesticide emissions and exposure to workers are aspects emphasized by the stakeholder.

### *Wuppertal Institute*

The Wuppertal institute supports all categories.

### *AFNOR*

The stakeholder does not consider itself having the technical knowledge necessary to answer the question. Consequently the question is excluded from the interview.

### *SAI Platform*

The stakeholder supports all the categories. Special emphasis is made of resources such as soil; emissions of pesticides; food safety and animal disease; information and traceability; ethical aspect such as child work and animal welfare; and economy.

### *Claude Fussler*

The stakeholder does not consider himself having the technical knowledge necessary to answer the question. Consequently the question is excluded from the interview.

### *Consodurable*

The stakeholder does not consider itself having the technical knowledge necessary to answer the question. Consequently the question is excluded from the interview.

### *ANIA – the National Agricultural and Food Association*

The sustainable development action programme of ANIA can be summarized in the 12 points below (ANIA, 2003, as quoted by d'Archimbaud, 2005).

- 1) *Resource management* for sustainable raw material provision.
- 2) Quality improvement of *sewage water* from industrial sites representing the food sector. Today only specific classified industrial sites are obliged to report annually upon their sewage water quality., to the regulatory authorities.
- 3) *Packaging* dematerialisation.
- 4) Emission reduction of cooling substances used for *refrigeration* (CFCs, HFCs etc). Promote legal compliance, in co-operation with the Ministry of Ecology and Sustainable Development and the Association Francaise du Froid (AFF).
- 5) *Waste valorisation*, i.e. transformation of by-products and waste into raw material.
- 6) *Green house gases* linked to fixed sites and transports.
- 7) Improve *employee* competence.
- 8) Reinforce *image* of food industry among young people.
- 9) Improve *information* to consumer, including development of good practices for nutritional information (especially for children), encouragement of nutrition labelling; and information campaigns targeting groups with specific needs.
- 10) Promote sustainable *distribution*.
- 11) Encourage *export* of French foods.
- 12) Promote *innovation* all along the product life cycle, including packaging.

It can be stated that ANIA covers “*satisfaction*” (by labelling and information), “*health*” (by nutrition and specific needs) and “*environment*” (by several points). Ethics has low priority as stated by d'Archimbaud (2005), yet point seven emphasizes employee development. Finally “*economy*” is covered (by export and image). As a conclusion the SHEEE categories is fairly well addressed even though the ethical category intentionally is left outside the scope of core attention.

### *Carrefour*

The company has developed a set of 20 quality indicators for geographical markets with production of private label products. The system of indicators and reporting is regrouped under the name of Le Tableau de Bord Qualité (TBQ), listed below (Carrefour, 2004):

- |                             |                         |
|-----------------------------|-------------------------|
| 1) Hygiene                  | 11) Fair trade products |
| 2) Energy                   | 12) Local suppliers     |
| 3) Water                    | 13) Low price products  |
| 4) Waste                    | 14) Stakeholders        |
| 5) Refrigerating substances | 15) Consumer awareness  |
| 6) Paper                    | 16) Logistics           |
| 7) Shopping bags            | 17) Accidents           |
| 8) Purchasing quality       | 18) Housewives          |
| 9) Organic products         | 19) Handicapped         |
| 10) Quality partnership     | 20) Education           |

Some of the parameters refer directly to the products, others to other aspects such as the stores. Nutrition is not covered in the TBQ, which is explained by the nutritional approach in the sense of a consumer benefit applied to certain product ranges. It can hence be stated that Carrefour covers nutrition, but does not consider it as a mandatory aspect of quality applied in every product. The emphasis of flexibility in application is further on not unique for nutrition, but is a general approach taken by the company. The company further underlines the importance of choice and the supply of products corresponding to individual preferences. Although not included in the set of indicators, satisfaction is a key parameter of Carrefour's quality programme, determined by food security, freshness, taste and authenticity. Finally, GMO is rejected by Carrefour and the company take a position against its application. (Cottel, 2005)

It can be concluded that the company has translated several of the aspects within the categories of the SHEEE model, into indicators of operational measurement. All the categories are covered in a more or less wide sense with the exception of nutrition, which is not translated into a mandatory quality indicator. Instead nutrition is described as an important factor in the form of a particular consumer benefit applied in a flexible manner.

### *Findus*

The company emphasizes the importance of transparency and trust; and the undeniable bond between environmental- and human health. Findus quality policy is constructed upon concerns for food safety, the environment as well as social aspects, according to the list below.

- 1) Superior products seen from a stakeholder perspective.
- 2) Food safety.
- 3) Environment.
- 4) Social responsibility for employees, trading partners and business associates, including encouragement of teamwork.
- 5) Legal compliance.
- 6) Constant improvements and action.

Beside the quality policy, Findus has specific policies for the environment, food safety and nutrition. Further, for some of the key ranges such as fish and vegetables, specific policies are developed with the aim for stakeholder satisfaction. Transport is identified as an area of high

potential improvement, with reference to environmental and animal welfare. Further and similarly to Carrefour, Findus does not consider nutrition as a fundamental pillar in a quality definition, but as an optional consumer benefit. Findus has further a code of conduct developed, which is applied in supplier relations. In accordance with consumer preferences, no GMO ingredients are used. Findus does further not take a position against GMO, but encourages further research and extensive labelling. (Larsson, Inger. 2005, June 28)

The SHEEE categories are addressed in policies of Findus. The company also emphasizes the optional role of nutrition, although some aspects of nutrition such as salt and fat are translated into criteria of general new product development guidelines and concern all products.

#### *INC*

With the exception of nutrition, the categories suggested find support from the stakeholder. Animal feed, antibiotics and hormones; and biodegradable packagings are emphasized. Furthermore, GMOs are not supported by the stakeholder.

#### *WWF*

Ecosystem protection constitutes the core of activities of the WWF. Naturally, other categories of concern get an indirect focus of attention and the organisation is progressively widening its scope with other categories such as ethical concern. (Royet, 2005) As a conclusion, health, environment and economy are the three categories currently supported by the stakeholder. Special emphasis is made of general use of natural resources; transports; and the naturalness of food such as natural sugar versus chemical sweetening substances.

### **3.1.2 Conclusion of findings of empirical data collection**

Four major conclusions can be drawn from the data collection, upon stakeholder preferences in terms of inclusion of categories in the model for product quality in respect of a sustainable development.

- The categories of the SHEEE model find general support from the stakeholders.
- Nutrition is supported though attention to specific nutritional aspects and flexible application.
- Information is widely enhanced.
- Encouragement of cultural and/or individual preferences.

## **3.2 Drivers, barriers and steering instruments for enhanced industrial performance**

### **3.2.1 Presentation of result from empirical data collection**

In this section the four last questions (Q2-5) will be treated, to develop the understanding for stakeholders' views upon the current conditions for sustainable production and consumption of food. More precisely, drivers and barriers for food quality management embracing sustainable development will be identified. Further, suggested supplementary steering initiatives for enhanced industrial management will be pointed out. The research questions and their formulation in the questionnaire can be found under the methodology paragraph. The questions are repeated in a shorter version here to facilitate the following of results. Q2) Identification of principal relevant tools at hand for food producers aiming for adoption and implementation of policies for sustainable development, with regards to effectiveness (result) and feasibility (practicality and costs); Q3) Usefulness of current product labels, seen to



coverage of product categories, life cycle phases and aspects; and seen to the information value with regards to relevance, credibility, visibility and comprehension; Q4) Drivers and barriers for industrial adoption; Q5) Suggestion of three initiatives for augmented sustainable food production and consumption in France.

The result of the empirical data collection is presented in Appendix VII. Here will follow a summary of results:

Q2) The set of available voluntary instruments previously introduced in paragraph 2.6.4, was completed during the empirical phase obtained information about the SD21000 guideline developed by AFNOR, on request by the industry. The guideline is intended for decision makers in big, small, private or public companies in any sector and in any part of the world. The aim is to assist in the initial phase, i.e. during the policy making and strategy build-up. The guide is payable and its existence is spread mainly through the large number of companies assisting in its development. (Moretain, 2005)

In terms of availability of useful management systems, stakeholders mean that systems are more numerous than applied, i.e. the problem is centred to quality rather than quantity. They believe that this is due to the following deficits of available systems:

- Low feasibility, i.e. high robustness, low flexibility, heavy administration and multiple audits.
- Lack of meaning, i.e. lack of reference, standards or consensus upon expectations.
- Lack of communication facilities with consumers.

