

Kick-off meeting of the technical working group for the EMAS sectoral reference document on best environmental management practice in the food and beverage manufacturing sector

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1 INTRODUCTION

The European Commission's Joint Research Centre (JRC) is developing a sectoral reference document on best environmental management practice in the food and beverage manufacturing sector. The document will describe best environmental practices that food and beverage manufacturers can implement to minimise their environmental impact.

The elaboration of this document is part of the European Commission's work to implement the EU Eco-Management and Audit Scheme (EMAS) Regulation¹. EMAS is a voluntary framework for companies and other organisations to evaluate, report and improve their environmental performance. Within this framework, the EU decided in 2009 to develop Sectoral Reference Documents (SRDs) on Best Environmental Management Practice for different sectors. These are documents that EMAS registered organisations must take into account when assessing their environmental performance, but can also be used by others looking for guidance on how to improve their environmental performance. The food and beverage manufacturing sector is one of the priority sectors for which these documents are developed. Further information on this background is available in the JRC report "Development of the EMAS Sectoral Reference Documents on Best Environmental Management Practice"² and on the following website: <http://susproc.jrc.ec.europa.eu/activities/emas>.

For the development of the food and beverage manufacturing SRD, the JRC established a European technical working group (TWG), comprising experts in different aspects of environmental sustainability within the sector. The TWG assists the European Commission in identifying the best practices to be described and then validate the final findings. The kick-off meeting of the TWG was held in Brussels on 20-21 February 2014. The goal of the workshop was to establish the information exchange between the members of the TWG and to begin steering the development of the document, discussing its scope and the preliminary best environmental management practices identified. The Instituto Andaluz de Tecnologia (IAT, Spain) and the Asociacion de Investigacion de la Industria Agroalimentaria (AINIA, Spain) were contracted by the JRC to prepare a background document to be used as a basis for the development of the sectoral reference document and a draft version of this background report was sent to the TWG members prior to the workshop.

2 OPENING OF THE WORKSHOP

The JRC opened the session and welcomed the participants. After a brief explanation of the meeting procedure, an introduction to the workshop and overall exercise was given. The meeting agenda (attached in Annex 1) was presented and agreed by the participants. The TWG members introduced themselves and summarised their experience in environmental sustainability in food and beverage manufacturing (the list of participants is attached in Annex 2). It was agreed to use first names to refer to the different TWG members and the same convention is adopted in these meeting minutes.

¹ Regulation (EC) 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC, OJ L 242/1, 22.12.2009

² Available on-line at: <http://susproc.jrc.ec.europa.eu/activities/emas/documents/DevelopmentSRD.pdf>

3 INTRODUCTION TO THE EMAS SECTORAL REFERENCE DOCUMENTS AND PURPOSE AND GOALS OF THE MEETING

The JRC introduced the framework of the EMAS Regulation³. According to its article 46, the European Commission will develop, in consultation with stakeholders and member states, sectoral reference documents comprising best environmental management practices, environmental performance indicators and benchmarks of excellence. The aim of the documents is to describe with concrete measures what organizations of a given sector can do to improve their environmental performance and minimise their environmental impact. It was also explained that the documents go beyond EMAS, offering support and being a source of information for all organisations that wish to improve their environmental performance.

After this introduction, the JRC presented the goal of the TWG kick off meeting, which is setting the scope of the document and discuss potential best environmental management practices. The JRC stressed how essential it is to ensure that the TWG members contribute as much as possible to the development of the sectoral reference document to ensure its quality and usefulness for the companies of the sector.

4 LESSONS LEARNT FROM THE DEVELOPMENT OF PREVIOUS SECTORAL REFERENCE DOCUMENTS

The JRC presented how the previous sectoral reference documents were developed as well as their structure. The approach and general structure will be the same for the food and beverage manufacturing document. The presentation focused on the meaning of best environmental management practices, environmental performance indicators and benchmarks of excellence with useful examples from previous documents. The approach used to identify best environmental management practises by analysing the measures implemented by frontrunners was also presented.

5 OVERVIEW OF THE FOOD AND BEVERAGE MANUFACTURING SECTOR – ECONOMIC AND ENVIRONMENTAL RELEVANCE

The JRC introduced some figures about the annual turnover, number of companies and employment in the EU food and beverage manufacturing sector. This is the largest manufacturing sector in EU with 1000bn€ turnover, which represents 15% of the total EU manufacturing turnover. Moreover, the food and beverage manufacturing sector employs more than 4 million people in EU and it is a fragmented sector with more than 285,000 companies (mainly SMEs, which account for more than 99% of the total number of companies). The food and beverage manufacturing sector is even more relevant if the number of actors involved in its value chain, both upstream and downstream, is considered. The main environmental pressures of the food and beverage manufacturing sector include energy and water consumption, air emissions, solid waste and waste water generation, use of chemicals, resource depletion, biodiversity loss and noise and odours generation.

³ A copy of the presentations used in this and in all the following sections is given in Annex 3.

A number of TWG members questioned the use of the term 'food waste'. It was agreed that the more generic wording of 'food residues', including 'food by-products' and 'food waste', would be more appropriate to describe the fraction of materials not ending up in products of the food and beverage manufacturers. 'Food by-products'⁴ obtained from the food and drink manufacturing sector are mainly used to produce animal feed⁵. 'Food waste', instead, should refer only to the fraction of food residues sent to waste treatment processes (such as anaerobic digestion, composting, incineration and landfilling)⁶.

Furthermore, the environmental impacts related to the agricultural phase were discussed since these are often the most relevant in the overall environmental impact of food and beverages. However, agricultural aspects are going to be covered in the Sectoral Reference Document (SRD) for the Agriculture – Crop and Animal Production Sector (see <http://susproc.jrc.ec.europa.eu/activities/emas/agri.html>). Therefore, in order to avoid duplication of efforts and overlap between the two documents, the SRD for the Food and Beverage Manufacturing Sector will not directly cover the primary crop and animal production phases. This will be the case at least when the agricultural production is mainly carried out in the EU. Indeed, the SRD for the Food and Beverage Manufacturing sector can address the environmental impacts of the agricultural phase for those products where the primary production is mainly carried out outside the EU, since the farmers concerned would not be directly targeted by the SRD for the Agriculture – Crop and Animal Production Sector. However, even in this case, these aspects would only be covered in terms of sustainable supply chain management, i.e. from the point of view of the food and drink manufacturers.

6 DEFINITION OF THE SCOPE OF THE SECTORAL REFERENCE DOCUMENT

There are two important dimensions to consider in the definition of the scope for the SRD for food and beverage manufacturing. They are: which organisations should be targeted, and which environmental aspects should be addressed. In principle, the target organisations are all the companies belonging to the food and beverage manufacturing sector (NACE⁷ codes 10 and 11) and the activities to be covered all the significant direct and indirect environmental aspects⁸. However, the food and beverage manufacturing sector is a very

⁴ According to the Waste Framework Directive (2008/98/EC) a by-product is 'a substance or object, resulting from a production process, the primary aim of which is not the production of that item, only if the following conditions are met: (a) Further use of the substance or object is certain; (b) The substance or object can be used directly without any further processing other than normal industrial practice; (c) The substance or object is produced as an integral part of a production process; and (d) Further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts'.

⁵ Communication from the Commission to the Council and the European Parliament on the interpretative communication on waste and by-products (COM/2007/0059)

⁶ In agreement with what is covered by the Waste Framework Directive (2008/98/EC), see Article 2(2)(b).

⁷ Statistical classification of economic activities established with Regulation (EC) 1893/2006.

⁸ In the context of EMAS, an environmental aspect is an element of an organisation's activities, products or services that has or can have an impact on the environment. Environmental aspects are divided in direct and indirect aspects. Direct environmental aspects are those associated with activities, products and services of the organisation itself (over which it has direct management control), i.e. they are related to the company's own operations. Indirect environmental aspects are those which can result from the interaction of an organisation with third parties and which can to a reasonable degree be influenced by an organization, such as those related to the value chain of the products of the company.

broad and diverse sector, where few best environmental management practices (BEMPs) could be applicable across the whole sector. There is thus the need to develop some BEMPs for the overall sector as well as specific BEMPs for a number of sub-sectors, which should be carefully selected. Moreover two BREFs⁹ exist that are relevant for the food and beverage manufacturing sector: the Food Drink and Milk BREF and the Slaughterhouses and animal by-products BREF. The interaction between the BREFs and the SRD on food and beverage manufacturing needs thus to be carefully analysed.

The JRC presented a comparison between the EMAS SRDs and the BREFs, which is summarised in the following table:

| | BREF | SRD |
|---|---|---|
| Legal basis | Industrial Emissions Directive (IED – 2010/75/EU) | EMAS Regulation (Regulation (EC) 1221/2009) |
| Main elements | Best Available Techniques (BAT) Environmental performance levels associated with the use of BAT, especially on emissions (BAT-Associated Emissions Levels - BAT-AELs). | Best Environmental Management Practices (BEMP) Benchmarks of excellence (i.e. performance achieved by the 10-20% best performers) |
| Character | BAT conclusions are the reference for setting IED permit conditions. Emission Limit Values (ELVs) in permits must be set within the BAT-AEL range (mandatory) | The implementation of BEMPs is voluntary. EMAS registered organisations must take the SRDs into account. |
| Scope of activities covered | Installation-based (i.e. gate to gate approach) Only industrial installations. In the FDM BREF, only manufacturers / producers, not other actors in the sector. | Life-cycle thinking (i.e. cradle to grave approach) All actors along the value chain. For food and beverage manufacturing, focus on manufacturers/producers. |
| Size of installations/ companies covered | Large manufacturing installations only. For food and beverage manufacturing, the thresholds are as defined in Annex I, part 6.4 of the IED. For instance: 75 tonnes per day of finished product for processing of animal raw materials or 300 tonnes per day of finished product for processing of vegetable raw materials. | Companies of all sizes (special focus on SMEs) |

⁹ Best Available Techniques Reference Documents (BREFs) for industrial sectors, developed under the Industrial Pollution Prevention and Control (IPPC) Directive and then Industrial Emission Directive (IED). For further information on the BREFs, see <http://eippcb.jrc.ec.europa.eu>.

| | | |
|-----------------|---|--|
| Approach | Based on analysis of current emission and consumption levels and related applied technologies / techniques. | Based on analysis of best performers (front-runner approach) |
|-----------------|---|--|

EMAS SRDs and BREFs are thus different in most aspects. However, there are some areas that could be covered by both.

In order on the one hand to avoid creating confusion for the stakeholders and any duplication of efforts, and on the other hand to maximise the added value of developing an EMAS SRD for a sector already covered by BREFs (one of which is also about to start its revision process):

- The SRD can refer to the BREFs for areas covered in the BREFs.
- The SRD can focus on the non-BREF areas.

The main environmental aspects for the food and beverage manufacturing sector, together with the related main environmental pressures and the indication of whether these are covered or not by the BREFs, are given in the following tables:

| Main direct environmental aspects | Main environmental pressures | BREF / non-BREF |
|---|---|------------------------|
| Industrial processes and related operations | Emissions to water | Covered by the BREF |
| | Air emissions (NO _x , SO _x , VOC, particulate matter) | Covered by the BREF |
| | Solid waste | Covered by the BREF |
| | Water consumption | Covered by the BREF |
| | Energy consumption | Covered by the BREF |
| | Use of chemicals for cleaning | Covered by the BREF |
| | GHG emissions (CO ₂ , CH ₄) | Non-BREF area |
| | Use of renewable energy | Non-BREF area |
| Transport and distribution | Air emissions (CO ₂ , CO, SO ₂ , NO _x ...) | Non-BREF area |

| Main indirect environmental aspects | Main environmental pressures | BREF / non-BREF |
|--|---|------------------------|
| Supply chain management | GHG, energy consumption, water consumption, air emissions... | Non-BREF area |
| Agriculture | GHG, biodiversity, air emissions, eutrophication, water consumption | Non-BREF area |
| Packaging manufacturing | GHG, resource depletion | Non-BREF area |
| Transport and distribution | GHG, air emissions | Non-BREF area |

| | | |
|-------------------------------|---|---------------|
| Retail | Energy consumption | Non-BREF area |
| Food preparation by consumers | Energy consumption | Non-BREF area |
| Food waste generation | Air emissions (CO ₂ , CO, SO ₂ , NOx ...) | Non-BREF area |

The SRD for food and drink manufacturing will thus address directly the non-BREF areas identified in the tables and refer to the relevant BREFs (mainly the Food Drink and Milk BREF) for the BREF areas. However, there may be the possibility to also cover BREF areas in a few cases: namely when addressing exclusively small installations that need techniques that are substantially different from those described in the BREFs, and in some areas which are covered by the relevant BREFs but where these are unlikely to have BAT-AEL.

Concerning the choice of sub-sectors to target, the JRC proposed the following criteria:

- Economic relevance in the EU
- Environmental relevance
- Representativeness across the whole sector
- Presence of active frontrunners
- Focus on sub-sectors where many companies are SMEs
- Exclude sub-sectors where most significant environmental aspects are well covered in the BREFs

Based on those criteria, the JRC proposed to develop specific BEMPs for a number of subsectors of the food and beverage manufacturing sector, marked with 'selected' in the following table (which shows all NACE codes belonging to food and beverage manufacturing).

| NACE | Subsector | Selected / Not Selected |
|-------|--|-------------------------|
| 10.11 | Processing and preserving of meat | |
| 10.12 | Processing and preserving of poultry meat | |
| 10.13 | Production of meat and poultry meat products | Selected |
| 10.20 | Processing and preserving of fish, crustaceans and molluscs | |
| 10.31 | Processing and preserving of potatoes | |
| 10.32 | Manufacture of fruit and vegetable juice | Selected |
| 10.39 | Other processing and preserving of fruit and vegetables | |
| 10.41 | Manufacture of oils and fats | Selected |
| 10.42 | Manufacture of margarine and similar edible fats | |
| 10.51 | Operation of dairies and cheese making | |
| 10.52 | Manufacture of ice cream | |
| 10.61 | Manufacture of grain mill products | |
| 10.62 | Manufacture of starches and starch products | |
| 10.71 | Manufacture of bread; manufacture of fresh pastry goods and cakes | Selected |
| 10.72 | Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes | Selected |
| 10.73 | Manufacture of macaroni, noodles, couscous and similar farinaceous products | Selected |
| 10.81 | Manufacture of sugar | |

| NACE | Subsector | Selected / Not Selected |
|-------|---|---|
| 10.82 | Manufacture of cocoa, chocolate and sugar confectionery | To be decided after further analysis of the subsector |
| 10.83 | Processing of tea and coffee | Selected |
| 10.84 | Manufacture of condiments and seasonings | |
| 10.85 | Manufacture of prepared meals and dishes | To be decided after further analysis of the subsector |
| 10.86 | Manufacture of homogenised food preparations and dietetic food | |
| 10.89 | Manufacture of other food products n.e.c. | |
| 10.91 | Manufacture of prepared feeds for farm animals | |
| 10.92 | Manufacture of prepared pet foods | |
| 11.01 | Distilling, rectifying and blending of spirits | |
| 11.02 | Manufacture of wine from grape | Selected |
| 11.03 | Manufacture of cider and other fruit wines | |
| 11.04 | Manufacture of other non-distilled fermented beverages | |
| 11.05 | Manufacture of beer | Selected |
| 11.06 | Manufacture of malt | |
| 11.07 | Manufacture of soft drinks; production of mineral waters and other bottled waters | Selected |

The TWG members supported the proposal for the scope, both for the environmental aspects and for the sub-sectors to cover in detail.