Stakeholders mean that the situation incites a passive attitude, as the build-up of own management systems might be both time consuming and difficult, i.e. cost-inefficient and in the view of lack of standards might not necessarily be optimum in terms of result (i.e. effectiveness) and risk being over-dimensioned (i.e. inefficiency).

Q3) The stakeholders confirm that labels is a good thing for the following reasons:

- Build credibility and consumer trust.
- Incentive for quality improvements.
- Drive monitoring and control.
- Minimum level of guarantee by promising “*at least...*”.
- Raise awareness.

Stakeholders further believe that the weak points of the current flora of labels are:

- The high number that confuses and reduces consumer retention.
- The difficulty to understand, due to little background information and limited on-pack communication conditions.

Stakeholders further believe the labelling system could be improved by:

- Quantity control by harmonisation and no further additions.
- Quality control by favouring third part certification.
- A back-up system of deeper-going communication channels such as company sites featuring a second layer of product quality information.
- Improved background information, i.e. consumer awareness by public as well as private initiatives.

Stakeholders do not believe in labels as the future key solution, but believe in making sustainable development mainstream and incorporated in daily operation. This does not mean that labels will disappear, but rather that they will be supported by other information systems. Few comments were raised concerning the inclusion of categories and vertical integration. Some stakeholders believe in the development of public labelling schemes for the ethical dimension and some stakeholders believe in a harmonisation of environmental- and ethical categories into one label, especially for import from outside EU. However, it can be concluded that the rich flora of labels and subsequently confused consumers are the dominant aspects of concern and no deeper-going reflections over the coverage or vertical integration seem to have been made.

#### Q4) Current barriers inhibiting industrial initiation:

- Unsatisfied need for efficient management tools such as operational management systems.
- Confusion about real needs and expectations, due to limited expertise, poor communication and/or consensus between stakeholders.
- Vague conditions for efficient and effective consumer information.

#### Current drivers:

- Consumer demand.
- Image.
- Long-term supply of raw material.
- Cost reductions.

#### Q5) Key factors for future improvements:

- Most stakeholders bring up the feasibility of management systems and it seems like there are points for possible improvements such as reduced robustness, increased flexibility and leanness of control- and audit systems.  
In addition to feasibility, there are comments upon “*needs*”, “*expectations*”, “*value building of efforts*”, and “*making sense*”. There seem to be a need for improved orientation and positioning on the map of reference points and goals.

There seem to be a need for a common standard, a goal which towards the industry should strive and efficient systems for managing identified categories of concern.

- A second major point of improvement is the bridge to the consumers. More meaningful information can be achieved by enriched background information and improved product information. Two criteria will play central roles: 1) Awareness building, through public- and private initiatives; and 2) Simplification and fortification of labelling system through harmonisation and completion by other information sources.
- Finally, some stakeholders emphasize the crucial role of administrative- and economic steering, i.e. legislation and economic incentives such as VAT reduction for high performing organisations. However, stakeholders mean furthermore that legislation is in general “*lagging 10 years behind*” and cannot be considered as a driver of change. Responsibility of enterprises means showing the way.

### 3.2.2 Conclusion of findings from empirical data collection

A set of prime drivers and barriers for management of industrial food quality embracing sustainable development; and some critical factors for future improvements can be derived from the empirical data collection.

Current barriers are related to:

- The management tools, i.e. *“how can I do this efficiently?”*
- The expectations, i.e. *“what should be my goal?”*
- The consumer information, i.e. *“how can I turn effort into value?”*

Current drivers are related to:

- Market potential: Consumer demand & Image.
- Supply potential: Long-term supply of raw material & Cost reductions.

Key factors for improved industrial performance are:

- Voluntary instruments in the form of management systems and standards.
- Various informative instruments in combination.
- Administrative and economic instruments are contested instruments exposed to ambiguous reactions among stakeholders.

## 4 Discussion

### 4.1 Critical categories of food quality in favour of sustainable development

The categories suggested in the SHEEE model seem to be find general support among the stakeholders. Some aspects are accentuated and specifically commented upon. Those exclusively, will be discussed in this chapter and in a context of theories previously introduced.

#### 4.1.1 Satisfaction

##### *Information (Pre-consumption satisfaction)*

This aspect comes across profoundly by frequent accentuation. It also appears as a driver or barrier for industrial performance. As emphasized in the theoretical chapter, the consumer satisfaction is a function of information obtained by the consumers pre-consumption (i.e. to detect the product with desired quality cues) and experiences post-consumption (i.e. liking of product and hence brand loyalty). Furthermore, the consumer has the right to information, according to the E.C. Treaty, and the information should be accurate and accessible. Different types of information about socially and environmentally responsible products was summarized as third party verified labels; claims made by the producer; and information from consumer organisations (Commission Proposal COM(02) 347 final). Furthermore, the three principal responses to imperfect information suggested by Mont (2005) were: 1) Regulation on green marketing claims; 2) Initiatives verified by independent bodies; and 3) ISO standardisations - organisational (ex. ISO 14001) and product oriented (ex. 14020 Environmental labelling).

Concerning the type of information; information from the producer and labels verified by third party, were encouraged to a large extent. Producers' claims seemed to be perceived as a contributor to the multiplication of labels and little effective in trust building vis-à-vis the consumer. As a conclusion it can be stated that labelling (ISO type one) seems to play a central role, at least for shorter time period and for awareness rising, but needs to be backed up with more enriching product information from channels such as private company sites. Those information channels offering informative and trustful communication will hence be most applied.

Labelling schemes are further perceived as slightly bureaucratic, due to the heavy administration and extensive control mechanisms needed for trust and credibility as well as effectiveness. As a conclusion, stakeholders do not seem to consider labelling as the optimal long-term solution, at least not on its own, due to its limited communication possibilities, relatively low level of trust and potential inefficiency.

The information initiative Consodurable, builds a bridge in between producer's own product quality information and consumer organisations, which increases trust but still has a certain level of bureaucracy depending on the type, number and control of criteria set by the organisation.

##### *Post-consumer satisfaction*

The importance of respecting cultural and individual preferences with regards to taste and other features, are enhanced by some stakeholders. This respect reflects the vital role of culture as a factor in the establishment of more sustainable consumption, equal to the expression of a social identity. The preservation of individual choices may also reflect the market potential in developing various segments featuring different product characteristics.

## 4.1.2 Health – safety and nutrition

### *Nutrition*

The dual base of health suggested in the SHEEE model was confirmed by stakeholders' perceptions of needs; and thus inclusion in product quality policies in favour of sustainable development. However, the management of nutritional aspect is exposed to different reactions from stakeholders. Some stakeholders, mainly the industrial representatives, translate nutrition into words such as “*differentiation*” and “*consumer benefits*”. Nutrition is by those stakeholders regarded as an option available for consumer in the search for a specific alternative to the standard products. In addition, nutrition is considered as a strong consumer benefit that builds its own segment. However, salt and fat seem to be concrete matters for attention. One stakeholder has developed guidelines for new product development with specific steering on these parameters. Other stakeholders mention the naturalness of foods and its bond with nutrition, such as natural sugar versus chemical sweetening substances. All in all it seems like nutrition is respected as a partial base of the health category, although it should be managed vis-à-vis the consumer in a flexible form. Flexibility further allows preservation of cultural traditions of recipes and eating habits; and will hence meet consumer preferences and individual choices of products. Nutritionally balanced diets are further managed on daily- or weekly basis and one piece of food can not fulfil multiple needs, as expressed by some stakeholders.

Against this background, it can be concluded that critical aspects of product nutrition such as fat, salt and sugar, can be managed by a certain level of control in all products, but even more through product options and transparent information. Prohibiting occasional consumption of certain recipes is not considered as sustainable development.

## 4.1.3 Environment

### *Fishery*

The fish stocks were mentioned by both experts and industrial representatives. This is coherent with outlined theories and statistics upon increase of fish catch and risk of exceeding the critical level of the species' carrying capacity.

### *Water*

Water was mentioned by several stakeholders. The concern can be justified with regards to quantity, but perhaps even more with regards to quality, as presented in the conceptual context. From a global perspective, water is a scarce resource with distribution problems entailing development problems due to poverty, famine and disease.

### *Pesticides*

Pesticides are frequently mentioned. This apparent concern is coherent with scientific theories upon progressive build-up of environmental, animal and human health issues due to accumulation and gradually increasing quantities of toxic substances in the ecosystems.