However, a few remarks were made:

- On the environmental aspects/issues selected:
 - It was stressed the importance to cover the direct environmental pressure of solid waste (and in particular food waste) in this EMAS SRD because of its importance for SMEs.
 - The wording "energy supply" should be used in the table of the environmental issues rather than "use of renewables".
 - Use of chemical fertilisers should be mentioned in the environmental issues linked to the agricultural phase.
 - The importance to cover the influence that food manufacturers can have on consumers. It was proposed to include a special chapter on consumer behaviour (including attention to consumer awareness and behavioural change).
 - The product development / process-line development phase could also be covered, especially for the relationship between food and packaging.
- On the sub-sectors selected:
 - The need to include the dairy / cheese making sector.
 - The need to cover prepared meals and dishes, and, in particular, frozen food.

It was also discussed and decided that the BEMPs that will be selected will only be those that can ensure no detrimental effect on the quality and/or safety of the products.

Finally, the issues of technologies which are subject to a patent, of trademarks and how to deal with potentially confidential information were also addressed.

7 IDENTIFICATION OF BEST ENVIRONMENTAL MANAGEMENT PRACTISE

The meeting continued with short sessions for each of the proposed sub-sectors to be addressed in detail. For each sub-sector, the TWG discussed and agreed the scope and target group, the most relevant environmental pressures/impacts to be addressed in the SRD and some preliminary candidate BEMPs. The BEMPs for the overall food and beverage manufacturing sector would be discussed last.

7.1 Processing of coffee

Scope: The JRC proposed to select the coffee roasters as target group and to cover the production of roasted coffee, decaffeinated coffee and soluble coffee. In the life cycle of these products, it was proposed to address the agriculture phase (carried out outside Europe) and the roasting of coffee itself.

The TWG members agreed on the choices of products and phases and stressed the importance of the agriculture phase as the most relevant for coffee production, as well as for many other food and beverage products. Some TWG members believe that coffee roasters can have little influence on agricultural practices, because of green coffee being bought on the spot market. Others, however, support that the agricultural phase is included and addressed as supply chain management, because there are examples of best practices in this field. It is thus decided to include it.

Consumer behaviour (e.g. choice between ground coffee and capsules) was singled out as another important aspect affecting the environmental impact of coffee. However, coffee manufacturers can only have limited influence on consumers. Therefore, this will not be addressed in the SRD for the food and beverage manufacturing.

Finally, it was proposed to cover product development because of the potential to minimise the environmental impacts at that stage (e.g. capsules, packaging in general, coffee machines). The JRC will evaluate whether it is better to address this for the overall sector or in this particular sub-sector.

Environmental pressures addressed: The main environmental pressures to be addressed are the reduction of energy and chemicals consumption during roasting and the sustainability of green coffee production. There was the proposal to also look at dioxins formation during coffee roasting depending on operating conditions. **Petros will provide two studies on this.**

Candidate BEMP 1: Improving the sustainability of green coffee production through supply chain management.

The discussion highlighted that certification schemes for green coffee are not always effective in guaranteeing lower environmental impacts. Moreover, certification of green coffee producers may be an issue in some areas of the world where these are mainly small producers. It was agreed that the BEMP would compare different sustainable coffee standards trying to identify the more meaningful ones or give the tool to coffee roasters for doing so. In addition, it is BEMP for a coffee roaster to work with suppliers and support direct changes in primary coffee production without requiring a formal certification. In this

case, a suitable indicator could be the number of audits carried out. Care should be put to avoid indicators that favour intensive over extensive agricultural practices. Although the focus of the SRD is on environmental sustainability, it was also recommended to mention social aspects in this BEMP given their relevance in sustainability of the green coffee supply chain.

Candidate BEMP 2: Decaffeination of coffee using supercritical CO₂.

Both decaffeination using supercritical CO₂ and solvents are currently in use in the industry, mainly depending on consumer preference in different markets. Some TWG members state that an important cross-media effect is the high energy consumption but others do not agree. However, the TWG supports considering this technique as BEMP.. The applicability should be not only new plants but also plants undergoing refurbishment or expanding.

Barbara will provide data (especially energy consumption) on implementation in a Lavazza plant. Francesco will check about the implementation of this technique within Mondelez.

Candidate BEMP 3: Green coffee pre-heating in batch coffee roasting.

The technique consists of pre-heating the coffee beans before roasting, recirculating (after cleaning) the exhaust hot air from the end of the roaster. During the discussion, some concerns were expressed about the degree to which it is possible to control some parameters (temperature...) during the roasting, if this technique is implemented. However, there are now many successful examples and it was agreed that this should be considered BEMP. The applicability must state that this BEMP can only be implemented by coffee roasters when buying a new roaster. In the case instead of upgrading existing equipment, energy recovery from exhaust air for space heating (e.g. offices) can be implemented. As for the indicators, it was recommended to state them in energy units (e.g. kWh/t) rather than carbon emissions.

Other proposals for potential BEMPs:

Other proposals from the TWG were:

- investigating schemes that allow companies to collect spent coffee (after use) from bars/restaurants/coffee machines and use it for heat production (after being converted into pellet), because of the high calorific value of spent coffee;
- the use of coffee chaff for energy generation;
- designing sustainable packaging (both for capsules and ground coffee) looking not only at primary but also at secondary packaging (however this may be covered in an horizontal packaging BEMP).

7.2 Manufacturing of wine from grapes

Scope: The proposal for the scope included the production of all types of wine and excluded distilling, rectifying and blending of spirits. The proposed life cycle phases to be covered were the wine production processes and packaging, excluding the agriculture phase (i.e. the vineyard), because that is going to be covered in the SRD for Agriculture – Crop and Animal Production Sector. It was noticed that sparkling wine was missing and should be added in the list of types of wine considered. It was also advised to use the EU wine classification in

the report. Yeast production could also be an aspect which can be investigated within this sector and **Stefano can provide information on this**. It was also suggested to look at the storage of finished products.

Environmental pressures addressed: The main environmental pressures along the wine value chain which were proposed to be addressed were the production of packaging materials, energy generation/use in wine manufacturing and bottled wine transportation. From the discussion, packaging proved to be a relevant aspect in wine manufacturing and many different options are available (plastic and glass bottles, bag in box etc.). In Europe, there are some examples of schemes that collect the used glass bottles, wash and reuse them for bottling new wine (**Jens can provide information on this**). However, limitations due to ensuring quality and hygiene of the product must be considered when choosing the material for packaging. Concerning transport, the option to transport it bulk in big tanks and then bottle it at destination could be investigated (but this is not allowed for DOC wines). It was also suggested to cover the waste water generation and treatment and the use of treated waste water to irrigate vineyards, but waste water will be covered in the BREF; therefore, it will not be considered in this SRD unless specific techniques only applicable to small scale installations are identified. However, the extractions of polyphenols from winery waste water could be researched. Improving the recyclability thanks to easily detachable bottle labels could also be an aspect to investigate. Finally, the discussion moved to the environmental impact of corks. Screw caps are chosen for quality but can pollute the glass when sent to recycling. In terms of quality, natural corks can be better than plastic and Stelvin corks and also from the environmental point of view, if natural corks are produced where environmental friendly agricultural practises are implemented, their environmental impact is lower than the other options (**Yann can provide some material on the cork production**).

BEMP 1: Use of lightweight bottles.

This technique is about reducing the amount of glass used and consequently the weight of the bottles. It was suggested that this technique could also be applied to glass jars (e.g. for pickles, vegetables...). The TWG confirmed the importance of this technique since the weight of the bottle is a hotspot in the LCA of wine. However, the problem is that the market demands heavy bottles (and dislikes alternatives to glass bottles) especially for good wine. The environmental indicator presented with this BEMP (in terms of CO₂ eq emissions) does not seem appropriate for cross-country comparison because it depends heavily on the energy mix of each country and on the transport mode used.

BEMP 2: Heat and cold production from biomass coming from vineyards and wineries

The candidate BEMP is about the use of a biomass boiler to generate heat (in the form of saturated steam) which can also be used in a adsorption chiller to cover cooling demands. From the discussion, the seasonality and the need to establish synergies among producers (**Zeno can provide info**), if not big enough, are aspects to be considered. **Alexis can provide info on an example** of implementing this technique to produce hot water; the plant had a payback time of 3 years. Tri-generation could also be a more efficient option, instead of just heat and cold production (**Zeno can provide info on these aspects**). The option of anaerobic digestion to produce biogas instead of combustion was also discussed. Moreover, if residues from the vineyard are used for heat and cold production, there may be a need to fertilize the soil (**Stefano and Zeno can provide data on trade off with**

use on field). It should thus be evaluated whether this technique can be considered BEMP only when use of the vineyards and wineries residues on field is not worth it, e.g. because of long distances.

BEMP 3: Use of ultrasounds for cleaning barrels

This technique allows reducing the water consumption thanks to the use of ultrasounds for cleaning barrels. TWG members were mainly concerned about the cost and the quality of the wine aged in the cleaned barrels, since the ultrasounds may alter the characteristics of the wood barrels. This BEMP may be only an emerging technique and further research is needed to allow full implementation. The use of ozone for cleaning barrels may be a more advanced technique and **Stefano will provide some material on this**.

Other proposals for potential BEMPs

After discussing the three BEMPs proposed, it was highlighted that another important aspect in the wine manufacturing is the cleaning of the storage tanks. The use of barrels for aging is limited while the use of tanks is widespread, requiring huge amount of water for cleaning (usually 1 l of water for 1 l of wine produced). The use of ozone can be used also for cleaning the tanks. **Stefano will provide some material on this**.

7.3 Manufacture of pasta

Scope: The proposed scope included only dry pasta manufacturing, excluding chilled and fresh pasta and manufacturers of canned/preserved pasta. The TWG observed that dry pasta is mainly produced by large companies, mainly in installations covered by the Best Available Technique Reference Document (BREF). Therefore, it was decided to investigate more the whole pasta manufacturing sector, in order to identify areas with potential for environmental improvement that are not covered by the BREF. Pasta manufacturing SMEs (including fresh pasta manufacturers) will be analysed.

Based on the analysis of the overall pasta manufacturing sub-sector, it will be decided whether to keep this sub-sector within those for which specific BEMPs are developed.

The other main point discussed was the inclusion of milling in the scope. This process is an important phase of the pasta manufacturing, since it uses a relevant amount of energy. It can be carried out on-site (especially in large plants) or in dedicated installations. Although some TWG members think that it would be difficult to identify BEMPs for milling as the processes are already very efficient, it was decided to include it in the scope because of its relevance.

Finally, the TWG discussed whether to include in the scope the agricultural phase or, more generally, supply chain management. In Europe, there are examples of pasta manufacturers establishing agreements with farmers' organisations to ensure that suitable durum wheat is produced and sustainable agriculture practises are applied. However, the need for high quality durum wheat drives European manufacturers to import a relevant share from USA, Argentina, Canada, etc., which is transported to Europe by ship, and, on a LCA perspective, this may even lead to a lower environmental impact than production of durum wheat in the EU. Therefore, the agricultural phase will not be covered.

Environmental pressures addressed and BEMPs: According to one study, the raw materials production (mainly agriculture) contributes 54% of the total environmental footprint of pasta manufacturing. However, the agriculture phase will not be covered in the SRD. The second and third most relevant aspects are packaging and energy consumption in the pasta manufacturing processes. Since packaging is an important aspect for the entire food and beverage manufacturing sector, it will be covered in an horizontal BEMP and not specifically for this subsector. As for the energy consumption in the manufacturing of dry pasta, this aspect will be addressed in the BREF. It is thus decided that it will not be covered in the SRD. The two proposed BEMPs for the manufacture of dry pasta (energy efficient pasta drying and eco-design of pasta packaging) therefore will be reconsidered.

7.4 Manufacture of soft drinks

Scope: The proposed scope for the soft drinks subsector included carbonated drinks, dilutables and still and juice drinks. Bottled water as well as fruit juice and nectars are instead excluded. The TWG agreed with this proposal. In particular, the exclusion of bottled water was supported because it is different in nature (only liquid, no ingredients). Fruit juices and nectars, instead, are addressed separately (see section 7.7).

Environmental pressures addressed: The main environmental pressures along the soft drinks value chain which were proposed to address were the reduction of water consumption, the minimisation of packaging and the reduction of energy use. Packaging was discussed in detail focusing on the design criteria of the bottles and how easily they can be recycled (especially plastic bottles). There was no agreement whether to deal with packaging specifically for this sub-sectors or only horizontally for the whole food and beverage manufacturing sector.

BEMP 1: Reduction of water consumption in packages rinsing operations.

This technique deals with the reduction of water consumption in packages rinsing operations (for single-use bottles which need to be rinsed before filling) using ionized air or implementing an integrated system for plastic bottle blowers and fillers. The cross-media effect of this technique is the increased energy use. **Susana will provide energy consumption data.** Moreover it can be implemented only for new production lines and, in some cases, company policies may be against rinsing with air because of safety concerns.

BEMP 2: Improve packaging by life cycle assessment.

The BEMP discussed the eco-design of packaging. However, as seen in previous sub-sectors, if there are not significant specificities, this aspect will be addressed in a BEMP for the overall food and beverage manufacturing sector.

BEMP 3: Use of blowers in the drying stage.

This candidate BEMP was about using blowers with high energy efficiency in the drying stage instead of air compressors. These blowers are also known as air knives and the drawback they have is the noise generated during operations.

An emerging technique mentioned during the discussion was the use of activated water which would save considerable amount of water and energy during the soft drinks production.

7.5 Manufacture of beer

Scope: The TWG agreed the proposed scope for this subsector, which included the beer manufacturing processes and excluded malt production.

Environmental pressures addressed and BEMPs: The main aspects proposed to be covered were the improvement of energy efficiency, the reduction of waste generation and the use of solar energy for brewing. During the discussion, it emerged that with regard to the reduction of waste generation, there are some processes which allow regenerating polyvinyl resins used in the process and **Yiorgos can provide material on this**. The TWG also stressed that spent grains and yeast are by-products and should not be listed as waste. In beer manufacturing, an important aspect to be considered can be the reuse of glass bottles, which after being washed can be refilled. However, this practise is not accepted by consumers in all EU countries (e.g. UK) and there may be some technical issues when sorting bottles of different types. Implementation of measures for reducing energy consumption is very different in Europe (in UK only few adopt measures while in Austria measures for reducing the energy consumption are more widespread) and it depends a lot on the size of the brewery. The TWG encouraged thus to look more at the differences across different sizes as well as at the (increasing) production of non-alcoholic beer. **Barbara can provide information from the GREENFOOD project about the huge gap in knowledge in craft breweries.**

BEMP 1: Use of solar thermal energy in the brewing process.

The candidate BEMP presented was the integration of solar thermal energy in the brewing process. The TWG considered important that both integration at the heat supply and at the process level are considered. However, the integration at the process level is where the highest potential benefits lay. This technique can be suitable for breweries of all sizes but it could also be applied in other sectors (e.g. cheese manufacturing). **Barbara will provide the contact of an expert in integrating solar thermal in the food and beverage manufacturing sector.** The use of solar thermal heat in sectors where the production is seasonal (such as wine production) may instead result more problematic. In Sweden breweries receive heat from the district-heating network which uses solar thermal energy and energy storage systems, **Jens will provide material on this**. In light of the discussion, this BEMP will be reconsidered, if it is more appropriate to be presented as general for the whole food and beverage manufacturing sector or only in some specific subsectors.

BEMP 2: Heat recovery in wort boiling.

The technique deals with recovering heat during the wort boiling to preheat the wort. The description also included reducing the total evaporation during the boiling, which, further to reduce the energy consumption, may allow reducing the frequency of cleaning (**Jurgen will provide information on this**). It was discussed that the two elements (heat recovery with preheating of the next batch and boiling minimisation) could be two separate techniques. Some TWG members expressed concerns whether heat recovery should now be considered common/good practice but not BEMP.

BEMP 3: Reduction of diatomaceous earth sludge through the use of cross-flow filtration.

Participants agreed that this technique is common in wine manufacturing but only few breweries implement it, therefore, it can be considered BEMP (**Roland can provide some details of a brewery implementing this technology and Steffen some data on one of the technologies that can be used for Kieselgur free beer filtration**). However, cross filtration may be forbidden for organic beer production. This will be investigated.

Other proposals for potential BEMPs

After discussing the three BEMPs proposed, it was highlighted that breweries which change from batch to semi-continuous processes have been able to reduce their energy consumption by 30-35% and therefore this could be an aspect to further investigate.

7.6 Production of meat and poultry meat products

Scope: the proposed scope included the manufacturers of meat and poultry meat products but excluded the processing and preserving of meat (also slaughterhouses) and livestock production. The TWG supported this choice to avoid the overlap with the BREF. However, the discussion highlighted that it may difficult to divide slaughterhouses from the production of meat products, since these activities are often carried out at the same location, especially for SMEs (**Cecile will check among her network**). Plastic skin of sausages and cured product may also be included in the scope of products to be studied.

Environmental pressures addressed: The proposed environmental pressure to be addressed was the energy use for the production of meat and poultry meat products. Participants discussed the importance of refrigeration in the meat industry (**Josep will send some info on this**) but it seems more appropriate to cover this aspect in the chapter of the document where BEMPs for the whole food and beverage manufacturing sector will be presented. The importance of packaging was also discussed (including vacuum packed products and active packaging). Finally, the refrigeration of residues (such as bones and animal fat) to allow their further high quality use was singled out as an aspect to investigate.

Proposals for potential BEMPs:

The high pressure processing (HPP) technology has the advantage of reducing the energy consumption instead of traditionally cooking the meat products. However, for SMEs it is difficult to buy a HPP system because of the high investment needed. There are examples in Europe of companies leasing it for limited time periods.

The quick dry slice technology is also applicable only for big companies and it can treat only sliced products increasing the speed of curing.

Drying and smoking of meat product as well as pasteurization could also be an aspect to look at, since there is a lot of margin of improvement, especially for SMEs.

Other areas of interest could be (i) investigating the dried salting instead of using brines which reduces the amount of water used and waste water generated (ii) studying the techniques used to unfroze meat (e.g. microwave) when the raw material to process is received frozen (iii) researching into the use of software which simulate and optimize the energy consumption of production processes (such as drying).

7.7 Manufacture of orange juice

Scope: It was proposed to cover the production of orange juice including companies which extract the juice from fresh oranges, companies which produce juice from imported juice or concentrate, and companies which extract and package in retail formats juice from fresh oranges. The TWG recommended including the production of "nectars" and modifying accordingly the title. Participants also recommended considering whether it would be possible to also cover apple juice, because of its importance in Europe; some BEMPs can be applied to both juices (especially those for companies producing juice from concentrate or imported juice) but in general the two production processes are different. As far as life cycle phases are concerned, the scope will include the processes at the juice manufacturers as well as, indirectly, the agricultural phase (mainly non-EU based).

Environmental pressures addressed: The proposed environmental pressures to be addressed were: organic waste generation, greenhouse gases generation and aspects related to the growing of citrus fruits (outside Europe) and transport of juice and concentrate. The discussion firstly focused on companies producing orange juice from fresh oranges. They can obtain also essential oils during the process (**Maurizio Petruccioli can provide info on this**) and this product has a high market value. Moreover, extraction of essential oils facilitates the waste water treatment processes. Pectin is also a by-product obtained from squeezed orange residues. These aspects will be investigated to evaluate their inclusion in the scope. Finally, the processes of homogenization and pasteurization for the production of concentrate were also discussed. It should be checked whether BEMPs can be found in those areas.

BEMP 1: Environmental supply chain management.

Several studies and measures have already been implemented in Brasil (main producer of oranges) and material can be found online (e.g. technical working group of Citrus Brasil). The TWG recommended that a set of indicators and not just CO₂ emissions are used. It was also mentioned that the same platforms, networks, tools used for oranges are used for many other sub-sectors. In light of the discussion this BEMP will be thus moved to the general chapter where BEMPs for the whole food and beverage manufacturing sector will be presented.

BEMP 2: Energy production from the anaerobic digestion of citrus waste.

This technique allows energy recovery from food residues (spent oranges) after the extraction of the juice. However, these residues are currently used for other purposes such as animal feed (but also production of pectin, tea flavours...). It was agreed that their use in AD should only be BEMP when there is an excess of spent oranges. Moreover, the seasonality of the production could be an issue but if the excess of squeezed oranges is managed correctly (drying, silage...) and appropriate AD systems are used (e.g. batch systems for small installations), the technique presented can be considered BEMP. It was also mentioned that spent oranges used as co-substrate can improve the anaerobic digestion of manure (**Petros will provide material on this**). Emerging techniques to investigate include conversion of peels into packaging and use of peels for thermal insulations of buildings.

BEMP 3: Biogas production from orange juice wastewater treatment.

During the discussion it emerged that this technique can also be applied by cheese and meat producers (**Jurgen will provide some material**). Moreover, if a company only produces orange juice, its implementation may be problematic due to the seasonality of the production. This BEMP will therefore be reconsidered and, if appropriate, included as an horizontal BEMP for the overall sector.

Other proposals for potential BEMPs

Another area of interest could be investigating the production of humus (i.e. soil amendment) from the spent oranges.

7.8 Manufacture of olive oil

Scope: It was proposed to cover the extraction of olive oil with the traditional, 2-phase and 3-phase olive oil extraction systems and the production of virgin olive oil, crude olive-pomace oil, refined olive-pomace oil and olive-pomace oil. Therefore not only oil mills but also extraction plants and refineries could be covered. Some TWG members proposed to include packaging and **Cecile will provide materials on frontrunners in the field.**

Environmental pressures addressed and BEMPs: The aspects proposed to be addressed were energy and water use for the manufacture of olive oil. During the discussion, investigating the use for the spent olives (including their use as co-substrate in AD, prior removal of pits and oil recovery from them) was also suggested.

BEMP 1: Separation of olive oil by natural decantation.

From the discussion it was clarified that this technique has a limited applicability because of its impact on the physical-chemical parameters and quality of the olive oil. Moreover, the amount of water needed to clean the tanks is an issue. There are other water free techniques able to separate the olive oil (**Steffen can provide information on water free centrifuges**). This BEMP will thus be reconsidered.

BEMP 2: Optimum harvest time.

This technique deals with olives being harvested before they fall on the ground, reducing the amount of water needed to wash them at the oil mill. TWG members expressed concerns about altering the taste of the oil by anticipating the harvesting as well as about how to ensure that olives are clean enough without the need to wash them. It was also mentioned that harvesting time depends on the region, machinery and people. This BEMP should be reconsidered and one option would be to name it optimum harvesting, presenting different options.

Other proposals for potential BEMPs

Other areas where potentially BEMPs can be developed are the malaxing of the olives (focusing on the energy requirements) and eventually the reduction of packaging weight (**Bonifacio can provide info on this**).

7.9 Manufacture of seed oils

Scope: The proposed scope included the manufacture of edible oil from seeds (rape, soya, sunflower etc., but not palm oil). Despite being covered already in the Best Available Technique Reference Document (BREF), the TWG members considered that there are areas and techniques for environmental improvements, especially for new production plants, which would not be included in the BREF.

Environmental pressures addressed: The environmental pressures proposed to be addressed were the greenhouse gases and waste generated. Production of seed oil generates also oil cakes which are normally used as animal feed and cannot be considered waste (and have a similar value to the oil itself). During the discussion it was mentioned that Fedoil on its website has a report where the impact of the different environmental aspects has been assessed.

BEMP 1: Use of rapeseed and sunflower hulls for energy generation.

Participants agreed that this technique can be applied only for the excess of hull generated, i.e. when they are not used as animal feed. It was also mentioned that this BEMP can be used only for sunflower hulls and not for rapeseed. Moreover, it may be more appropriate to state that BEMP is cogeneration and not only heat production.

7.10 Manufacture of bread, pastry goods, biscuits and cakes

Scope: The proposed scope include the processes of mixing, proving/fermenting, baking and cooling which lead to the production of bread, biscuits, cakes and pastries. Participants supported the inclusion of freezing because of its importance in the manufacturing of cakes, pastries and, especially, fresh bread. In fact, recently, there has been an increasing popularity of industrially produced bread, which is partly baked, then frozen and finally baked at the point of sale. However there are still a consistent amount of traditional small bakeries (especially in some EU countries). Therefore it should be decided which companies the sectoral reference document will address: large industrial bakeries producing finished products to be directly sold on retailers' shelves, industrial bakeries producing semi-finished products to be baked at the point of sale, and/or small individual bakeries producing and selling their own products. The processes and best practices for each of these groups are very different. There are also substantial differences between the productions of bread, of cakes and of biscuits, and for each of them between fresh products (e.g. fresh cakes or fresh pastry) and industrial products.

Environmental pressures addressed: The energy consumption for baking and freezing is the main aspect which will be covered. The techniques used to store grains for pest control (i.e. low temperature storage or the use of chemicals) to ensure food safety could be another aspect to be investigated. The use of cold storage increases the energy consumption but reduces the amount of pesticides used (i.e. the energy used for their production and transport). Selection of ingredients with lower environmental impact was discussed but will not be considered an aspect to study since these changes are currently due to health and not environmental concerns and many choices would alter the characteristic and quality of

the products. Another aspect which could be addressed is the unsold bread (about 20%). This is a large source of food residues often becoming waste, and both how to reduce the quantities of unsold bread and how to best manage it for recycling/recovery could be investigated. Indeed, there are examples of companies that collect it from the shops and use it as ingredient for other bread products, animal feed or to produce biogas.

7.11 Identification of BEMPs for the overall sector

BEMP 1: Perform an environmental sustainability assessment of products and/or operations

The discussion focused on the lack of data availability for performing a sustainability assessment. For SMEs performing a full LCA would be very costly, however identifying hotspots to perform the LCA on could be a more feasible option. For instance, the department for Environment, Food and Rural Affairs (DEFRA) in UK has developed a guide on sustainable soft drinks, identifying hotspots. This BEMP could be integrated with more information after the trial of the product environmental footprint (PEF) and organization environmental footprint (OEF) methodologies in the food and drink sector will be completed by DG ENV.

BEMP 2: Sustainable supply chain management.

As discussed in some of the previous subsector, the TWG agreed on the importance and effectiveness of this technique for the whole food and beverage manufacturing sector.

BEMP 3: Improve ingredient choice/recipes to minimise the environmental impact.

The TWG members considered that this is a difficult option, since changing ingredients will change the characteristics/quality of the product. Moreover, also for this BEMP a sustainability assessment of the ingredients is required; therefore, it could be coupled with the previous technique. **Aintzane** mentioned the example of a SME implementing this measure (for prepared meals) and she **will provide information**.

BEMP 4: Improve or select packaging to minimise environmental impact.

As discussed in several of the previous subsector, the TWG agreed on the importance and effectiveness of improving packaging for the whole food and beverage manufacturing sector.

BEMP 5: Adapt packaging to optimum portion size(s) to minimise food waste and amount of packaging.

Avoiding large packaging can reduce the food waste, but there is a trade-off because more waste packaging is generated. It would be interesting to learn from real experiences. This technique could involve an extra burden for small producers since it may require the storage of more packaging types. A different option for reducing food waste is when food and beverage are sent in bulk to the retailers and then sold according to the need of the consumer.

BEMP 6: Set longer best before dates to minimise food waste.

During the discussion it was stated that this technique may go in contrast with food safety and quality of the products. Introducing sell by dates and best before dates, instead, seems only a good practise, already widely implemented in some countries. Given that laws, demands from retailers and consumer information are the main factors determining

choices in this field, and considering the potentially negative trade-off with food safety and quality, it is decided to exclude this candidate BEMP.

BEMP 7: Environmental-friendly cleaning operations.

The TWG supported the inclusion of this technique, given its importance and effectiveness for the whole food and beverage manufacturing sector. Further research is needed on the specific practices to be described.

BEMP 8: Improve transport and distribution operations

The TWG agreed on the importance and effectiveness of improving transport and distribution operations for the whole food and beverage manufacturing sector.

Other proposals for potential BEMPs

Other areas of interest for the whole food and beverage manufacturing sector could be freezing and refrigeration, implementation of pest control measures which allow avoiding the loss of ingredients due to insects (in storage or milling operations), use of renewable energy for the production processes. Moreover, the sectoral reference document could present as BEMP the implementation of a production control system which allows understanding which is the cause of an unforeseen stop of the plant (producing food waste) and measures to avoid further process stops are taken, such as an integrated approach on management and production control.

8 OTHER REMARKS

The TWG invited to take dissemination into account in the development of the document. **An will send the link of an Internet tool developed for BAT in the Flemish region** which could provide inspiration. Another proposal is to develop for each BEMP, on top of the full description, a “fiche” of one or maximum two pages.