### *Packaging*

Packaging was mentioned by the industrial representatives for the reasons of dematerialisation (i.e. volume and weight reduction), quality of material (i.e. heavy metal elimination and biodegradable materials) and recovery. Those concerns are consistent with existing theories

and policies concerning minimisation of wastes in general and hazardous wastes in particular; and improved waste treatment methods.

#### *Industrial solid waste*

Further, recuperation of industrial waste such as food residues was brought up by the industrial representatives by statements upon by-products, cost reductions and waste minimisation. This is coherent with presented theories, suggesting reuse in the form of animal feed or composting which enables the transformation of food wastes into soil, organic fertilizers and energy (biogas). Further, the salt content of food and potential dioxin emissions from waste incinerations facilities, were not coming across. This does not mean those effects were not recognised by the respondents.

#### *Industrial liquid waste*

The quality of sewage water from the industrial sites was underlined by the industrial association. This is reasonable against the background of presented scientific concern upon the suspended solids, BOD content (which disturbs the treatment process), fat (which clogs the pipes), nitrogen and phosphorous (that contribute to eutrophication).

#### *Proximity*

Transport might refer to both environmental and ethical concerns. Proximity was enhanced, as well as the under dimensioned transports costs encouraging long distance transports. Local provision was also included in quality policies and indicator schemes by one stakeholder.

#### *Refrigerating substances*

Refrigerating hazardous substances are emphasized by industrial representatives in the form of legal compliance with regards to the EU ban on CFCs and HCFCs. This ban is supported by scientific data upon the ozone layer depleting effect of these hazardous compounds.

### **4.1.4 Ethics – human occupational and animal welfare**

#### *Occupational health and safety*

Worker exposure to toxic substances in form of inhalation and skin contact of pesticides was brought up. Accidents, was further referred to by industrial representatives as an aspect of corporate responsibility.

#### *Transports*

The ethical dimension of long transports was brought up by an industrial representative and one expert group. One stakeholder further includes local provision as a parameter of quality which might refer to ethical- and/or environmental concerns. By reference to increased international trading including live stock for local slaughter and transformation, driven by cultural (i.e. norms or claims) or economic factors (i.e. local remuneration levels or annual volume maximisation) this concern is coherent with current theories.

#### *Labour relation*

The relevance of increased ethical control of products emerging from countries in economic development or transition, concerning ethical aspects such as labour relations was brought up. Aspects such as working hours and child work seem to be of particular concern for stakeholders esteeming the category, while ethical concern has not yet been incorporated in the policy framework of all stakeholders.

## 4.1.5 Economy

### *Consumer access*

An aspect brought up by one stakeholder was the consumer access, in respect of price levels. This is an ambiguous point - yet interesting. With reference to a global context and the challenge of unequal food distribution in the light of mal- and undernutrition, poverty and hence sustainable development; the claimed importance of consumer access might be well-founded. However, with reference to quality development in arrangement with extreme low cost strategies, there are reasons for concern. This does not mean that quality and reasonable prices is an impossible combination, but requires sound solutions, preferably in combination with substantial volumes.

## 4.2 Current barriers and drivers

### 4.2.1 Barriers

#### *Confusion.*

The issue of a prevailing confusion concerning management of environmental- and social aspects constitutes a critical factor for industrial performance, was particularly confirmed by the stakeholders. This confusion was interestingly translated, or even developed, into factors such as feasibility and meaningfulness.

Feasibility refers to ideas such as simplicity (for more time- and cost efficient daily operations) and flexibility (for adaptation to organisational needs). There is an outspoken lack of tools for SMEs, which might cause passivity by firms.

Meaningful management refers to the lack of reference and the prevailing vague pictures of the factual needs and expectations upon the actors within the food sector. This is referred to by statements such as “*lack of consensus in the food chain*”, “*making sense*” or “*translating efforts into value*”.

Feasibility and meaningfulness can further be translated into efficiency and effectiveness. Effectiveness can be difficult to assess in the absence of relevant goals and standards, and can further be a complicated task for companies who do not master the required skills for relevant goal setting. Moreover, poor communication between internal experts and decision makers, as enhanced by one stakeholder, needs to be developed.

#### *Information*

Facilitated communication with the consumer would encourage companies to manage business effects in a wider sense. Almost all stakeholders confirm the central role of consumer information.

#### *Costs*

Another barrier frequently brought up is costs. However, costs are sometimes seen a driver in the form of potential reductions from resource- or process optimisation.

#### *Administrative and economic instruments*

Legislation was mentioned as a barrier by one expert group, with reference to agriculture policies. The lagging behind of regulation in terms of response to current needs was highlighted by another stakeholder. Others consider legislation as a burden and do not wish to

have more of compulsory instruments. Some stakeholders enhance however the effectiveness of regulation and economic instruments. All in all, there are polarised views upon these instruments and their suggested application for enhanced industrial management for sustainable development.

#### **4.2.2 Drivers**

With reference to drivers introduced in the theoretical chapter, three out of four can be seen confirmed by empirical data.

##### *Globalisation*

Business opportunities, increased complexity and new responsibilities on a global scale, was mentioned as a driver in the Green Paper about CSR by the European Community. This is indirectly covered by responses such as “long term raw material supply”, which was mentioned by several stakeholders. Further, transport can be narrowly associated with globalisation, which was also coming across during several interviews.

##### *Image and reputation*

The enhanced importance of reputation for competitive edge due to consumers’ and NGOs’ request for information about how products and services are generated, was also introduced as a driver in the EC Green Paper. It is confirmed by many stakeholders, the force and presence of this consumer demand.

##### *Investors*

As a consequence of the above, financial stakeholders ask for disclosure and transparency beyond traditional financial reporting. The reason for this is improved risk- and success assessment, demanded by the public opinion. This was not frequently brought up by respondents; only a couple mentioned investors.

##### *Competitive edge*

Enhanced knowledge and innovation, which is needed for the maintenance of competitive edge and the retention of high skilled personnel, was confirmed more or less directly by most stakeholders, through statements such as “*competitive edge*” or confirmed by approving factors such as image and reputation.

### **4.3 Steering instruments for enhanced industrial performance**

#### **4.3.1 Voluntary instruments**

The empirical data confirm the widespread need for enhanced availability of useful management systems. In fact, both scientific- and industrial representatives underline its importance. There seem to be a problem with the quality, rather than the quantity of current management systems. The quality is not satisfying due to the wide scope, low level of flexibility and lack of standard, i.e. a goal. These factors, alone or in combination might lead to passivity, as was described by some of the stakeholders.

There is a tool developed by AFNOR upon request from the industry, named SD21000. This tool can be described as a general introduction to corporate responsibility and applicable preferably in the planning phase. The manual has been praised by the ISO and might be used in a wider context, in a similar or modified version. The diffusion of this manual is uncertain by the time of the writing of this report, however only one stakeholder confirms its application. Further, another stakeholder did not find it fully useful.



### **4.3.2 Industry self-regulation**

On the way to mainstreaming sustainable development and in making it meaningful for concerned parties, one stakeholder spread some light over the potential utility of a new official body, in the form of a centre of concentrated know-how about sustainable development and its management. The centre was suggested to be created by the industry for the purpose of advisory and managerial support, provision of tools and monitoring. This would be a combination of voluntary instrument and industry self-regulation, with possibly high chances for effective outcome, and a response to the expressed need for standards, management tools and confidence.

It needs to be admitted that co-operation can be difficult in times of hard competition and where sustainable development is considered as a vehicle for competitive advantage. However, there is a good example of successful industry self-regulation in the Responsible Care, the performance initiative of the USA chemical industry that reduced emissions by 70% and resulted in an employee safety record four times better than the average of the manufacturing sector. It facilitates for America's leading chemical companies to go beyond government requirements and communicates their results to the public. Companies are assisted by management practices; independent auditors; and performance tracking. The programme covers five categories of concern: Environmental impact; Employee-, Product- and Process safety; Facility security; Product stewardship – Managing product safety & public communication; Accountability through Management System certification; and contribution to Economy.

### **4.3.3 Informative instruments**

Informative instruments in the form of product labelling verified by third party are encouraged, although under certain circumstances. See further the previous paragraph 4.1.1 Satisfaction.