ANNEX 1 – AGENDA



EUROPEAN COMMISSION

DIRECTORATE-GENERAL

JOINT RESEARCH CENTRE

Directorate J - Institute for Prospective Technological Studies (Seville)

Sustainable Production and Consumption Unit

KICK-OFF MEETING OF THE TECHNICAL WORKING GROUP FOR THE EMAS SECTORAL REFERENCE DOCUMENT ON BEST ENVIRONMENTAL MANAGEMENT PRACTICES FOR THE FOOD AND BEVERAGE MANUFACTURING SECTOR

Brussels, 20-21 February 2014

Venue: Albert Borschette Conference Centre, Room 3C

AGENDA

| Thursday 20 February 2014 | |
|---|----------------------|
| Arrival and registration of participants | 09:15 – 09:45 |
| Opening and welcome | 09:45 – 10:00 |
| Introduction of experts | 10:00 – 10:15 |
| Purpose and goals of the meeting | 10:15 – 10:30 |
| Introduction of the EMAS sectoral reference documents (SRDs) on best environmental management practise (BEMP) and lessons learnt so far | 10:30 – 11:00 |
| <i>Coffee break</i> | <i>11:00 – 11:30</i> |
| Overview of the Food and Beverage manufacturing sector (economic and environmental relevance). | 11:30 – 12:00 |
| Definition of the scope of the sectoral reference document | <i>12:00 – 13:00</i> |
| <i>Lunch break</i> | <i>13:00 – 14:15</i> |
| Identification of BEMPs for: Processing of coffee | 14:15 – 15:15 |
| Identification of BEMPs for: Manufacture of wine from grape | 15:15 – 15:45 |
| <i>Coffee break</i> | <i>15:45 – 16:15</i> |
| Identification of BEMPs for: Manufacture of pasta | 16:15 – 17:15 |
| Identification of BEMPs for: Manufacture of soft drinks | 17:15 – 17:45 |
| Wrap-up and close of the day | 17:45 – 18:00 |

| Friday 21 February 2014 | |
|--|----------------------|
| Opening of the day | 09:00 - 09:15 |
| Identification of BEMPs for: Manufacture of beer | 09:15 - 10:15 |
| Identification of BEMPs for: Production of meat and poultry meat products | 10:15 - 10:45 |
| <i>Coffee break</i> | <i>10:45 - 11:15</i> |
| Identification of BEMPs for: Manufacture of orange juice | 11:15 - 12:00 |
| <i>Lunch break</i> | <i>12:00 - 13:15</i> |
| Identification of BEMPs for: Manufacture of olive oil | 13:15 - 14:15 |
| Identification of BEMPs for: Manufacture of seed oil | 14:15 - 15:00 |
| Identification of BEMPs for: Manufacture of bread, pastry goods, biscuits and cakes | 15:00 - 15:30 |
| <i>Coffee break</i> | <i>15:30 - 16:00</i> |
| Identification of BEMPs for the overall sector | 16:00 - 17:00 |
| Wrap-up and close of workshop | 17:00 - 17:30 |

ANNEX 2 – LIST OF PARTICIPANTS

ANNEX 2: LIST OF PARTICIPANTS

| Name | Organization |
|-----------------------|---|
| Jürgen Fluch | AEE - Institut für Nachhaltige Technologien |
| Yiorgos Kotseridis | Agricultural University of Athens |
| Petros Samaras | Alexander technological education institute of Thessaloniki |
| Roland Demleitner | Associations of Private Brauereien Deutschland e.V. |
| Luca Ruini | Barilla group |
| Bernd Bohrer | bb-biotech |
| Stephan Ghekiere | Cargill Refined Oils EU (CROE) - Grain & Oilseeds Supply Chain EU (GOSCE) |
| Alexis Raoux | CASTEL FRERES |
| Susana Pliego | coca-cola Iberia |
| Geert Huysmans | coca-cola Services n.v. |
| Aurora Abad | Comite Europeen des enterpries vins |
| Cristina Rosell | CSIC |
| Jens Peter Mortensen | Danmarks Naturfredningsforening |
| Bonifacio Sulprizio | De Cecco |
| Zeno Beltrami | DNV GL – Business Assurance Italy |
| Aintzane Esturo | EQCS - AZTI-Tecnalia |
| Coen Blomsma | FEDIOL |
| Frank Grilli | Ferrero |
| Patricia Lopez Blanco | Food and Drink Europe |
| Steffen Hruschka | GEA Westfalia Separator Group GmbH |
| Maurizio Snidersich | Illy caffe' |
| Josep Comaposada | IRTA - Research and Technology Food and Agriculture |
| Henning Osmers | Lebensbaum / Ulrich Walter GmbH |
| Barbara Conti | Luigi Lavazza SPA |
| Dionne Heijnen | Mondelez International |
| Francesco Tramontin | Mondelez International |

| | |
|------------------------|---|
| Barbara Sturm | Newcatle University |
| Yann Juban | OIV - International Organisation of Vine and Wine |
| Garibi Ignacio | Pernod Ricard Winemakers |
| Guenther Rau | REFCCO Rau Enviroment Food & Communications Consulting |
| Cécile Lepers | SYNABIO |
| Georg Sulzer | Umweltgutachterbuero Dr. Sulzer |
| Francesco Pavanello | Unione Italiana Vini |
| Stefano Stefanucci | Unione Italiana Vini |
| Maurizio Petruccioli | Universita' della Tuscia |
| Maurizio Cellura | Universita' di Palermo |
| Joe Kerry | University College Cork |
| An Derden | VITO - Flemish Institute for Technological Research |
| Aurora García | IAT – Insitituto Andaluz de tecnologia |
| Rafael Rodríguez Acuña | IAT– Insitituto Andaluz de tecnologia |
| Alfredo Rodrigo | AINIA - Asociacion de Investigacion de la Industria Agroalimentaria |
| Benjamin Vallin | EC - DG ENTR |
| Rolf-Jan Hoeve | EC - DG ENV |
| Alex Radway | EC - DG ENV |
| Gilles Vincent | EC - DG ENV |
| Anne-Laure Gassin | EC - DG SANCO |
| Yiannis Antonopoulos | EC - JRC |
| Paolo Canfora | EC - JRC |
| Marco Dri | EC - JRC |
| Panagiotis Karlis | EC - JRC |
| Kristine Stubdrup | EC - JRC |

ANNEX 3 - PRESENTATIONS


European Commission

Purposes and goals of the kick-off meeting



Marco Dri
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*Sustainable Production and Consumption Unit
Institute for Prospective Technological Studies (IPTS)
Joint Research Centre (JRC)
European Commission*

Joint Research Centre


European Commission

Title of the meeting: Kick-off meeting of the Technical Working Group for the EMAS sectoral reference documents on Best Environmental management Practises for the Food and Beverage Manufacturing Sector

What is it???



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European Commission

What is EMAS?

EU Eco-Management and Audit Scheme (EMAS) is established by EU regulation:

- Open for companies and other organisations
- Is a voluntary management tool to evaluate, report and improve the environmental performance



3

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European Commission

The legal background

The latest revision of EMAS was carried-out in 2009,
REGULATION (EC) No 1221/2009

↓

Promote best environmental performance

↓

Develop of Sectoral Reference Documents on Best Environmental Management Practise

19 February 2014

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European Commission

The Sectoral Reference Documents on Best Environmental Management Practice

→ Main elements

- Best environmental management practices
- Environmental performance indicators
- Benchmarks of excellence

→ Not only for EMAS registered organisations but for all actors within the sectors covered who intend to improve their environmental performance




19 February 2014 


European Commission

11 priority sectors

• Commission Communication (2011/C 358/02)













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The Technical Working Group ...

European Commission
(JRC/IPTS and DG Environment)

↓

Working Groups for the different sectors

Member States

Companies

EMAS orga.

Universities

Research centres/institutes

Techniques providers

Verifiers

Competent bodies

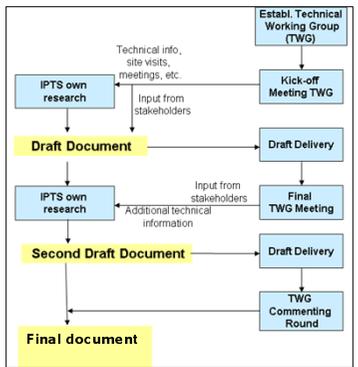
Accreditat. bodies

enviro. NGOs

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... and its key contribution



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graph TD
    EC[European Commission] --> WG[Working Groups]
    WG --> IPTS1[IPTS own research]
    WG --> KickOff[Kick-off Meeting TWG]
    IPTS1 --> Draft1[Draft Document]
    KickOff --> Draft1
    Draft1 --> IPTS2[IPTS own research]
    Draft1 --> DraftDel1[Draft Delivery]
    IPTS2 --> Draft2[Second Draft Document]
    DraftDel1 --> Draft2
    Draft2 --> FinalDoc[Final document]
    Draft2 --> DraftDel2[Draft Delivery]
    DraftDel2 --> Meeting[Final TWG Meeting]
    Meeting --> Round[TWG Commenting Round]
    Round --> FinalDoc
    