The importance of informative instruments can further be looked upon from the perspective of market forces and demand generation. Difficulties in off-setting goods of high but unexpected value can disrupt the evolution of quality of a market and allow products of inferior quality to dominate, due to their capacity to sell at the same prices as the products of superior quality. Such a situation may be installed due to informational asymmetry, appearing when the seller knows more about the product than the buyer and where the market prices do not reflect the true value of products, finally leading to the defeat of the better products. Any market or any goods with a prevailing lack of consumer awareness in combination with poor product information may end up with stagnating development curves with regards to quality of marketed products.

### **4.3.4 Administrative and economic instruments**

Extensive analysis of administrative and economic instruments lies outside the scope of this report, although they will be included as drivers and/or barriers potentially emphasised by collected empirical data. Against this background a brief discussion will be made.

Regulation is a contested steering instrument. It can however be concluded that most stakeholders agree upon that CSR means going beyond regulation.

Economic incentives are high-lighted by some stakeholders as effective and/or efficient means for improvement. This could for example mean VAT relieves for well-performing organisations within certain areas of concern.

## 5 Conclusions and recommendations

This chapter aims to respond to the research questions posed in the beginning of the report, developed on the basis of information obtained during the literature review. The three research questions (RQ) were:

- 1) Which are the critical categories of concern to consider in policies of industrial food quality in respect of sustainable development?
- 2) Could the availability of useful management tools (i.e. voluntary- and informative steering instruments) be described as a crucial matter, i.e. driver or barrier, for industrial initiation and implementation of policies?
- 3) Which supplementary steering initiatives would be prone to enhance the industrial management in favour or sustainable development?

The chapter is divided into two sections. The first part treats the policy content (RQ1) and the second the initiation and implementation (i.e. management) of those policies (RQ2-3).

### 5.1 Five critical categories of concern in industrial policy making

The five categories of concern (i.e. Satisfaction, Health, Environment, Ethics and Economy) have all found support from the interviewed stakeholders. This means that the SHEEE model has been accepted as a framework of categories for potential inclusion in policies of industrial food companies aiming for quality upholding a sustainable development.

The accentuation of specific aspects can further deepen the recommendations of this report with the following subjects of understanding:

#### *Quality information*

Attention paid to product quality information can be valuable in the view of consumers' right to know and chances of making informed choices. This could be understood as their ability to protect themselves in a narrower or wider sense, i.e. supporting the aims expressed in EU food policy upon the protection of human life and health including the protection of animal health and welfare, plant health and the environment.

Product information is further connected to market forces and demand generation. Informational asymmetry, appearing when the seller knows more about the product than the buyer, may entail market prices badly reflecting true value of goods and defeat of superior products. Markets recognised by modest consumer awareness in combination with meagre product information may end up with flattening development curves with regards to quality of marketed goods and long-term value adding to consumers.

Product information may against this background refer to Pre-consumption satisfaction and Economy.

#### *Nutrition*

The endorsement of nutrition is suggested through a flexible product application adapted to individual needs and preferences. The functioning of such an approach requires however an established landscape of information, i.e. extensive background awareness of consumers for the understanding of needs and product information enabling suitable and accurate choices.

Nutrition is one of two identified branches supporting Health of consumers.

### *Cultural preferences*

A certain nourishment of cultural preferences can be suggested for sustainable development and consumption in France. This is particularly appropriate for products with a complex meaning associated with their utilisation such as food or cinema, which are not expected to turn in to simple commodities or straightforward subjects for consumption. This understanding can be linked to both Post-consumption satisfaction and Economy.

## **5.2 Three steering instruments for enhanced industrial performance**

The issue that low availability of useful management tools constitutes a barrier for industrial initiation and implementation of policies has been further supported by empirical data. It can be concluded that the prevailing confusion concerning management of environmental and social aspects constitutes a barrier for enhanced industrial performance and is recommended to be developed into management tools nourishing feasible and meaningful management. All in all, three principal steering instruments can be recommended as a result of this research and will be presented in this paragraph. The instruments can operate alone or combination.

In accordance with the scope of this report and the focus on management issues, the administrative and economic steering instruments appear only in the form of drivers and barriers of industrial management. Against the background of diverse reactions from stakeholders upon the role and appreciation of regulation and economic steering, those instruments will not be recommended as sole instruments and will thus not take predominant roles in the final recommendations. Moreover, these instruments will not assist companies on their way to increased efficiency of industrial operations and the need for voluntary instruments in the form of management tools will still be prevailing.

### **5.2.1 Voluntary instruments**

The potential need for increased availability of useful management tools for enhanced industrial management has been confirmed by empirical data.

The core of the problem is rather linked to the quality of available management systems, rather than the quantity. The quality is suggested to be improved by launching less rigorous management systems, which could better attract enterprises in general and SMEs in particular.

Further and besides the operation of systems, there is a problem with objective setting. Objective setting is important for at least three principal reasons: factual effectiveness; organisational efficiency; and organisational motivation. This means efficiency for the organisations (through centralised standardisation), meaningfulness for society (via factual effectiveness) and for the people working with it (through motivation and value creation of efforts).

Therefore, improved availability of reasonable standards would serve both society and enterprises. Legislation is by stakeholders not perceived as a reasonable standard.

### **5.2.2 Industry self-regulation**

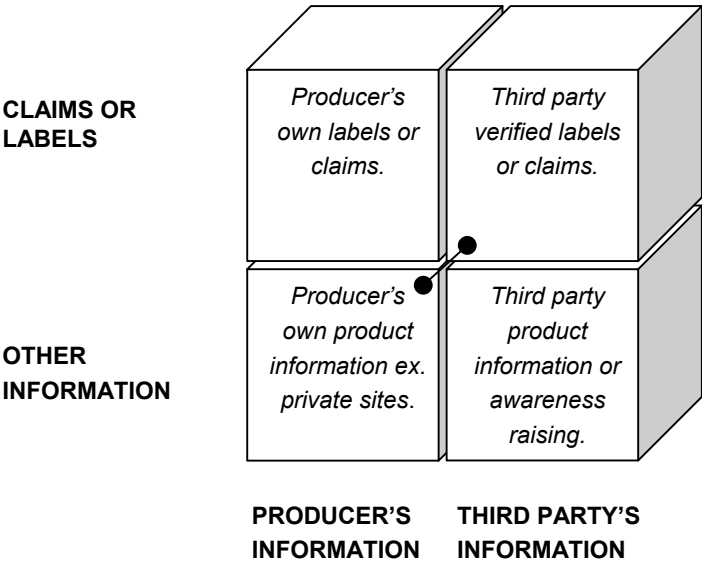
A hint of industrial self-regulation can be derived from statements made by stakeholders in the context of improved effectiveness, organisational efficiency and motivation developed in the previous paragraph about Voluntary instruments. In effect, industry self-regulation would

incorporate suggested voluntary instruments by providing standards as well as tools for implementation and maintenance. In addition, it would constitute a centre of support for professionals and amplify the trust vis-à-vis the consumer. Examples of successful industrial self-regulation from other markets exists, i.e. Responsible Care, and might be a source of inspiration for interested parties and/or a subject for further investigation within new research projects.

**5.2.3 Informative instruments**

The presumed central role of product information, derived from theories upon quality expectations and informative steering instruments, has been confirmed by empirical data.

The research can conclude and recommend product labelling verified by third party (i.e. ISO Type I) in combination with more enriching product information from the producers, enabled through information channels such as private web sites, whereas limited space seldom allow extensive on-pack information. The benefits of this combination are consumer trust (through control, monitoring and verification by external party), information value (i.e. beyond first degree information provided by labels), awareness raising (through ISO label Type I), little bureaucracy (due to producer’s own information) and endorsement of quality improvement (via progressive evolution of ISO label Type I). The combination of informative instruments as suggested by stakeholders is summarized in Figure 5-1.



*Figure 5-1 Stakeholders believe in labels verified by third party, in combination with deeper-going product information from the producer. Further they believe that product information with time will progress into the producers' responsibility and occupation.*

The stakeholders anticipate further sustainable development becoming more main stream with time; and consequently the related quality parameters evolving into normative. This potential evolution is in effect a mirror of the advancement of food safety in developed countries, where labels assuring safe consumption are rarely seen. In the context of evolution, regulation might potentially and progressively enter into the sphere of responsibility. In such picture, the labels might take role of new and different significance. The information tool kit might therefore change over time and attention to structural change is suggested.

### **5.3 Future research**

Suggestions upon subjects for future research would include possibilities for industry self-regulation of the French food sector, and optimisation programmes of labelling schemes with regards to inclusion of categories of concern and integration within the product life cycle.