```

19 February 2014 



Purposes and goals of the meeting

- to get to know each other
- to exchange views
- to discuss the development of the Sectoral Reference Document (organisation of the information exchange)
- to discuss the timing



Purposes and goals of the meeting

To discuss:

- Scope of the document for the Food and Beverage manufacturing sector
- Environmental aspects of the Food and Beverage manufacturing sector
- Proposals for best environmental management practices
- First ideas about environmental performance indicators



Thank you!



Paolo Canfora
Marco Dri
Ioannis Antonopoulos
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<http://su.sproc.jrc.ec.europa.eu/activities/emas/index.html>


European Commission

Introduction to the sectoral reference documents and lessons learnt



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European Commission*

Joint Research Centre


European Commission

Main elements of the sectoral reference documents

The sectoral reference documents comprise 3 main elements:

- Best environmental management practises (BEMPs)
 - Food waste minimisation by retailers
- Environmental performance indicators
 - Kg waste generation per m2 of sales area
- Benchmarks of excellence
 - Zero food waste sent to landfill or incineration plant

An example from 

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European Commission

Best Environmental Management Practices (BEMPs)

What is BEMP:

- those techniques, measures or actions that allow organisations of a given sector to **minimise their impact on the environment**
- **direct** and **indirect** aspects
- **technical/technological** as well as **management /organisational** type
- **fully implemented** by best performers
- **technically feasible** and **economically viable**



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Best Environmental Management Practices (BEMPs)

What is not BEMP:

- Obsolete techniques
- Common practice
- Good practise
- Emerging techniques
 - are available and innovative
 - not yet proved their economic feasibility
 - not yet implemented at full scale

BEMP is what goes well beyond common practise
but is already fully implemented
and widely applicable

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Best Environmental Management Practices (BEMPs)

Description of BEMPs (requires detailed technical information):

- Description
- Achieved environmental benefit
- Appropriate environmental indicator
- Cross-media effects
- Operational data
- Applicability
- Economics
- Driving force for implementation
- Reference organisations
- Reference literature

Structure similar to Best Available Technique Reference Documents (BREFs) according to Industrial Emission Directive

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Environmental Performance Indicators and Benchmarks of Excellence

- **Environmental performance indicators**
 - "specific expression that allows measurement of an organisation's environmental performance" (EMAS Regulation)
- **Benchmarks of excellence**
 - exemplary environmental performance

already in use environmentally meaningful can be a proxy

very ambitious achieved by frontrunners not a target but a measure of what is possible

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How to identify BEMPs

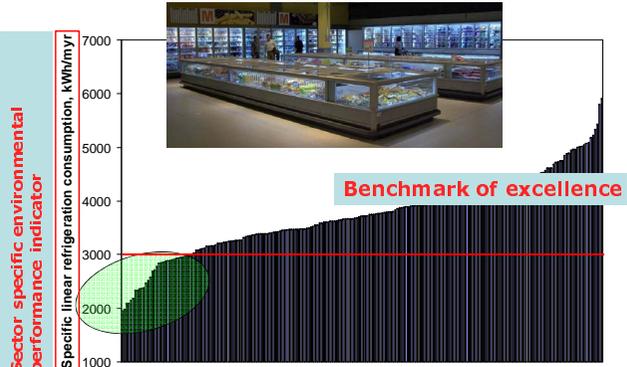
The frontrunner approach



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An example of BEMP, environmental performance indicator and benchmarks of excellence



Benchmark of excellence

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Lessons learnt

Environmental performance indicators and benchmarks

- In many cases, clear conclusions on environmental indicators and also on benchmarks of excellence could be drawn.
- Quantitative distribution not always available but other effective methods for benchmarking can be used.
- **A key role of the technical working group is to validate the findings, and to draw conclusions on environmental performance indicators and benchmarks of excellence**

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Lessons learnt

Technical Working Group:

- allows access to a wider network
- constructive and supportive but very different contribution intensities
- composition may change from kick-off to final meeting

Feedback framework

- comments were submitted in an informal way (no template).
- using a template may discourage to send comments

19 February 2014



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Thank you!



Paolo Canfora
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 European Commission

Overview of the food and beverage manufacturing sector

Economic and environmental relevance



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*Sustainable Production and Consumption Unit
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Joint Research Centre


 European Commission

General overview of the food and beverage manufacturing sector

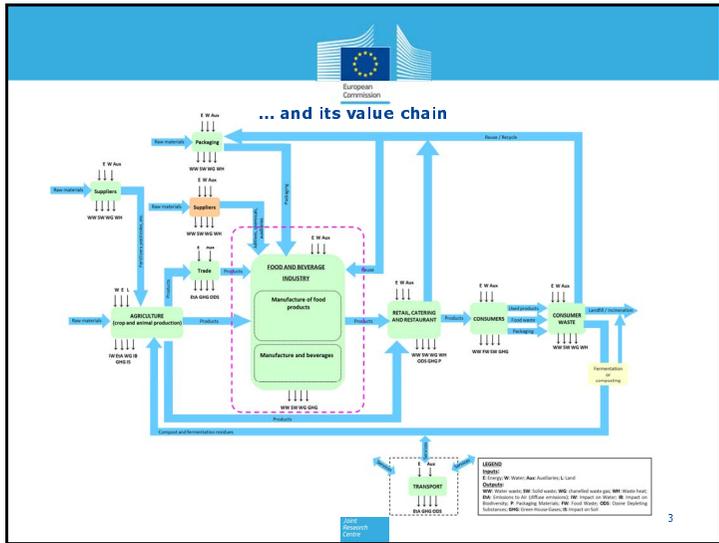
The annual turnover in EU of the Food and Beverage Manufacturing Sector is around 1000bn€ (15% of total EU manufacturing turnover, the largest EU manufacturing sector)




Food and Beverage Manufacturing Sector accounts for 15% of EU employment (4.25 million people)

It is a fragmented sector with more than 285,000 companies
More than 99% of food and beverage companies are SMEs
SMEs represent 49% turnover and 63% employment of the Food and Beverage Manufacturing Sector

Joint Research Centre
 Source: FoodDrinkEurope 2013




 European Commission

General overview of the food and beverage manufacturing sector

Sub-sectors with highest share of turnover in the Food and Beverage Manufacturing:

- Meat and meat products, 20% of the total
- Drinks, 15%
- Dairy products, 13%



Subsectors with the highest number of companies in the Food and Beverage Manufacturing:

- Bakery and farinaceous products, 54% of the total number of companies
- Meat and meat products, 15%
- Drinks, 8%


Subsectors with the highest number of employees:

- Bakery and farinaceous products, 32% of the total
- Meat and meat products, 21%
- Drinks, 10%

Joint Research Centre
 Source: FoodDrinkEurope 2013



General overview of the environmental relevance



Energy:

Food and drink manufacturing accounts for about 5.3% of total final energy use worldwide

European food and drink manufacturing accounts for about 1.5% of total GHG emissions

Water:

Food and drink manufacturers account for 1.5% of total water use in EU



Waste:

Food and drink industry accounts for the 5% of the overall EU food waste generated



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Source: FoodDrinkEurope 2012



Main environmental pressures

Energy consumption:

- Electricity (e.g. pumps, ventilation, mixers, compressors, refrigeration and cooling units).
- Fuel consumption for transport.
- Fossil fuels for heat production (used for processes like boiling, drying, pasteurization and evaporation).



But also:

- Energy used by consumers for food preparation.
- ...



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Main environmental pressures

Water consumption:

- Used as ingredient, especially for the drinks industry.
- Cleaning operations.
- Hot and cold operations (cooking, pasteurisation, cooling, etc.).
- Auxiliary water (production of steam, etc.).
- Process water (washing raw materials, etc.).



But also:

- Water used in agriculture



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Main environmental pressures

Air emissions:

- Dust (raw material reception, storage, etc.).
- VOCs (cooking, fermentation, etc.).
- Refrigerants.
- Emission from combustion, such as CO₂, CO, NO_x and SO_x.



But also:

- CO₂, NO_x and SO₂ from transport.
- Emissions from industrial production of packaging, raw materials, etc.
- Greenhouse gases emissions from primary crop and animal production.
- ...



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Main environmental pressures

Solid waste generation:

- **Non-hazardous waste** from processing and manufacturing (organic residues, sludge, waste packaging, etc.).
- **Hazardous waste** from the maintenance of equipment and machinery (absorbents, filter materials, oil filters, etc.).



But also:

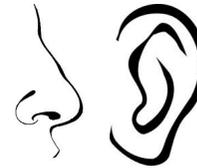
- **Food waste** (households, wholesale/retail and food service).
- **Packaging waste**

- ...

Main environmental pressures

Waste water generation:

- **Process water** (from washing, boiling, evaporation, extraction, filtration, etc.).
- **Water from cleaning operations.**
- **Service water** (cooling water, etc.).
- **Sanitary water.**



Noise and odours generation:

- **Noise** from the operation of plant, machinery and equipment
- **Odour losses** during storage, filling and emptying of bulk tanks and silos.
- **Odours** caused by VOCs.

Main environmental pressures



Use of chemicals:

- **Refrigerants**
- **Cleaning and disinfection agents, additives, etc.**

Resource depletion:

- **Materials used for packaging production**

- ...



Biodiversity loss:

- **Loss of biodiversity** due to agriculture activities

Thank you!



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Scope of the EMAS SRD on Food and Beverage Manufacturing



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European Commission

Setting the scope of the SRD

- Which target organisations?
- Which environmental aspects?
- In principle:
 - Whole food and drink manufacturing sector (NACE codes 10 and 11)
 - All significant direct and indirect environmental aspects
- But:
 - Very broad and diverse sector → Need to select sub-sectors
 - There are BREFs for this sector → Analyse SRD vs BREF



Comparison between EMAS SRD and BREF

| | BREF | SRD |
|----------------------|---|--|
| Legal basis | Industrial Emissions Directive (IED – 2010/75/EU) | EMAS Regulation (Regulation (EC) 1221/2009) |
| Main elements | Best Available Techniques (BAT) Environmental performance levels associated with the use of BAT, especially on emissions (BAT-Associated Emissions Levels – BAT-AELs). | Best Environmental Management Practices (BEMP) Benchmarks of excellence (i.e. performance achieved by the 10-20% best performers) |
| Character | BAT conclusions are the reference for setting IED permit conditions. Emission Limit Values (ELVs) in permits must be set within the BAT-AEL range (mandatory) | The implementation of BEMPs is voluntary. EMAS registered organisations must take the SRDs into account. |

Comparison between EMAS SRD and BREF

| | BREF | SRD |
|--|---|---|
| Scope of activities covered | Installation-based (i.e. gate to gate approach) Only industrial installations. In the FDM BREF, only manufacturers / producers, not other actors in the sector. | Life-cycle thinking (i.e. cradle to grave approach) All actors along the value chain. For food and beverage manufacturing, focus on manufacturers/producers. |
| Size of installations / companies covered | Large manufacturing installations only. For food and beverage manufacturing, the thresholds are as defined in Annex I, part 6.4 of the IED. For instance: 75 tonnes per day of finished product for processing of animal raw materials or 300 tonnes per day of finished product for processing of vegetable raw materials. | Companies of all sizes (special focus on SMEs) |
| Approach | Based on analysis of current emission and consumption levels and related applied technologies / techniques. | Based on analysis of best performers (front-runner approach) |

Scope – Direct Environmental Aspects

| | Main direct environmental aspects | Main environmental pressures |
|-----------------|---|---|
| BREF | Industrial processes and related operations | Waste-water generation |
| | | Air emissions (NO _x , SO _x , VOC, particulate matter) |
| | | Solid waste |
| | | Water consumption |
| | | Energy consumption |
| non-BREF | Transport and distribution | Use of chemicals for cleaning |
| | | GHG emissions (CO ₂ , CH ₄) |
| | | Use of renewable energy |
| | | Air emissions (CO ₂ , CO, SO ₂ , NO _x ...) |

Scope – Indirect Environmental Aspects

| | Main indirect environmental aspects | Main environmental pressures |
|-----------------|-------------------------------------|---|
| BREF | Supply chain management | GHG, energy consumption, water consumption, air emissions... |
| non-BREF | Agriculture | GHG, biodiversity, air emissions, eutrophication, water consumption |