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## Abbreviations

AB	Agriculture Biologique
ADEME	Agence de l'Environnement et de la Maitrise d'Energie
AFSSA	Agence Francaise de Sécurité Sanitaire des Aliments
BOD	Biological Oxygen Demand
CFC	Chloro Fluoro Charbon
CSR	Corporate Social Responsibility
EASO	European Association for the Study of Obesity
EEA	European Environmental Agency
EHS	Environmental Health and Safety
EMAS	Eco-management and Auditing Scheme
EMS	Environmental Management System
EPI	Environmental Policy Integration
GHG	Green House Gases
HACCP	Hazard Analysis of Critical Control Points
HCFC	Hydro Chloro Fluoro Carbon
HFC	Hydro Fluoro Carbon
ILO	International Labour Organisation
IOTF	International Obesity Task Force
IPP	Integrated Product Policy
ISO	International Organisation for Standardisation
MSC	Marine Stewardship Council
MSW	Municipal Solid Waste
ODS	Ozone Depleting Substances
OHS	Occupational Health and Safety
PNNS	Programme National Nutrition Santé
SCM	Supply Chain Management
SME	Small- or Medium size Enterprise
SPS	Sanitary and Phytosanitary agreement
TBT	Technical Barriers to Trade agreement
WHO	World Health Organisation
WTO	World Trade Organisation

## Appendix I

*Interview material: 1) Questionnaire French version; and 2) List of aspects presented with Q1.*

Q1) Comment définiriez vous un produit alimentaire durable\* ? Donnez des exemples des aspects que vous / votre organisation considerez les plus significants. Pour faciliter votre réponse, une liste d'aspects identifiés par les scientifiques et le GRI (Global Reporting Initiative) vous êtes disponible (ci-joint). Notez que les aspects sont généraux et que l'importance de chaque aspect peut varier entre les zones géographiques.

Q2) Quels sont les outils les plus pertinents actuellement disponibles pour un producteur avec l'ambition d'implanter une politique de produits alimentaires durables\* ? Répondez en donnant des exemples des standards (législation, conventions internationales, standard industriel, labels, standard privé d'une entreprise) et systèmes de management (les ISO, EMAS etc) pertinents, vue son efficacité (résultat) et sa possibilité (praticité et coûts).

Q3) Comment décrieriez vous l'utilité des labels actuellement disponibles? Répondez par commenter la couverture (types de produits, phases du cycle de vie et aspects divers) et la valeur de l'information (pertinence, crédibilité, visibilité et compréhension du consommateur) des labels disponibles (AB, NF Environnement et Agro-alimentaire, Fleur UE, A.O.C, Label rouge, Max Havelaar et d'autres).

Q4) Quels sont les leviers et les barrières de l'implantation industrielle? Répondez en donnant des exemples des forces extérieures et intérieures ; pression des intéressés, les bénéfices économiques, les valeur de l'entreprise, les ressources disponibles de l'entreprise (économique, savoir-faire et temps) ou d'autres forces.

Q5) Quelles seraient les trois initiatives qui augmenteraient d'une manière significative la production et consommation des produits alimentaires durables en France ? Répondez en donnant des exemples d'initiatives réalisables, tout en tenant en compte les initiatives diverses comme la législation, standards, systèmes de management, information des consommateurs ou d'autres initiatives.

\*Durable = qui contribue au développement durable.

In order to facilitate the answering and decoding of Q1, a list of aspects was exposed to the respondent, based on the scientific source of FOOD21 and complemented with indicators from the GRI where a more detailed set of aspects of some categories could be found. This list is presented on next page.

LIST OF CATEGORIES AND ASPECTS EXPOSED TO RESPONDENTS			
ENVIRONMENTAL ASPECTS	ASPECTS ENVIRONNEMENTAUX	SOCIAL ASPECTS	ASPECTS SOCIAUX
<b>Natural resources</b>	<b>Resources naturelles</b>	<b>Consumer welfare</b>	<b>Santé du consommateur</b>
Fossil energy	Energie fossile	Food safety	Securité sanitaire
Nitrogen	Azote	Nutrition	Nutrition
Phosphorus	Phosphore	Information /Labelling*	Information/Etiquetage*
Soil structure	Structure du sol	<b>Labour practices*</b>	<b>Relations entreprise/ employé*</b>
Water resources	Resources d'eau	Education	Formation
Biological diversity	Biodiversité	Diversity & Opportunities	Diversité & Opportunités
<b>Emissions</b>	<b>Emissions</b>	Engagement & Employment	Engagement & Emploi
Nitrogen	Azote	Labour/Management relation	Relations salaires/ direction
Phosphorus	Phosphore	<b>Human rights*</b>	<b>Droits de l'homme*</b>
Pesticides	Pesticides	Strategy & Management	Strategie & Management
GHG (CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O etc)	GES (CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O etc)	Non-discrimination	Non-discrimination
Ozone depletion*	Destruction du couche d'ozone***	Freedom of association & Collective bargaining	Liberté d'associations & Négociations collectives
Other emissions* (NO <sub>x</sub> , SO <sub>x</sub> , VOC etc)	D'autres émissions (NO <sub>x</sub> , SO <sub>x</sub> , VOC etc)	Child work	Travail d'enfants
Solid waste*	Déchets*	Forced and compulsory work	Travail forcé et obligatoire
Antibiotics	Contamination des médicaments	Communities	Communautés
<b>Recycling*</b>	<b>Recyclage*</b>	Bribery & Corruption	Pot-de-vin & Corruption
		Political contribution	Contribution politique
		<b>Animal well-being</b>	<b>Bien-être des animaux</b>
		Animal welfare & Natural behaviour	Bien-être des animaux & Comportement naturel
		Feed	Nourriture
		Medicin	Médicaments

## Appendix II

### *Principal element of European food law (European Commission, 2005a).*

Regulatory authorities established by governments are charged with the task of protecting the public from unsafe food and to do this they must be able to assess food borne risks and implement strategies for this control. In the past, governments have adopted a variety of approaches to achieve this, largely subjective and based on local interests and conditions. Increasingly there is a move towards more systematic and unified approaches to the problem. In part, this has been driven by perceived weaknesses in existing systems, increasing concerns about the safety of food and the need for cost effective strategies to prevent and where necessary to reduce the risk from food borne hazards. A major driver behind the introduction of transparent and more science-based approaches to risk management has however been the needs of international commerce. Food and food products are important items of international trade and the loss of export markets can have significant economic impact on producing countries. It is therefore important to be sure that when one country rejects imported food on the grounds that it is unsafe this is being done for sound scientific reasons rather than simply to raise a trade barrier for the protection of domestic producers or penalising the exporting country. For this reason world trade agreements under the General Agreement on Tariffs and Trade (GATT), now the World Trade Organisation (WTO) have recognized that so-called Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) should be transparent and based on sound scientific principles<sup>82</sup>.

The EU food law aims at ensuring a protection of human life and health, including the protection of animal health and welfare, plant health and the environment. This integrated farm to fork approach is considered a general principle for EU food safety policy. The General Principles of Food Law (Articles 5 - 10) entered into force on 21 February 2002. Existing food law including its procedures must be adapted by 1 January 2007 in order to comply with the general framework established by Regulation/EC/178/2002.

The food law establishes the rights of consumers to safe food; and to accurate and honest information. It included the following elements (European Commission, 2005a):

- *Risk Analysis.* The regulation embraces principles of risk analysis in relation to food and establishes procedures for the scientific and technical evaluations which are undertaken by the European Food Safety Authority (EFSA). Regulation EC 178/2002 requires that the three components of risk analysis (risk assessment, risk management and risk communication) provide the basis for food law. Scientific risk assessment should be independent, objective and transparent; and based on the best available science. Decision makers need nevertheless to consider a range of information in addition to the scientific risk assessment, such as the feasibility of risk control, efficiency of risk reduction actions depending on where in the food supply chain the problem occurs, the socio-economic effects and the environmental impact.

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<sup>82</sup> Article five, paragraph one of the SPS agreement states: Members shall ensure that their sanitary or phytosanitary measures are based on an assessment, as appropriate to the circumstances, of the risks to human, animal or plant life or health, taking into account risk assessment techniques developed by the relevant international organisations. However, there is no internationally adopted risk assessment method, and hence everybody is doing their own and can adapt to individual interests. (Salzman, 2004) Within the EU, the European Food Safety Authority (EFSA) states reference principles (European Commission, 2005a).