| | Packaging manufacturing | GHG, resource depletion |
| | Transport and distribution | GHG, air emissions |
| | Retail | Energy consumption |
| | Food preparation by consumers | Energy consumption |
| | Food waste generation | Air emissions (CO ₂ , CO, SO ₂ , NO _x ...) |

Scope – Selection of sub-sectors

The SRD will include:

- BEMPs for the overall sector
- Specific BEMPs for a number of subsectors
 - Criteria used to select the subsectors
 - Economic relevance in the EU
 - Environmental relevance
 - Representativeness across the whole sector
 - Presence of active frontrunners
 - Focus on sub-sectors where many companies are SMEs
 - Exclude sub-sectors where most significant environmental aspects are well covered in the BREFs

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Scope – Selection of sub-sectors

| NACE | Subsector |
|--------------|---|
| 10.11 | Processing and preserving of meat |
| 10.12 | Processing and preserving of poultry meat |
| 10.13 | Production of meat and poultry meat products |
| 10.20 | Processing and preserving of fish, crustaceans and molluscs |
| 10.31 | Processing and preserving of potatoes |
| 10.32 | Manufacture of fruit and vegetable juice |
| 10.39 | Other processing and preserving of fruit and vegetables |
| 10.41 | Manufacture of oils and fats |
| 10.42 | Manufacture of margarine and similar edible fats |
| 10.51 | Operation of dairies and cheese making |
| 10.52 | Manufacture of ice cream |

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Scope – Selection of sub-sectors

| NACE | Subsector |
|--------------|---|
| 10.61 | Manufacture of grain mill products |
| 10.62 | Manufacture of starches and starch products |
| 10.71 | Manufacture of bread; manufacture of fresh pastry goods and cakes |
| 10.72 | Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes |
| 10.73 | Manufacture of macaroni, noodles, couscous and similar farinaceous products |
| 10.81 | Manufacture of sugar |
| 10.82 | Manufacture of cocoa, chocolate and sugar confectionery |
| 10.83 | Processing of tea and coffee |
| 10.84 | Manufacture of condiments and seasonings |
| 10.85 | Manufacture of prepared meals and dishes |
| 10.86 | Manufacture of homogenised food preparations and dietetic food |
| 10.89 | Manufacture of other food products n.e.c. |



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Scope – Selection of sub-sectors

| NACE | Subsector |
|--------------|--|
| 10.91 | Manufacture of prepared feeds for farm animals |
| 10.92 | Manufacture of prepared pet foods |
| 11.01 | Distilling, rectifying and blending of spirits |
| 11.02 | Manufacture of wine from grape |
| 11.03 | Manufacture of cider and other fruit wines |
| 11.04 | Manufacture of other non-distilled fermented beverages |
| 11.05 | Manufacture of beer |
| 11.06 | Manufacture of malt |
| 11.07 | Manufacture of soft drinks; production of mineral waters and other bottled waters |



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Thank you!



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Development of the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Food and Beverage Manufacturing Sector

Manufacturing of Coffee

Kick-off meeting of the TWG,
20-21 February 2014.

Alfredo Rodrigo
ainia

This work has been developed by IAT-AINIA under contract with the European Commission. The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

PROPOSAL FOR THE SCOPE

TYPE OF COMPANIES/PRODUCTS

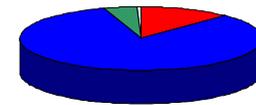
Included:

- Roasted coffee,
- decaffeinated coffee,
- soluble coffee

Not included:

- Coffee substitutes containing coffee

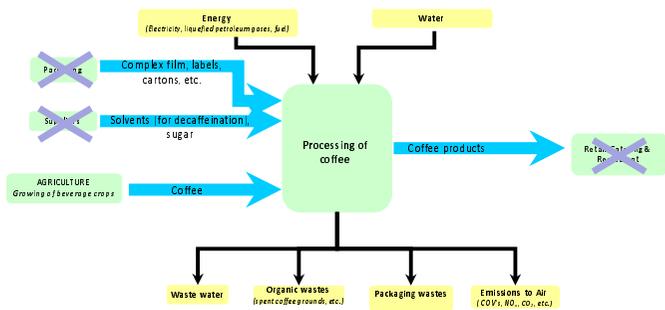
Production of Coffee product in EU27



- Decaffeinated coffee, not roasted
- Roasted coffee, not decaffeinated
- Roasted decaffeinated coffee
- Coffee substitutes containing coffee

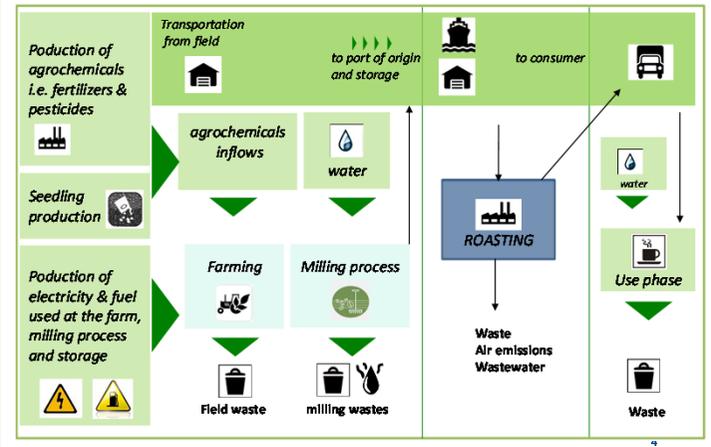
PROPOSAL FOR THE SCOPE

LIFE CYCLE PHASES



Indirect aspects Direct aspects Indirect aspects

UPSTREAM PROCESSES CORE PROCESSES DOWNSTREAM PROCESSES



Main environmental aspects

•Energy

•Air emissions

- VOC, CO, particulate, smoke, odour and NOx are produced during roasting process.
- VOC's when using solvents in decaffeination stage..

•Organic wastes: Coffee chaff, Spent coffee grounds(soluble coffee)

•water and wastewater decaffeination with water technology and in the production of soluble coffee products.

•Green coffee transport

- Wastewater, water, GHG emissions, waste from green coffee production
- GHG emissions, biodiversity loss, eutrophication... from growing of coffee

Proposal of main environmental aspects to be addressed:

- Improvement of sustainability of green coffee production
- Prevention VOC emissions
- Reduction of energy consumption

Any other important aspect missed? 5

Improvement of sustainability of green coffee production

It is BEMP to enhance sustainability of green coffee production by:

- purchasing certified green coffee
- purchasing green coffee with reduced environmental footprint
- work together with suppliers and support direct changes in primary production



- Enhance sustainability of the value chain by purchasing certified coffee (e.g. Fairtrade, organic coffee, Rainforest Alliance), or using assessments based on LCA to identify green coffee with less environmental footprint or actions towards improving sustainability.

- Influencing primary production by supporting direct changes in primary stages through company initiatives, platforms or other collaborations.

6

Improvement of sustainability of green coffee production

Achieved environmental benefits:

Reduction of environmental impacts in:

- Coffee cultivation: Transformation of land use, Fertilizer, Irrigation water, Agro-chemicals (e.g. pesticides), Fuel, management of crop residues, packaging
- Pre-processing of coffee beans: Water, Waste water, Organic waste (husk), Energy
- Transportation: Energy, Organic waste, Packaging waste

Applicability:

- All coffee roasters

Economics:

TO BE DEVELOPED

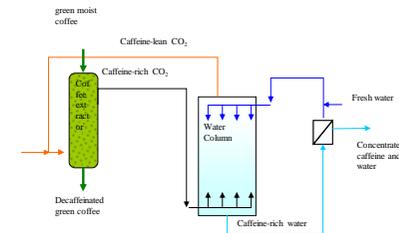
Indicators:

- Systematic implementation of sustainable green coffee supply chain management
- % of sustainably sourced coffee in relation to the total green coffee purchased

7

Decaffeination of coffee using supercritical CO₂ technique

It is BEMP to selectively extract caffeine by using supercritical carbon dioxide



Supercritical CO₂ is circulated through pre-soaked beans along a high-pressure extraction chamber. In the second vessel, water and the caffeine-rich carbon dioxide are circulated in cross-flow and the caffeine dissolves in the water. The carbon dioxide is re-pressurised and re-used.

8

Decaffeination of coffee using supercritical CO₂ technique

Achieved environmental benefits:

- Avoided consumption of organic solvents
- Avoided presence of organic solvents in the gaseous or wastewater streams
- Low water consumption
- Energy (?)

Applicability:

- in new decaffeination plants.

Economics:

2,300,000€ investment for a supercritical CO₂ extraction system with two 600-litre extractors (Perellin, 2006)

Indicators:

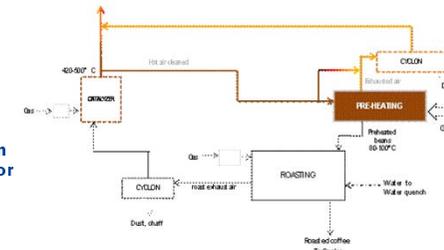
rate of use of organic solvents in decaffeination process, %

9

Green coffee pre-heating in batch coffee roasting

It is BEMP to:

- pre-heat the coffee beans before the roasting;
- exploit the heat from the roasting gases for the pre-heating.



The cleaned hot air is withdrawn from the exhaust gas flow and fed to the pre-heating bin where the green coffee is pre-heated up to a certain temperature level (80-100°C).

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Green coffee pre-heating in batch coffee roasting

Achieved environmental benefits:

- Up to 20% reduction in energy consumption in the roasting stage.

Applicability:

- only on batch roasters

Economics:

- customized systems so variable cost
- savings in energy cost
- increase in productivity since low roasting residence time

Indicators:

- energy used in roasting, in kWh/t of green coffee.
- Kg CO₂-eq/t roasted coffee.

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Candidate BEMPs for manufacturing of coffee

- 1) Improvement of sustainability of green coffee production
- 2) Decaffeination of coffee using supercritical CO₂ technique
- 3) Green coffee pre-heating in batch coffee roasting

Any other??

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 European Commission

Development of the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Food and Beverage Manufacturing Sector

Manufacturing of wine



Kick-off meeting of the TWG, 20-21 February 2014.

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 European Commission

PROPOSAL FOR THE SCOPE

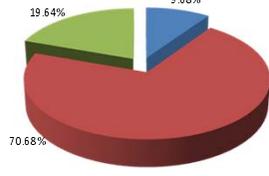
TYPE OF PROCESSES/PRODUCTS

Included:

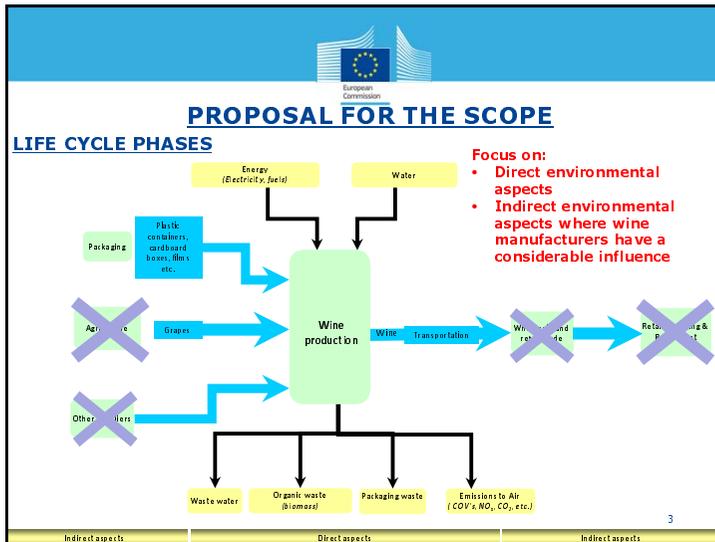
- Manufacturers of wine
- All types of wine (p. 66 of the background report)?
- "Red vinification"
- "White vinification"

Not included:

- Distilling, rectifying and blending of spirits

Wine exports from EU27 per wine type (000 hl)


■ Sparkling wine ■ Bottled wine ■ Bulk
GAIN, (2013)

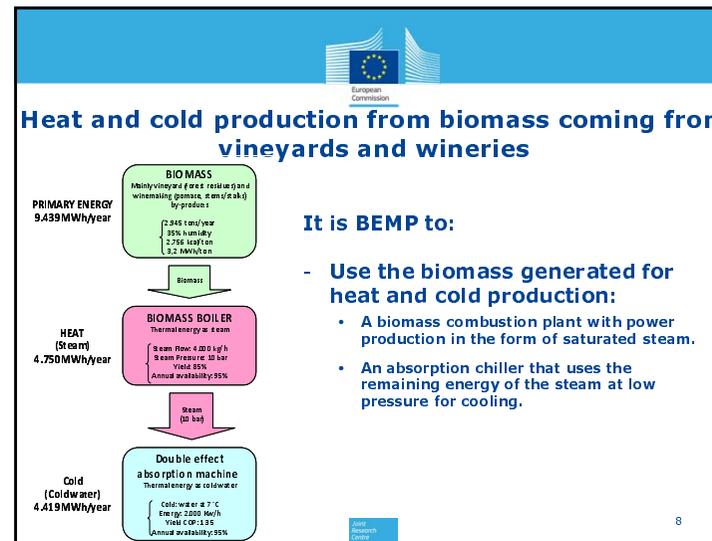
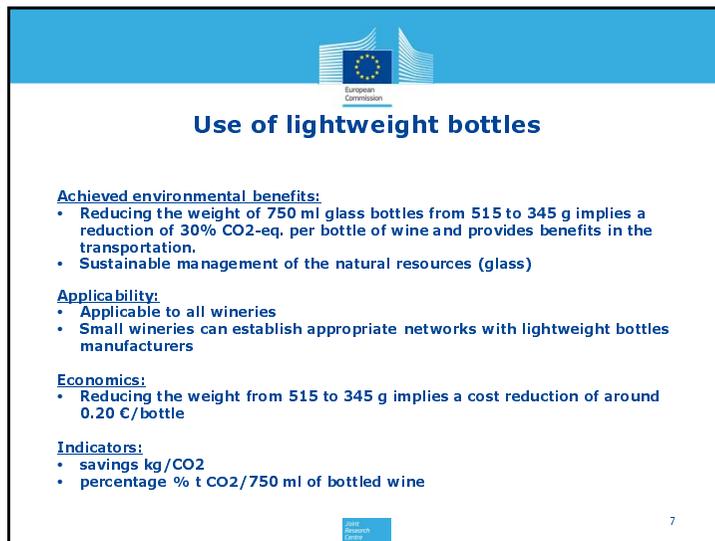
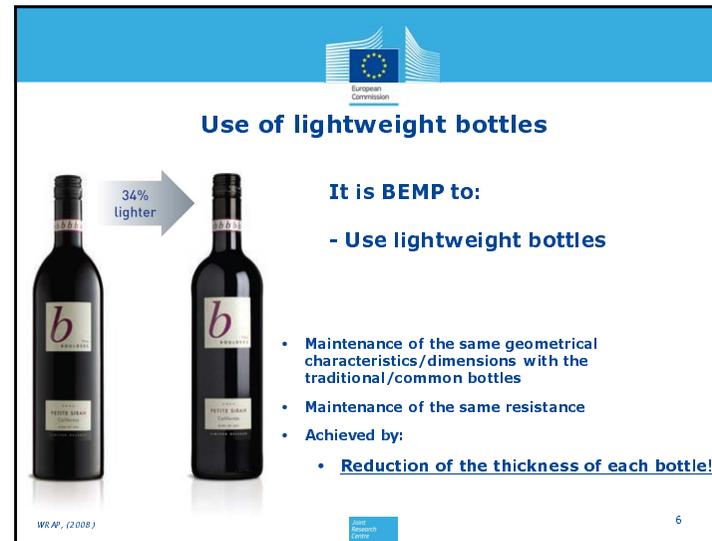
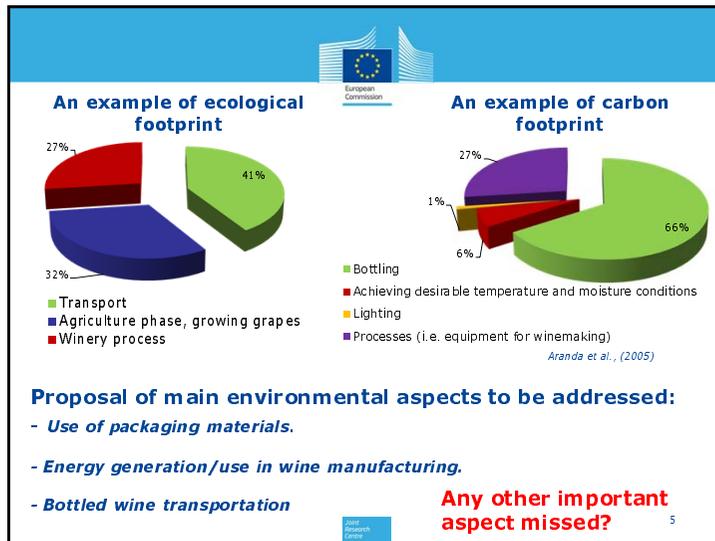



 European Commission

Main environmental issues

- Agricultural phase (fertilisation)
- Organic waste - biomass
- Energy
- Water use for the winemaking process
- GHG emissions generation from the winemaking process
- Use of packaging materials (glass)
- Bottled wine transportation







Heat and cold production from biomass coming from vineyards and wineries

Achieved environmental benefits:

- Reduction and onsite management of the biomass generated
- Reduction of the fossil fuels used for generation of heat and cold

Applicability:

- Applicable to new and existing wineries (in terms of technology) if they have the required amount of biomass

Economics:

- Reduction of energy costs (for purchasing fossil fuels)

Indicators:

- Share of renewable energy in energy consumption (%)
- Biomass recovered for heat and cold (%)



9



Candidate BEMPs for wine manufacturing

1. Use of lightweight bottles

2. Heat and cold production from biomass coming from vineyards and wineries

3. Use of ultrasound techniques for cleaning barrels

4. Any other missing techniques???




 European Commission

Development of the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Food and Beverage Manufacturing Sector

Manufacturing of pasta



Kick-off meeting of the TWG, 20-21 February 2014.
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PROPOSAL FOR THE SCOPE

TYPE OF COMPANIES/PRODUCTS

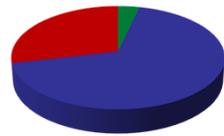
Included:

- Manufacturers of dry pasta (65-70% of the pasta retail sales)

Not included:

- Manufacturers of chilled and fresh pasta
- Manufacturers of canned/preserved pasta

Retail sales of pasta in EU



Euromonitor, 2013

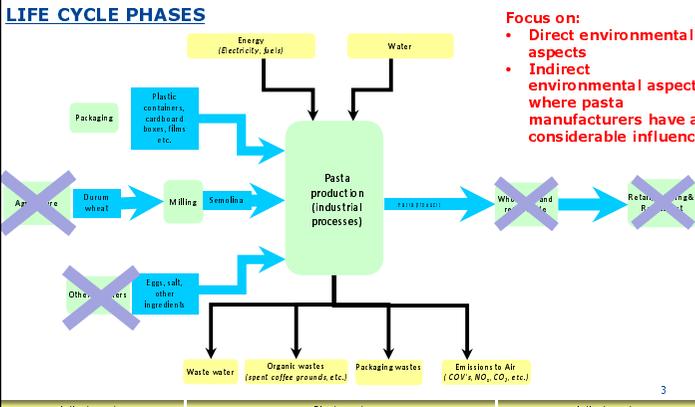
■ canned/preserved pasta
■ dried pasta
■ chilled/fresh pasta

2


 European Commission

PROPOSAL FOR THE SCOPE

LIFE CYCLE PHASES



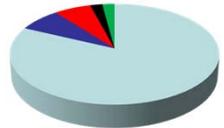
Focus on:

- Direct environmental aspects
- Indirect environmental aspects where pasta manufacturers have a considerable influence

3


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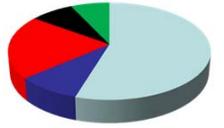
An example of ecological footprint of pasta



■ raw material production (82%)
 ■ packaging (7.4%)
 ■ pasta production (6.4%)
 ■ milling (2.1%)
 ■ distribution (2.1%)

(Barilla, 2013)

Example of carbon footprint



■ raw material production (54.7%)
 ■ packaging (9%)
 ■ pasta production (21.2%)
 ■ milling (7.9%)
 ■ distribution (7.1%)

(Barilla, 2013)

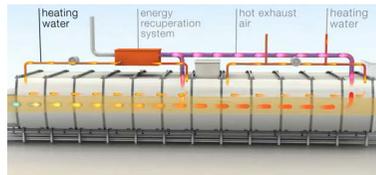
Proposal of main environmental aspects to be addressed:

- Energy consumption during the pasta manufacturing industrial process.
- Energy and resources use in packaging manufacturing.

Any other important aspect missed?

4

Energy efficient pasta drying



Buhler group, 2012

Hot and humid air from the end of the pre-dryer stage and the main dryer stage are drawn into a heat-recovery unit. The exhaust heat is recovered and used to heat process water, which is fed into the heating circuit of the dryer.

It is BEMP to:

- Recover energy from the drying exhaust air to be reused within the same process.
- Use energy efficient fans for reducing electricity consumption.

Energy efficient pasta drying