Therefore, the regulation EC/178/2002 establishes the principle that risk management is not exclusively based on a scientific risk assessment but also embraces a wide range of other relevant factors.

- *Transparency.* Transparency of legislation and public consultation are essential elements of enhanced consumer trust in food safety. Regulation EC/178/2002 (Article 7) formally establishes the precautionary principle<sup>83</sup> as an option for risk managers when decisions have to be made to protect health.
- *Traceability.* Regulation EC/178/2002, applicable from 1 January 2005, defines traceability as: the ability to trace and follow food, feed, and ingredients through all stages of production, processing and distribution<sup>84</sup>. The requirement is limited to ensuring that businesses are at least able to identify the immediate supplier of the product and the immediate subsequent recipient, with the exemption of retailers to final consumers (one step back-one step forward). Importers are similarly affected as they will be required to identify the exporting supplier in the country of origin. It covers all food and feed and related business operators, without prejudice to existing legislation on specific sectors such as beef, fish, GMOs etc.
- *Rapid Alert System for Food and Feed (RASFF)* is a system exists since 1979 and is legally based on the Regulation EC/178/2002 (Articles 50 – 52). The purpose of the RASFF is to provide the control authorities with an effective tool for exchange of information on actions taken to ensure food safety.
- *Labelling.* In 1997 (revised in 1998) general guidelines for implementing the principle of Quantitative Ingredients Declaration (QUID) were introduced. Labels should indicate the quantity of certain ingredients expressed as a percentage of the final product. Consumers express a particularly strong expectation for complete and precise information on foodstuffs. The Directive 2000/13/EC, amended by Directive 2001/101/EC (meat) and 2003/89/EC (ingredient indication), establishes general requirements on the consumer labelling of foodstuffs. The amendment concerning ingredients, introduces the obligation for all ingredients to be indicated on the label, which eliminates the 25% rule that up to now demanded labelling only for the ingredients that constituted less than 25% of the final food product. Further, the amendment establishes a list of ingredients, liable to cause allergies or intolerances<sup>85</sup>. The new provisions are to be fully implemented from 25 November 2005. It can be stated that Directive 2000/13/EC on consumer labelling,

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<sup>83</sup> The precautionary principle is applicable when risk managers have identified reasonable grounds for concern about an unacceptable level of risk to health exists but the scientific evidence or data may not be complete enough to enable a comprehensive risk assessment. Decision makers may then take measures to protect health, supported by the precautionary principle, while seeking more complete scientific and other data. (European Commission, 2005a)

<sup>84</sup> Traceability is similarly defined in the ISO8402 norm as: the ability to trace the history, application or location of an entity by means of recorded identification (Dupuy et al., 2004). Two type of product traceability can be identified: tracing (used to find the source of a quality problem) and tracking (used to localise a product, i.e. recall). An effective information system for one of these two types of traceability is not necessarily effective for the other. It is further emphasized that traceability does not reduce the probability of a food crisis, but its consequences, such as unnecessary high quantities of recalled products and lost consumer confidence. (Dupuy et al., 2004)

<sup>85</sup> Since it is possible that some ingredients derived from allergens, are not likely to be a risk for allergic peoples, the Directive establishes during a transitional period, a procedure allowing the industry, through the provision of scientific evidence, to obtain an interim labelling exemption for these ingredients. (European Commission, 2005a)



presentation and advertising of foodstuff, is the main piece of EU legislation regarding the labelling of foodstuffs. It is based upon the principle of functional labelling and aims to ensure that the consumer gets the essential information with reference to the composition of the product, the manufacturer, storage and preparation methods etc. Producers are further free to add supplementary information, provided it is accurate and not misleading. It also prohibits any ascription upon properties such as prevention, treatment or cure of human diseases. Labelling tends to be complex and unclear, therefore, the Commission has taken initiatives together with the Member States, the consumers, the industry and the trade; for an evaluation of the legislation on labelling from a simplification point of view. The release of a proposal is expected in 2006.

- *GM Food & Feed Labelling.* Since 1997 Community legislation has made labelling of GM food mandatory for: 1) products that consist of GMO or contain GMO; and 2) products derived from GMO but no longer containing GMO if there is still DNA or protein resulting from the genetic modification present. Regulation EC/1830/2003 concerning the traceability and labelling of GMO and the traceability of food and feed produced from GMOs; was published in the Official Journal of the European Union together with the amending Directive 2001/18/EC<sup>86</sup>. Further, labelling of GM additives and flavourings are covered by the regulation EC/50/2000 (labelling of foodstuffs and food ingredients containing additives and flavourings). Furthermore, mandatory labelling is required for four out of the eight authorised GMOs for use in feed, in accordance with the general labelling rules of Directive 90/220/EEC. Finally, GM seed varieties must be labelled in accordance with Council Directive 98/95/EEC.
- *Nutrition labelling.* Nutrition labelling is steered by Directive 90/496/EC (as amended by Directive 2003/120/EC). With the aim of facilitating the consumer understanding and informed choice, the Commission launched in January 2003 a consultation among Member States and stakeholders, in view of preparing a proposal amending Directive 90/496/EEC. Following the review of the comments received from more than 50 parties, the Commission intends to prepare a legislative proposal.

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<sup>86</sup> In the past, the labelling of GM foods was based on regulation EC/258/97 (novel foods and novel foods ingredients (Article 8)). The labelling of GM maize and soy, not covered by this regulation are covered by regulation EC/1139/98 (compulsory indication of the labelling of certain foodstuffs produced from GMOs) as amended by Regulation EC/49/2000. (European Commission, 2005a)

## Appendix III

*Advantages and disadvantages of genetically modified food and crops (Miller, 2004).*

### Advantages of GMO

- Need less fertilizer
- Need less water
- More resistant to insects, plant disease, frost and drought
- Faster growth
- Can grow in slightly salty soils
- Less spoilage
- Better flavour
- Less use of conventional pesticides
- Better tolerance of herbicides

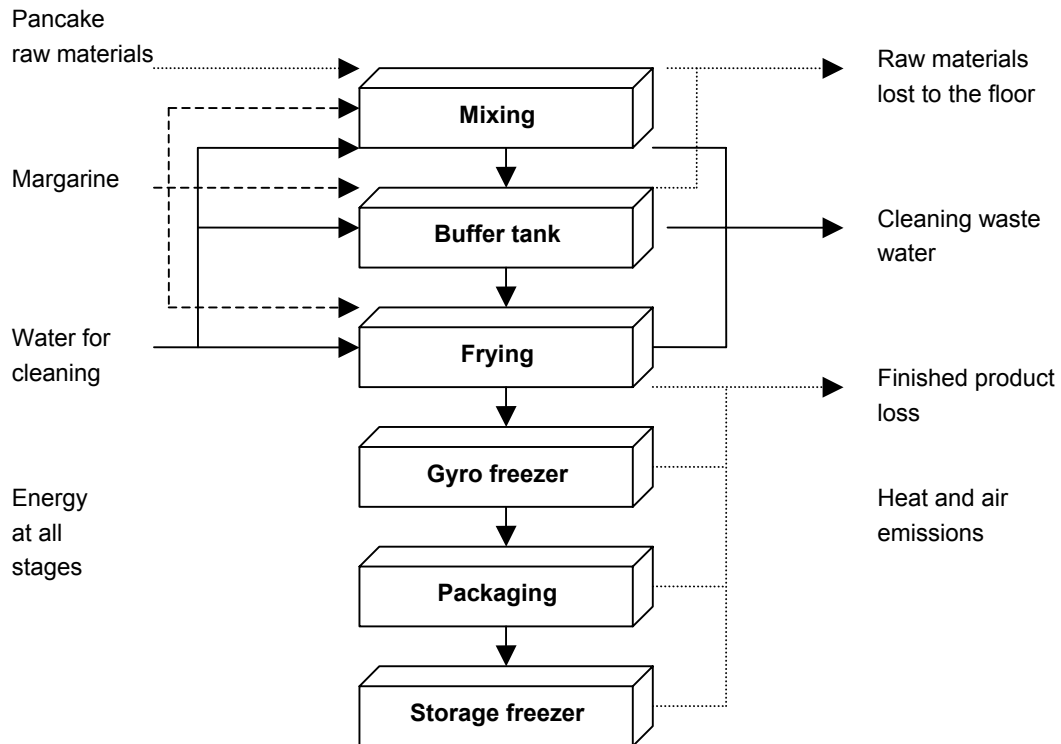
### Disadvantages of GMO

- Irreversible and unpredictable genetic and ecological effects
- Harmful toxins in food from possible plant cell mutations
- New allergens in food
- Lower nutrition
- Increased evolution of pesticide resistant insects and plant diseases
- Creation of herbicide resistant weeds
- Harmful beneficial insects
- Lower genetic diversity
- Better tolerance of herbicides

## Appendix IV

### *The pancake case (Johansson et al., 2003)*

A case about a factory production frozen pancakes will be introduced, serving as an example of how food technology can improve processes with regards to superior environmental and financial performance. In concrete terms, the material, water and energy efficiency is stressed and the principal sources of environmental nuisance and intervention points for progress pointed out. The food plant process referred to in the case is illustrated in the figure below.



- *Ingredient arrival.* The pancakes use seven ingredients; water, eggmass, flour, milk powder, margarine, salt and frying oil. Flour is delivered by volume truck and stored in an outdoor flour silo. Milk powder is delivered in bags, which are thrown directly onto the feed line on the mixer. Eggmass and margarine are delivered in insulated stainless steel containers which are reused. Finally, salt arrives in paper bags.
- *The batter.* Flower, milk powder and salt - all dry ingredients, are pumped by compressed air into an open steel mixer, where measurement is done electronically. They are further pumped into a closed container, where water and eggmass are added, also by electronic measurement, and mixed for 20 minutes. The semi-finished batter is pumped to a closed stainless steel buffer tanks for short-term storage (<two hours). The tanks are cooled to 5-10 degrees Celcius, by closed loop cooling water. Margarine is added manually, to finish the batter.
- *Cooking the pancakes.* The pancakes are fried either by the use of natural gas or electric heat: 1) Natural gas: The batter is pumped from the buffer tank to a steel container.

The froth created during the passage in the host is skimmed off manually and passed into a steel container and disposed in the drain. The frying process starts with oil injection into iron moulds including some splatters onto the surrounding equipment and floor. The batter is disposed into the moulds that pass over natural gas flames. The fried pancakes are dropped onto a transport belt, where some pancakes fall onto the floor through a space between two belts. Pancakes are manually sorted and removed if not complying with quality requirements. The accepted pancakes are transported by belt into a gyro freezer. The two natural gas driven frying machines use 16,3m<sup>3</sup>/hour of natural gas, or 160 kWh of energy. The fryers are cooled with cooling water, which is discharged directly on to the plant floor and then passes into the drain. 2) Electric heat: The process is similar with some exceptions - the froth does not appear, the pancakes are contact-cooked on one side and cooked with radiated heat on the other side. Each machine uses 100 kW.

- *Pancake waste.* The pancakes that fall onto the floor, that are not satisfying or crumbs found on the floor; are sold for pig food.
- *Freezing and packing.* The gyro-freezers<sup>87</sup> use ammonia<sup>88</sup> as a refrigerant, and powered by compressor capacity. A conveyor belt transports the pancakes during 30 minutes through the freezer. The pancakes are still hot when they enter the freezers, with a temperature of 45-78 degrees Celcius, depending on thickness. The freezer has a temperature of -36 degrees and the pancakes have a temperature of -18 degrees at the freezer exit. The pancakes continue on the conveyor band after freezing to packing. In this case the pancakes are packed manually in cardboard boxes lined with plastic bag. The boxes are disposed on pallets, closely packed with isolates the cold. Temperature of every finished pallet is measured; if warmer than -18 degrees the pallet is taken through a -35 degree tunnel freezer to reach the -18 degrees. Every pallet is later wrapped in plastic, labelled and moved into a refrigerated storage room of -18 degrees, where they are stored at least 24 hours before transported to long-terms storage.
- *Material, water and energy balance.* The input and output flows can be calculated to see the resource efficiency of operations. In this particular pancake case the balances were the following:
  - *Material.* *Input* = 1250 tonnes of raw materials (100% dry solids).  
*Output* = (35% dry solids x 2500 tonnes fabricated pancakes)  
 875 tonnes + 80 tonnes solid waste = 955 tonnes.  
*Result* = 295 tonnes of 25% of lost material in the process chain. The solid material not captured in products, passes due to cleaning or direct disposal, into the drain and the sewage water, which is the cause of heavy load of BOD<sup>89</sup>, fat and suspended solids into the effluent streams.<sup>90</sup>

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<sup>87</sup> Products are transported on a conveyor belt in the form of a spiral, through the freezer.

<sup>88</sup> Ammonia (NH<sub>3</sub>) has been widely used as refrigerator before chlorofluorocarbons (CFCs). Ammonia is toxic if inhaled and must be handled carefully. (Miller, 2004).

<sup>89</sup> BOD means biological oxygen demand and is defined as: the amount of dissolved oxygen needed by aerobic decomposers to break down the organic materials in a certain volume of water over a five day incubation period at 20 degrees Celcius. Only a few fish species can survive in waters with dissolved oxygen (DO) lower than 4 ppm (little

- *Water*                      *Input* = 70000m<sup>3</sup>.  
*Output* = 52000m<sup>3</sup> (waste water) + 11000 (cooling water) =  
63000m<sup>3</sup>.  
*Result* = 7000m<sup>3</sup> lost in the process, which of 1625m<sup>3</sup> is in  
the final product (65% x 2500 tonnes of fabricated pancakes).  
The rest, 5375m<sup>3</sup>, might have been lost through evaporation  
in cleaning, washing and steam systems.
  
- *Energy*                      No quantitative data is available for the pancake case. It can  
be assumed that most of the energy consumption is a result  
of deep-freezing hot pancakes coming directly from the  
frying machines.

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polluted waters have 8-9; moderately polluted 4-7; and gravely polluted below 4. BOD can be determined by 1) chemical analysis (presence of inorganic and organic chemicals that pollute water); or 2) by using indicator species such as tissues from filter feeding mussels from sediments of coastal waters (presence of industrial chemicals, toxic metals or pesticides). (Miller, 2004)

<sup>90</sup> BOD and fat contents are the main liquid effluents problems under normal operational conditions. High BOD content may disturb the treatment processes, whereas fat clog the pipes. Flootation is one technique to separate the fat and enables transformation into biogas. (Johansson et al., 2003)

## Appendix V

*Substitutes to CFCs (Miller, 2004).*

CFC SUBSTITUTES		
Type	Advantages	Disadvantages
Hydrochlorofluorocarbons (HCFCs)	<ul style="list-style-type: none"> <li>• Break down faster (2-20 years).</li> <li>• 90% less danger .</li> <li>• Ex. application: refrigeration, air conditioning, foam.</li> </ul>	<ul style="list-style-type: none"> <li>• Ozone depleting in high doses.</li> <li>• Potent green house gas.</li> </ul>
Hydrofluorocarbons (HFCs)	<ul style="list-style-type: none"> <li>• Break down faster (2-20 years).</li> <li>• Do not contain ozone destroying chlorine.</li> <li>• Ex. application: refrigeration, air conditioning, insulating foam.</li> </ul>	<ul style="list-style-type: none"> <li>• Potent green house gas.</li> <li>• Flammable and toxic.</li> </ul>
Hydrocarbons (HCs) such as butane and propane.	<ul style="list-style-type: none"> <li>• Cheap and readily available.</li> <li>• Ex. application: refrigeration, foam and cleaning agents.</li> </ul>	<ul style="list-style-type: none"> <li>• Flammable and toxic.</li> <li>• Increase ground level air pollution from photochemical smog.</li> </ul>
Ammonia (NH <sub>3</sub> )	Simple alternative for refrigerators, widely used before CFCs.	<ul style="list-style-type: none"> <li>• Toxic if inhaled.</li> <li>• Careful handling.</li> </ul>
Water & Steam	Ex application: cleaning operations and sterilization of medical instruments.	<ul style="list-style-type: none"> <li>• Need for water treatment of polluted water.</li> <li>• Water resource intensive if not closed loop system.</li> </ul>
Helium	Ex. application : Refrigeration.	Rare and potentially scarce gas, although very little coolant is needed per appliance
Terpenes (from the rinds of citrus fruits)	Ex. application: cleaning of electronic parts.	Few, including potential allergic reactions.

# Appendix VI

## Illustrations of labels appearing on the French market



The Green Dot (Point Vert) means that the producer contributes financially to a waste collection system (Eco-emballages or Adelphe) facilitating recycling of packaging material.



AB – Property of the Ministry of Agriculture. guarantees that 95% of the ingredients are produced according to organic agriculture.