Achieved environmental benefits:

- Reduction of thermal energy use (15-25kWh per 100Kg of finished pasta)
- 10% reduction of electricity consumption in the drying stage

Applicability:

- Only for long goods pasta
- Can be implemented in new and existing facilities

Economics:

Savings of 0.5mil€ in 5 years can be achieved for lines with capacity of 1250-1750Kg/h

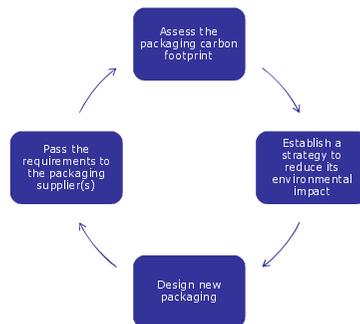
Environmental Performance Indicators:

- Thermal energy use in the drying stage (kWh/ton of finished pasta)
- Electricity use in the drying stage (kWh/ton of finished pasta)

Eco-design of pasta packaging

It is BEMP to improve the packaging design, reducing the carbon footprint related to its production, use and disposal. This can be achieved by:

- choosing materials with less environmental impact.
- reducing the thickness of the packaging.
- improving the recyclability.



Eco-design of pasta packaging

Achieved environmental benefits:

- Reduction of carbon emissions.
- Reduction of use of natural resources (materials).
- Reduced (non-recycled) waste generation.

Applicability:

This technique is applicable to all pasta manufacturers.

Economics:

10% cost reductions for packaging can be achieved.

Environmental Performance Indicators:

- packaging carbon footprint (kgCO₂ per tonne of finished pasta)



Candidate BEMPs for manufacturing of pasta

- 1) Energy efficient pasta drying**
- 2) Eco-design of pasta packaging**

Any other??

Development of the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Food and Beverage Manufacturing Sector

Manufacturing of soft drinks

Kick-off meeting of the TWG, 20-21 February 2014.

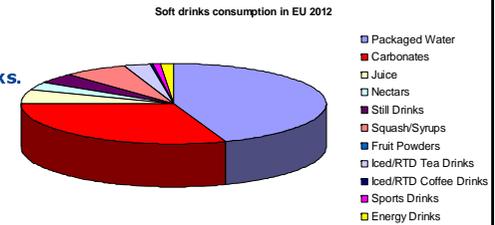
Alfredo Rodrigo
ainia

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PROPOSAL FOR THE SCOPE

TYPE OF PRODUCTS

- Included:
- Carbonated drinks.
 - Dilutables.
 - Still and juice drinks.

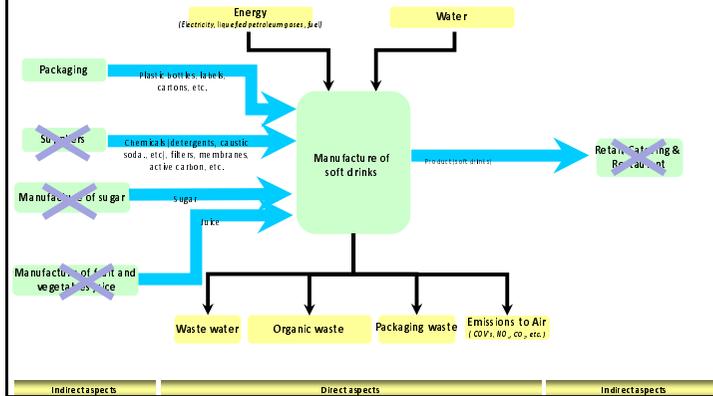


- Not included:
- Bottled water
 - Fruit juices and nectars

2

PROPOSAL FOR THE SCOPE

LIFE CYCLE PHASES



Main environmental impacts

- Water
- Wastewater
- Energy
- Natural resources, energy, water from packaging production
- Packaging waste
- Air emissions
- Waste



Proposal of main environmental aspects to be addressed:

- Reduction of water consumption
- Minimisation of packaging
- Reduction of energy use

Any other important aspect missed?

4

Reduction of water consumption in packages rinsing operations

It is BEMP to:

- use ionised air as a medium for rinsing packages instead of water
- or
- Implement an integrated systems for plastic bottle blowers and fillers that remove the need for bottle rinsing prior to filling



Source: Coca-cola Spain

Rinsers are used to clean glass, plastic and metal containers (one-use) that may have dust or other contaminants that have settled during shipment from the container supplier.

5

Reduction of water consumption in packages rinsing operations

Achieved environmental benefits:

- 100% water savings (where applicable)
- Reduction of discharged wastewater volume
- For integrated systems there can be additional benefits in consumption of energy and packaging materials

Applicability:

- Not applicable for all type of packaging (e.g. glass bottles)

Economics:

- Ionised air rinsers generally are more expensive than equivalent water rinsers.
- Operational costs reduced by 8 to 12%

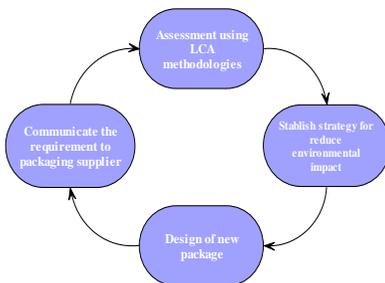
Indicators:

- consumption of water in the rinsing and washing steps, m3/units of packaging rinsed

6

Improve packaging by life cycle assessment (LCA)

It is BEMP to apply LCA based methodologies to the design of primary packaging.



LCA tools allow an integrated environmental assessment taking into account the whole product life cycle.

7

Improve packaging by life cycle assessment (LCA)

Achieved environmental benefits:

- Reduction of use of natural resources
- Improvement of recyclability
- Reduction of CO2 emissions

Applicability:

This technique is applicable to all soft drink manufacturers

Economics:

Reduction in the cost of packaging

Indicators:

- Carbon footprint of packaging, gCO2e/unit
- % of recycled material used in packaging

8

Use of blowers in the drying stage

It is BEMP to use blowers instead of compressed air systems to provide high volume and low pressure air in can/bottles drying stages and in air ionizing rinsing systems.



Refresco Iberia

Small blowers installed at the point of use can replace compressed air based dryers producing the same amount of airflow and pressure with a much higher energy efficiency.

9

Use of blowers in the drying stage

Achieved environmental benefits:

- Energy savings up to 87%.

Applicability:

- Blowers can replace air compressed systems for drying bottles/cans in all installations.
- Blowers can also replace air compressed systems to produce the air stream for ionized air systems.

Economics:

- investment in blowers is higher than a compressed air systems
- quick return of investment due to significant energy saving

Indicators:

- energy consumed in the blowing stage, kWh/10⁶ packaging units

10

Candidate BEMPs for manufacturing of soft drinks

- 1) REDUCTION OF WATER CONSUMPTION IN PACKAGES RINSING OPERATIONS
- 2) IMPROVE PACKAGING BY LIFE CYCLE ASSESSMENT (LCA)
- 3) USE OF BLOWERS IN THE DRYING STAGE

Any other??

11

Development of the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Food and Beverage Manufacturing Sector

Manufacturing of beer

Kick-off meeting of the TWG, 20-21 February 2014.

Alfredo Rodrigo
ainia

This work has been developed by IAT-AINIA under contract with the European Commission. The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

PROPOSAL FOR THE SCOPE

TYPE OF COMPANIES/PRODUCTS

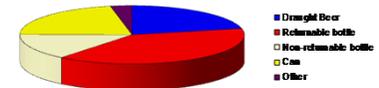
Included:

- Beer manufacturing

Not included:

- Malt production

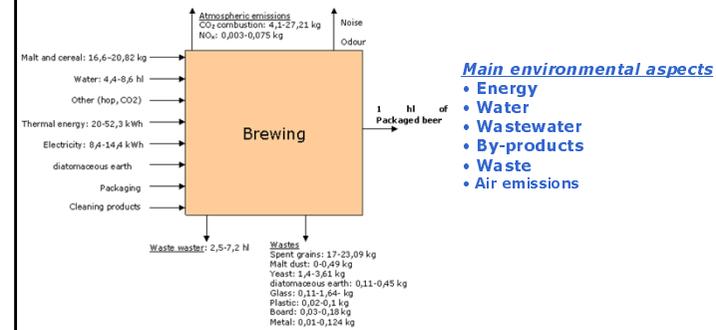
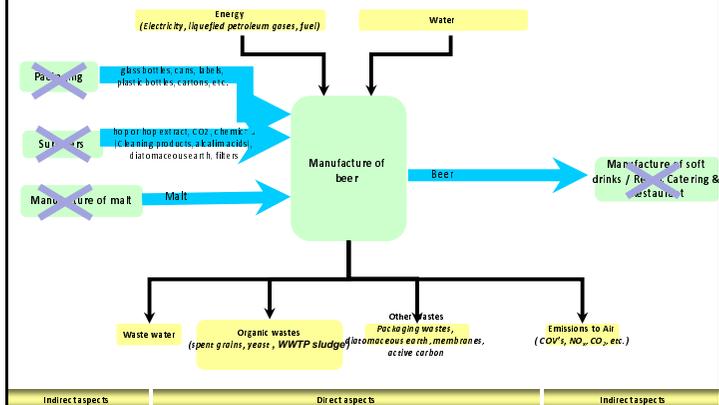
Type of beer packaging, 2011



Brewers of Europe, 2012

PROPOSAL FOR THE SCOPE

LIFE CYCLE PHASES



Main environmental aspects

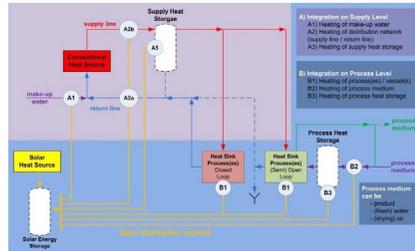
- Energy
- Water
- Wastewater
- By-products
- Waste
- Air emissions

Proposal of main environmental aspects to be addressed:

- Use of solar energy
- Improvement of energy efficiency
- Reduction of waste

Any other important aspect missed?

Use of solar thermal energy in the brewing process



Source: IEA SHC Task 49/IV AEE INTEC

It is BEMP to:
integrate solar thermal energy in the brewing process

- Integration on Supply Level: pre-heating of feed water before heating system, pre-heating feed water before a close heating system
- Integration on Process Level: solar thermal energy is used directly in process operations, process medium or process heat storage

5

Use of solar thermal energy in the brewing process

Achieved environmental benefits:

- Reduction of fossil fuel consumption
- Reduction of air emissions (dust, NO_x, SO₂, CO₂)

Applicability:

- new and existing breweries

Economics:

TO BE DEVELOPED

Indicators:

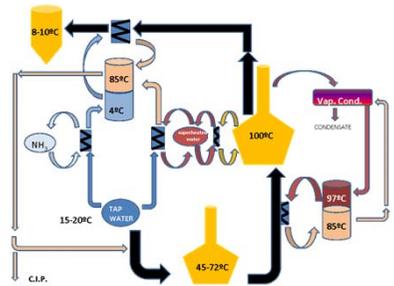
- Percentage of energy consumption met by solar thermal energy (%)

6

Heat recovery in wort boiling

It is BEMP to

- recover heat from boiling vapour condensate.
- reduce total evaporation in boiling.



Source: Mahou-San Miguel (2013)

- Use heat recovered from boiling vapour condensate to preheat the wort from 72 °C to approximately 90 °C before boiling.
- Reduce total evaporation in wort boiling by increasing the heat transfer homogeneity and promoting the stripping of volatiles.

7

Heat recovery in wort boiling

Achieved environmental benefits:

- reduction of thermal energy consumption.
- reduction of air emissions, namely CO₂ emissions.
- condensation of wort vapour minimising odour emissions.
- reduction of cleaning frequency of kettle (water, energy ,chemicals)

Applicability:

- energy storage system is applicable for any brewing plant
- techniques for reducing evaporation rate are applicable for any new brewing plant.

Economics:

TO BE DEVELOPED

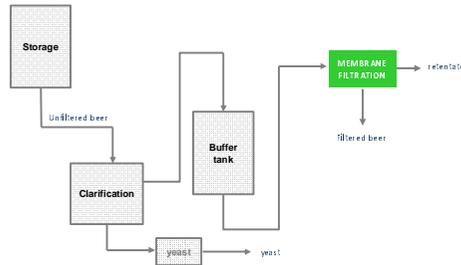
Indicators:

- Total evaporation measured as percentage of wort
- Specific consumption in wort pre-heating, kWh/HL

8

Reduction of diatomaceous earth sludge through the use of cross-flow filtration

It is BEMP to use cross-flow filtration (membrane) as an alternative to kieselguhr in breweries.



Beer flows tangentially to the surface of the membrane. Permeate (filtered beer) cross the membrane and the retentate is removed from the feed side of the membrane.

9

Reduction of diatomaceous earth sludge through the use of cross-flow filtration

Achieved environmental benefits:

- Reduced consumption of diatomaceous earth.
- Prevention of waste generation (kieselguhr sludge)

Applicability:

Applicable to new breweries and existing plants which need to increase their capacity with new filtration operation units

Economics:

TO BE DEVELOPED

Indicators:

The amount of kieselguhr used in beer filtration.

10

Candidate BEMPs for manufacturing of beer

- 1) USE OF SOLAR THERMAL ENERGY IN THE BREWING PROCESS
- 2) HEAT RECOVERY IN WORT BOILING
- 3) REDUCTION OF DIATOMACEOUS EARTH SLUDGE THROUGH THE USE OF CROSS-FLOW FILTRATION

Any other??

11


 European Commission

Development of the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Food and Beverage Manufacturing Sector

Manufacturing of meat and poultry products



Kick-off meeting of the TWG, 20-21 February 2014.

Ioannis Antonopoulos
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 European Commission


 European Commission

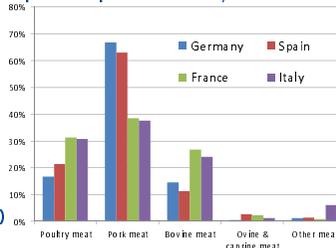
PROPOSAL FOR THE SCOPE

TYPE OF COMPANIES/PRODUCTS

Included:
 - Manufacturers of meat and poultry meat products

Not included:
 - Processing and preserving of meat (included slaughterhouses)
 - Livestock production

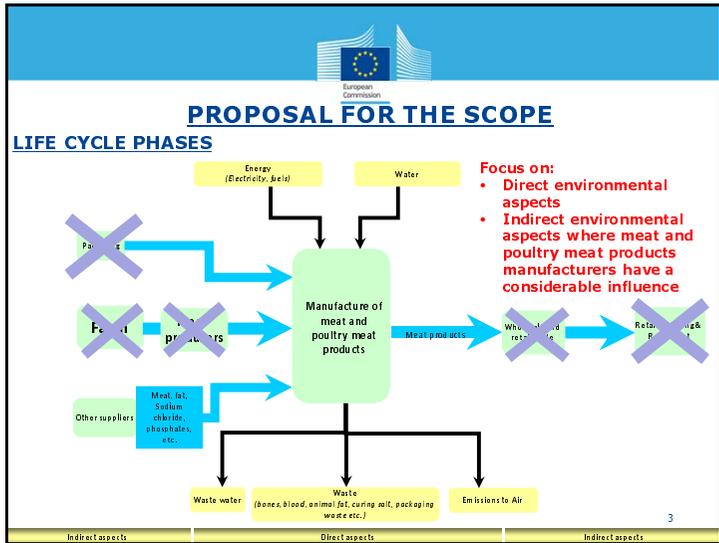
• Main meat products and poultry meat products producers in EU, 2010



| Product Type | Germany | Spain | France | Italy |
|----------------------|---------|-------|--------|-------|
| Poultry meat | ~15% | ~20% | ~30% | ~30% |
| Pork meat | ~65% | ~60% | ~35% | ~35% |
| Bovine meat | ~15% | ~15% | ~25% | ~25% |
| Ovine & caprine meat | ~5% | ~5% | ~5% | ~5% |
| Other meat | ~5% | ~5% | ~5% | ~5% |

FAOSTAT, (2013) 2






 European Commission

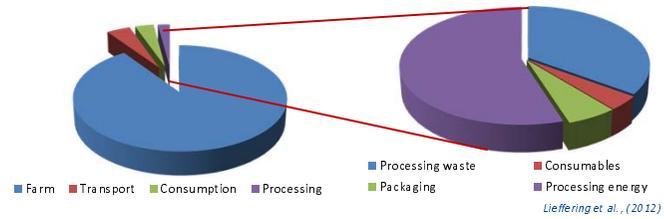
Main environmental issues

- Livestock production and slaughtering
- Energy – preserving fresh meat
- Use of other materials (i.e. phosphates etc.)
- Energy (meat products processing and refrigeration?)
- Use of packaging materials
- Packaged meat products transportation





Carbon footprint across all the relevant stages for beef products



Proposal of main environmental issues to be addressed:

- Energy use for the production of meat and poultry meat products

Any other important aspect missed?

Candidate BEMPs for manufacturing of meat and poultry meat products

1. High pressure processing (HPP) for decontamination of meat
2. Quick Dry Slice (QDS) technology
3. Any other missing techniques???

Development of the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Food and Beverage Manufacturing Sector

Manufacturing of orange juice

Kick-off meeting of the TWG,
20-21 February 2014.

Alfredo Rodrigo

ainia

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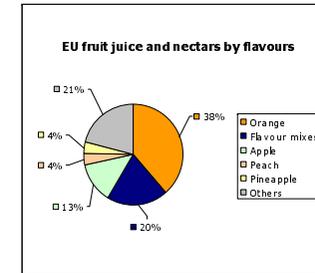
PROPOSAL FOR THE SCOPE

TYPE OF PRODUCT

- Orange juice

TYPE OF COMPANIES

- production of juice from fresh oranges (extraction)
- production of juice from imported juice or concentrate and packaging in retail formats
- Extraction of juice from fresh oranges and packaging in retail formats

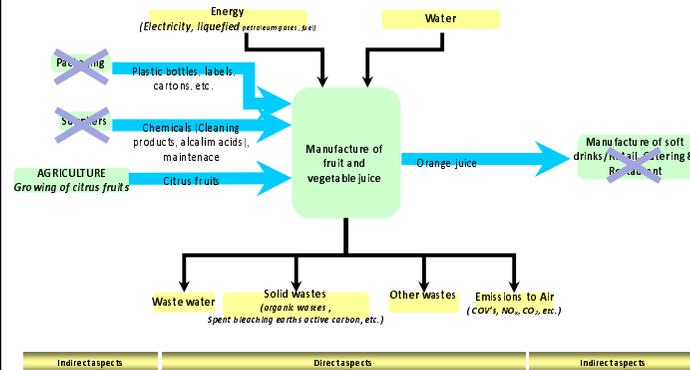


ALMA, 2012

2

PROPOSAL FOR THE SCOPE

LIFE CYCLE PHASES



ENVIRONMENTAL ISSUES

Main environmental issues/aspects

- Water consumption
- Wastewater generation
- Organic waste generation: orange peels
- Energy consumption
- Air emissions
- Juice/concentrate transport
- GHG emissions, biodiversity loss, eutrophication... from growing of citrus fruits

Proposal of main environmental aspects to be addressed:

- Aspects related to growing of citrus fruits and transport of juice and concentrate
- GHG emissions from energy use
- Organic waste

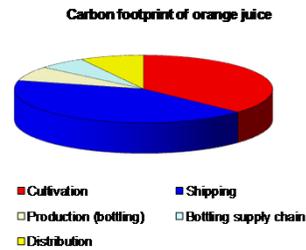
Any other important aspect missed?

4

Environmental supply chain management

It is BEMP to reduce the carbon footprint and other environmental aspects linked to growing of oranges by environmental supply chain management.