NF Environnement official eco-label. Guarantees reduced environmental impacts through the product life cycle while keeping its quality. No food products included. ISO Type I.



EU flower, the NF environnement equivalent on European level. No food products included. ISO Type I.



NF Agrio-alimentaire, official quality label. Guarantees product quality seen to ingredients, consistency and type of production. Today cooked ham. ISO



Max Havelaar – fair trade.



Moebius loop, an example of ISO product labelling Type II – autodeclaration. This symbol means that the material is technically recyclable and if accompanied by a % this indicates the amount of recyclable material contained



Autodeclared private brand (ISO Type II).



MSC certified voluntary label guaranteeing sustainable fishery. (ISO Type I)

## Appendix VII

### *Empirical data of stakeholders' response to the current and future management conditions for sustainable development.*

#### QUESTIONS

Q2) Identification of principal management tools at hand for food producers aiming for adoption and implementation of policies for sustainable development, with regards to effectiveness (result) and feasibility (practicality and costs.)

Q3) Usefulness of current product labels, seen to coverage of product categories, life cycle phases and aspects; and seen to the information value with regards to relevance, credibility, visibility and comprehension.

Q4) Drivers and barriers for industrial adoption.

Q5) Suggestion of three initiatives for augmented sustainable food production and consumption in France.

#### CATEGORISATION OF RESPONSES

Q2)	Q3)	Q4)	Q5)
a) ISO 9000	a) Useful.	a) Consumer demand/Image	a) Regulation
b) ISO15161	b) Too many.	b) Other external stakeholder pressure	b) Non-visual process management systems
c) ISO 14001	c) Shortage.	c) Assurance of long-term raw material supply	c) Visual product management systems
d) EMAS	e) Difficult to understand.	d) Financial profit.	d) Other information system
e) ISO 26000	f) Other comment.	e) Confusion/Lack of know-how.	e) Consumer awareness
f) ISO 22000		f) Regulation	f) Supply chain communication
g) HACCP		g) Other	g) Other
h) IFS			
i) BRC			
j) EFSIS			
k) EUREPGAP			
l) GFSI			
m) Public procurement			
n) PNNS			
o) Global compact			
p) GRI			
q) OECD			
r) OHSAS 18001			
s) Other comment			

#### EMPIRICAL DATA (N.A = Not Available)

##### **French Ministry of Agriculture, Food and Fishery**

Q2:	N.A
Q3:	N.A
Q4:	N.A
Q5:	N.A
Comment:	N.A

##### **French Ministry of Ecology and Sustainable Development**

Q2:	N.A
Q3:	N.A



Q4: Driver: a,f  
Barrier: d,e  
Q5: e  
Comment: Q5: Voluntary or economic steering instruments. Regulation not appreciated by industry. CSR implies going beyond regulation where it is lagging behind.

#### **Wuppertal Institute**

Q2: s  
Q3: N.A  
Q4: Driver: N.A  
Barrier: e  
Q5: N.A  
Comment: Q2: LCA in combination with own feasible management system which also includes stakeholders views.

#### **AFNOR**

Q2: s  
Q3: b,c,e  
Q4: Driver: a,b,d  
Barrier: d,e  
Q5: e,f  
Comment: Q2: SD 21000 developed by AFNOR and appreciated by ISO.  
Q4: Feasibility a key factor.

#### **SAI Platform**

Q2: s  
Q3: e, f  
Q4: Driver: a,b,c  
Barrier: b,e  
Q5: a,e,f  
Comment: Q2: For agriculture no relevant system available. ISO is too rigorous, not flexible and does not encourage improvement. Stakeholder develop own management system inspired by IKEA Stairs.  
Q3: 1) Stakeholder has a neutral attitude to labels, but confirms that their role is limited and aims for making sustainable development management more mainstream; 2) Consumer mix "bio" with health; 3) Labels needs rigorous control for trust; 4) Industry prefers brand image rather than labels.  
Q5: Suggest regulation in combination with improved communication between industry and consumer.

#### **Claude Fussler**

Q2: c,d,s  
Q3: b,e, f  
Q4: Driver: d  
Barrier: d,e  
Q5: e,g  
Comment: Q2: LCA for impact assessment and systems for management. The stakeholder believes there are more systems than applications.  
Q3: 1) Trust and clear criteria a prerequisite; 2) Increase consumer relevance by extensive off-pack information; 3) Harmonisation could be advantageous if possible for instance via national official labels.  
Q4: Driver: Profit due to favourable market conditions, raw material and labour costs. Barrier: Lack of awareness a start up hurdle.

Q5: 1) Ex. VAT reduction; 2) Economic instruments more efficient than regulation; 3) Regulation always lagging 10 years behind and CSR means showing the way.

### **Consodurable**

Q2: N.A  
Q3: b,e  
Q4: Driver: a,g  
Barrier: d,e  
Q5: d,e  
Comment: Q3: Any additional label should be official and with well-known criteria.  
Q4: Barrier: Limited possibilities to increase consumer prices.

### **ANIA**

Q2: a,c,g,f  
Q3: b  
Q4: Driver: a,d  
Barrier: e  
Q5: b,h  
Comment: Q2: 1) SD 21000 not very practical; 2) ISO 13428 for packaging weight and heavy metal reduction; 3) Systems available but little implemented.  
Q3: 1) Too many labels (certified and auto-declared); 2) All-in-one label too complex; 3) Brand image not trust building.  
Q4: Driver: Cost reduction, ex. waste. Barrier: Lack of knowledge and lack of systems for SMEs.  
Q5: 1) Managements systems for SMEs; 2) Meaningful management, i.e. translation of efforts into value.

### **Carrefour**

Q2: c,p,s  
Q3: a,b,f  
Q4: Driver: a,b,c,d  
Barrier: a,e,h  
Q5: b,e  
Comment: Q2: Several international conventions; private initiatives such as SA 8000; Alter eco fair trade audit; IKEA IWAY; and Veolia social performance indicators.  
Q3: Trust; informed choices; traceability and control; limitations in packaging space and for new product development.  
Q4: Driver: Regulation as derived from Q2; competitive edge; best policy competition; cost reductions/long-term survival. Barrier: Implementation costs; lack of competence; low demand of fair trade.  
Q5: 1) One reference, built on criteria and indicators, and developed by enterprises for increased usefulness and reduced empty information flow (such as GRI); 2) Official body with know-how in sustainable development for monitoring and support; 3) Massive public campaigns.

### **Findus**

Q2: k,f,i,j  
Q3: b,f  
Q4: Driver: a,b  
Barrier: a,h  
Q5: a,g,h

Comment: Q2: 1) Eurepgap inflexible for farmers and should be combined with SAI Platform; 2) EMS not necessary, due to partial coverage by food quality systems ex. waste; 3) Efsis can be complemented with environmental management; 4) ISO14001 irrelevant and entails additional audits; 5) Lack of system for transport; 6) Own nutrition system (for salt and fat) applied in new product development.

Q3: 1) Suggests environment and ethics integration in one European label, in particular for imported products; 2) Quality (i.e. safety) irrelevant due to regulation; 3) Nutrition mainly optional besides salt and fat and a question about transparency; 4) MSC feasible but costly due to increasing raw material prices.

Q4: Driver: Sustainable development is today fundamental and crucial for competitive edge; Media. Barrier: Lack of financial incentives ex. transports that are too cheap; Sensitive issues difficult to communicate (i.e. situation stuck between low consumer awareness and hence retained private communication efforts).

Q5: 1) Ex. transports too cheap which has consequences for the environment as well as animal well-being; 2) Empowered consumer associations.

#### **INC**

Q2: N.A

Q3: a,b

Q4: Driver: N.A  
Barrier: N.A

Q5: e

Comment: Q3: Labels drive quality improvements - a response to quality reducing low price operators.

Q5: INC includes fair trade and organic products in their random quality test such as coffee.

#### **WWF**

Q2: f

Q3: a,b

Q4: Driver: a,c,f  
Barrier: d,f

Q5: a,e

Comment: Q2: Percieved as sufficient.

Q3 : 1) AB has relevant, clear and certified critiera ; 2) Agriculture raisonnée is not sustainable and without general reference; 3) A.O.C promoting proximity; 4) MSC relevant but strict criteria reduces availability (compare FSC for wood); 5) WWF has not position on ethical values for the moment, but will progressively be developed.

Q4: Barrier: Agriculture legislation.

Q5: Regulation favouring organic farming. Still CSR means actions beyond legal compliance.