- Fruit juice companies can:
- identify "hot spots" for improvement in their supply chain;
 - promote sustainable orange juice production setting reduction objectives and working with suppliers in order to achieve them.



Source: PepsiCo UK & Ireland (Tropicana Pure Premium 2008)

5

Environmental supply chain management

Achieved environmental benefits:
the reduction of indirect environmental impacts, such as GHG emissions, biodiversity loss, eutrophication... from growing of citrus fruits and transport of juice and concentrate.

Applicability:
applicable to orange juice company producing juice from imported juice or concentrate

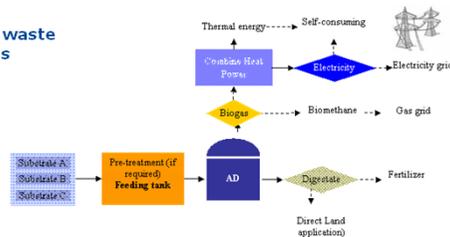
Economics:
TO BE DEVELOPED

Environmental Performance Indicators:
GHG emissions per unit of orange juice packaged, g CO₂/litre

6

Energy production from anaerobic digestion of citrus waste

It is BEMP to use orange waste as co-substrate for biogas production



Orange juice companies create synergies or reach agreements with local waste management companies, farms or urban WWTP having anaerobic digesters capable to treat citrus waste in co-digestion with other bio-wastes (sewage sludge, manure,...).

7

Energy production from anaerobic digestion of citrus waste

Achieved environmental benefits:

- Prevention of uncontrolled leachates with high organic content.
- Prevention of uncontrolled GHG emissions from fermentation (methane).
- Renewable energy generation: 700-750 NL biogas /kg orange pulp with methane content of 52% (Ruiz-Fuertes et al. 2007).

Applicability:
• Companies producing juice from fresh oranges located close to an agro-industrial biogas plant or a WWTP with an anaerobic treatment of the sewage sludge.

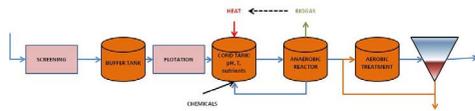
Economics:
Reduction of waste treatment cost

Environmental Performance Indicators:
•Percentage of orange waste sent to AD (%)

8

Biogas production from orange juice wastewater treatment

It is BEMP to produce biogas from wastewater treatment using a combination of an anaerobic system (UASB, EGSB or IC) with an aerobic post-treatment



9

Biogas production from orange juice wastewater treatment

Achieved environmental benefits:

- Renewable energy generation
- Lower energy requirements
- Lower sludge production (up to 80-90%)

Applicability:

- suitable for large fruit juice industries having their own waste water treatment system

Economics:

- higher investment costs compared to conventional aerobic plant
- savings in operational costs (energy and sludge dewatering and disposal)

Environmental Performance Indicators:

- Nm³ of biogas generated
- Removal efficiency of organic matter (% COD and BOD removal, total or soluble)
- Specific energy use per volume of wastewater treated

10

Candidate BEMPs for manufacturing of orange juice

- 1) ENVIRONMENTAL SUPPLY CHAIN MANAGEMENT
- 2) ENERGY PRODUCTION FROM ANAEROBIC DIGESTION OF CITRUS WASTE
- 3) BIOGAS PRODUCTION FROM ORANGE JUICE WASTEWATER TREATMENT

Any other??

11


 European Commission

Development of the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Food and Beverage Manufacturing Sector

Manufacturing of olive oil



Kick-off meeting of the TWG, 20-21 February 2014.

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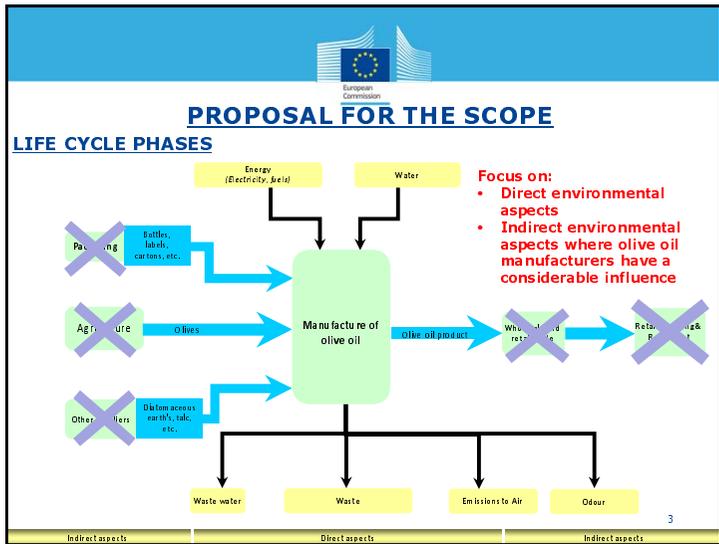



 European Commission

PROPOSAL FOR THE SCOPE

| | |
|---|---|
| <p>TYPE OF SYSTEMS/PRODUCTS</p> <p><u>Included:</u></p> <ul style="list-style-type: none"> - Systems for olive oil extraction: <ul style="list-style-type: none"> - Traditional, - 2 phase and - 3 phase - Olive oil products: <ul style="list-style-type: none"> - Virgin olive oil - Crude olive-pomace oil - Refined olive-pomace oil - Olive-pomace oil | <p>OLIVE OIL PRODUCTION FACILITIES:</p> <ul style="list-style-type: none"> • Oil mills: Virgin olive oils are obtained by mechanical or other physical means. • Extraction plants: Crude olive - pomace oil is obtained from olive pomace by treatment with solvents or by physical means. • Refineries: Refined olive oil is obtained by refining Virgin olive oil, and Refined olive - pomace is obtained by refining Crude olive - pomace oil. |
|---|---|


2
 EC, (1991)



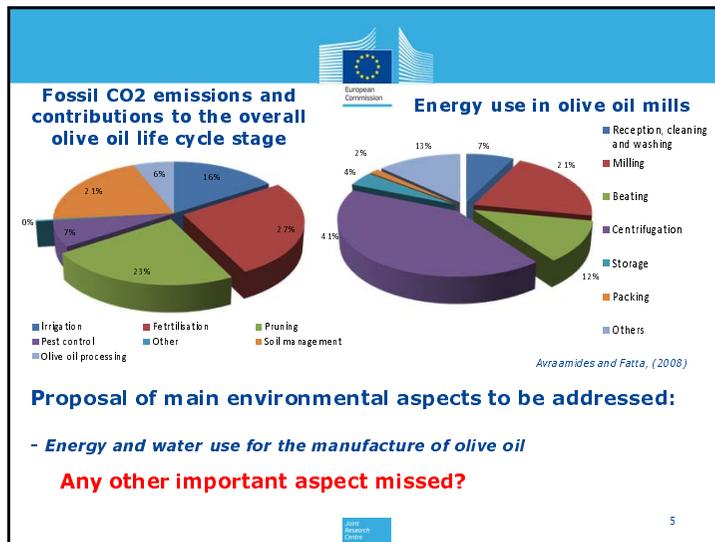

 European Commission

Main environmental issues

- Agricultural phase (fertilisation)
- Wastewater treatment – depending to the system used
- Energy
- Water use
- Use of packaging materials (glass)







Separation of olive oil by natural decantation

It is BEMP to:

- Reduce the energy use on site
- Reduce the water consumption

The natural decantation system allows significant water and energy savings compared to the vertical centrifugation. Therefore, this system works without water addition and with low energy requirements.

Separation of olive oil by natural decantation

Achieved environmental benefits:

- Operation without water addition.
- ~87% reduction on electrical use

Applicability:

- In new and existing facilities
- More available place for the installation of the system is required

Economics:

- The investment return has been estimated in a period between 2 – 4.5 years
- Savings of 75,000€/year have been reported in the Region of Andalusia

Environmental Performance Indicators:

- Energy use: kWh/(unit of product)
- Water use: $I_{(water)} / I_{(olive\ oil)}$

Candidate BEMPs for manufacturing of olive oil

1. Separation of olive oil by natural decantation
2. Optimum harvest time
3. Any other missing techniques???

Development of the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Food and Beverage Manufacturing Sector

Manufacturing of seed oils

Kick-off meeting of the TWG,
20-21 February 2014.

Alfredo Rodrigo
ainia

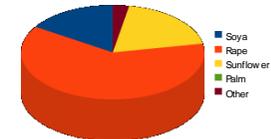
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PROPOSAL FOR THE SCOPE

TYPE OF PRODUCTS/COMPANIES

- Producers of edible oils from oilseeds (rape, soya, sunflower, etc.).

Seed oils production in EU-27



Seed oils consumption in EU-27

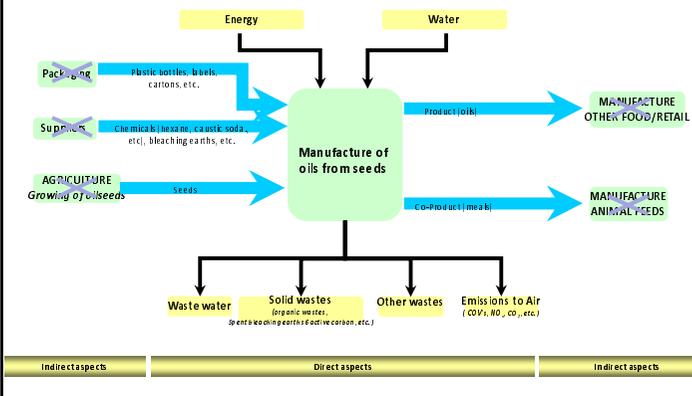


FEDIDL, 2012

2

PROPOSAL FOR THE SCOPE

LIFE CYCLE PHASES



Main environmental issues

- Wastewater (organic matter, oils & grease, suspended solids and the presence of phosphorous and sulphates)
- Air emissions (VOCs, exhaust gases (CO, NOx...), particulates...)
- Waste generation (Hulls)
- Energy use
- Water use

Proposal of main environmental aspects to be addressed:

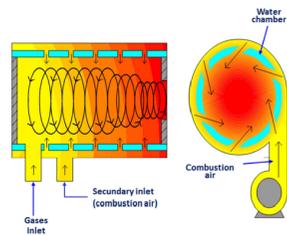
- Waste generation
- GHG emissions

Any other important aspect missed?

4

Use of rapeseed and sunflower hulls for energy generation

It is BEMP to use sunflower seed and rapeseed husks as biomass for on-site steam production.



BERKES technology for burning Sunflower husks, 2013

By using technologies that allow an efficient combustion (efficiency higher than 85%).

5

Use of rapeseed and sunflower hulls for energy generation

Achieved environmental benefits:

- Reduction of organic waste generation (hulls)
- Reduction of fossil fuels consumption

Applicability:

- any seed oil mill that processes sunflower seeds or rapeseeds and dehulls the seeds

Economics:

Investment cost: 150.000 to 170.000 Euros/MW_{thermal}

Indicators:

- Percentage of heat consumption met by energy generated from hulls
- Percentage of husk used in the steam boilers

6

Candidate BEMPs for manufacturing of seed oils

1) USE OF RAPESEED AND SUNFLOWER HULLS FOR ENERGY GENERATION

Any other??

7


 European Commission

Development of the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Food and Beverage Manufacturing Sector

Manufacturing of bread, pastries, biscuits and cakes



Kick-off meeting of the TWG, 20-21 February 2014.

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 European Commission

PROPOSAL FOR THE SCOPE

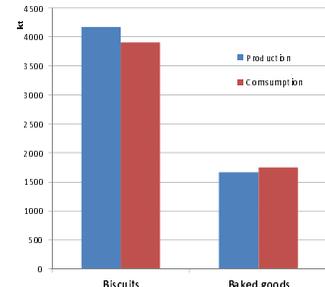
TYPE OF PRODUCTS

Included:

- Bread
- Biscuits
- Cakes
- Pastries

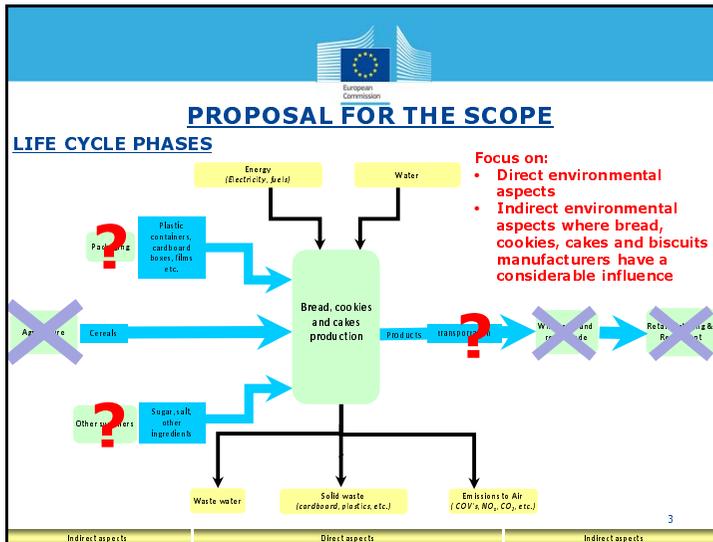
Main bread making processes:

- Mixing
- Proving/Fermenting
- Baking
- Cooling



Caobisco, (2013)


 Joint Research Centre




 European Commission

Main environmental issues

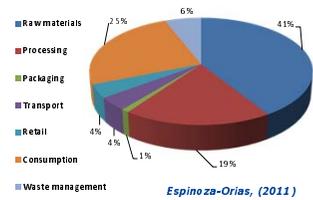
- Energy use – baking process
- Water use and selection of ingredients??
- Use of packaging materials
- Transportation/distribution - in case of fresh or frozen bread??
- Other important issues??





 Joint Research Centre

Carbon footprint for bread baking



| STAGES | Aspects |
|---------------------|--|
| First fermentation | Air emissions (CO ₂) |
| Forming/moulding | Organic solid waste generation |
| Second fermentation | Air emissions (VOCs, CO ₂) |
| Baking | Air emissions (mainly CO ₂) |
| Packing | Solid waste generation (e.g. cardboard, plastics, metal) |
| Cleaning | Wastewater generation Solid waste generation |

Proposal of main environmental issues to be addressed:

- **Energy use**
- **Resources management** **Any other important aspect missed?**
- **Selection of the ingredients???**

Candidate BEMPs for manufacturing of bread, biscuits, pastries and cakes

1) Proposals?

Development of the EMAS Sectoral Reference Document on Best Environmental Management Practice in the Food and Beverage Manufacturing Sector

Candidate BEMPs for the overall sector



Kick-off meeting of the TWG, 20-21 February 2014.

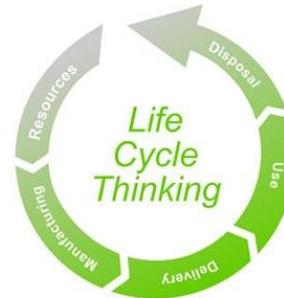
Paolo Canfora

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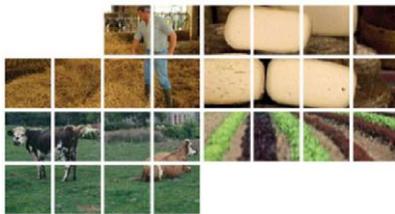
*Joint Research Centre (JRC)
European Commission*

Perform an environmental sustainability assessment of products and/or operations



Food and drink manufacturers can perform carbon footprinting and/or Life-Cycle Assessments (LCA) of their products and/or operations to identify hotspots, priority areas for action and define a strategy for reducing their environmental impacts.

Sustainable supply chain management



Food and drink manufacturers can work with their suppliers to improve the environmental sustainability of their products and/or apply green procurement (e.g. buying certified raw materials).

Improve ingredient choices / recipes to minimise the environmental impacts of ingredients

By analysing the environmental impacts of the ingredients they use, food and drink manufacturers can adapt their recipes to reduce the environmental impacts of their products, for instance by excluding certain highly unsustainable ingredients.



Improve or select packaging to minimise environmental impact



Improve the design of the packaging to minimise its environmental impact.

If appropriate, analyse different options for packaging in terms of carbon footprinting and/or LCA and choose the most sustainable options.

Adapt packaging to optimum portion size(s) to minimise food waste and amount of packaging

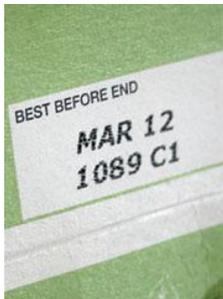
Food and drink manufacturers can influence the amount of food waste generated by consumers by marketing their products in packages of different sizes which better cater for the needs of consumers.

In particular, the availability of smaller portions may allow consumers that need small quantities to avoid over-buying.

Need to watch out for the trade-off between food waste and amount of packaging.



Set longer best before dates to minimise food waste



Food and drink manufacturers can strive for maximising the life time of their products to reduce food waste generation by consumers.

Environmental-friendly cleaning operations

Adopt environmental-friendly practices in cleaning operations

- reduction of water consumption
- reduction of energy consumption
- use of more environmental-friendly chemicals...



Improve the transport and distribution operations



Those companies responsible for the transport and distribution of their products can minimise the related environmental impacts

- choice of transport mode
- intermodality
- load factor
- vehicle efficiency...

Candidate BEMPs for the overall sector

1. Perform an environmental sustainability assessment of products and/or operations
2. Sustainable supply chain management
3. Improve ingredient choices / recipes to minimise the environmental impacts of ingredients
4. Improve or select packaging to minimise environmental impact
5. Adapt packaging to optimum portion size(s) to minimise food waste and amount of packaging
6. Set longer best before dates to minimise food waste
7. Environmental-friendly cleaning operations
8. Improve the transport and distribution operations

Any other??