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LCA WORKSHOP FOR THE FISHING INDUSTRY

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Skýrsluágrip Rannsóknastofnunar fiskiðnaðarins



Icelandic Fisheries Laboratories Report Summary

Titill / Title	LCA Workshop for the	Fishing Industry	
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Ágrip á íslensku:	Þessi skýrsla greinir frá niðurstöðum norræns vinnufundar um líftímagreiningu í fiskiðnaði (LCA) sem haldin var í Reykjavík 15- 16. maí 2000. Um var að ræða tveggja daga vinnufund með 36 þáttakendum frá ýmsum löndum. Vinnufundurinn var styrktur af norrænu ráðherranefndinni.		
fiskiðnaðinum og ræða möguleika og takmarkanir á hana til þess að meta heildarumhverfisáhrif fisks og fis		arkanir á því að nota sks og fiskafurða	
	Þáttakendur voru sérfræðingar á flestum sviðum fiskiðnaða sem veiðum og vinnslu, dreifingu, markaðse fiskveiðistjórnun, umhverfisáhrifum fis notkunarmöguleikum LCA og merkingum í matvælaiðnaði.		ðum fiskiðnaðar, svo u, markaðsetningu, n fiskveiða, natvælaiðnaði.
	Fyrri daginn var aðal áhersla lögð á að kynna og ræða umhverfisáhrif fiskveiða frá sjónarmiðum hagsmunaaðila, stjórnvalda og neytenda. Seinni daginn var aðal áhersla lögð á kynna þau verkefni þar sem LCA hefur verið notað í matvælaiðnaði og þau verkefni um notkun LCA í fiskiðnaði sem nú eru í gangi á Norðurlöndum.		
	Í lokin voru tekin saman helstu atriði sem varða þörfina fyrir áframhaldandi rannsóknir á sviði umhverfismála og hvernig LCA getur komið fiskiðnaðinum að gagni við að meta umhverfisáhrif fiskvinnslu og fiskveiða. Einnig er áhugavert hvernig hugsanlega má nýta LCA sem grunn fyrir umhverfismerkingar fyrir sjávarafurðir og önnur málefni sem varða viðhorf neytenda.		
	Allir þáttakendur voru sammála um nauðsyn þess að halda slíka vinnufundi og mikilvægi þess að viðhalda tengslum milli iðnaðar og sérfræðinga á sviði LCA. Hugsanlega er hægt að framkvæma þetta með notkun sameiginlegrar vefsíðu á internetinu þar sem m.a. væru settar inn almennar upplýsingar frá báðum aðilum, ásamt því að halda árlega vinnufundi svipaða þeim sem haldinn var í Reykjavík.		

Lykilorð á íslensku: LCA, fiskur,umhverfi,merkingar,stjórnun

Skýrsluágrip Rannsóknastofnunar fiskiðnaðarins

Icelandic Fisheries Laboratories Report Summary

Summary in English:	This report presents the outcome of the Nordic workshop on "Life Cycle Assessment in the Fishing Industry" which was held in Reykjavík, Iceland, on May 15-16, 2000. The workshop was attended by 36 participants from all the Nordic countries and was funded by the Nordic Council of Ministers.
	The aim of the workshop was to introduce the LCA method to the fishing industry and to discuss the advantages and disadvantages of using the LCA for fish and other seafood products as tools to evaluate their environmental impact.
	The participants represented expertise on the whole fish product chain, (manufacturing, retail, marketing, etc), in fish stock management and environmental aspects of commercial fishing as well as environmental assessment of food products using e.g. LCA methods and eco-labelling.
	On the first day of the workshop, the focus was on presenting and discussing the environmental aspects of commercial seafood products from the perspective of various parties in the whole fish product chain; fisheries, industry, retailers and consumers. On the second day, the focus was on the status of LCA for food products and the ongoing LCA projects in the Nordic countries oriented on seafood products.
	In the final part of the workshop, discussions were held on the need for research in the area of environmental evaluation of seafood products using the LCA method, including evaluations of its potential advantage for the fish industry. An important aspect of this discussion was how LCA for seafood products can be combined with other environmental considerations important for eco-labelling and consumer aspects.
	At the end of the workshop, the participants agreed on the success of the workshop and the need to continue to reinforce cooperation, both between parties in the fish product chain and with and between the researchers performing LCA studies of seafood products. One suitable approach for such cooperation was considered to include an interactive website for researchers, with an open part for general information, as well as holding annual workshops with the same scope and focus as the Revkiavik workshop
English keywords:	LCA, fish, environment, labelling, management

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1. INTRODUCTION

Over the last few years, various studies, focusing on the environmental impact of fish processing industry and at developing cleaner production methods for the fish industry, have been carried out in the Nordic countries. Furthermore, in the last couple of years, environmental assessment and eco-labelling of seafood products has become an important marketing issue. Activities such as "Marine stewardship" and "Green fish" are driven by various environmental oriented organisations. Environmental aspects will undoubtedly play a more important role in consumer attitudes towards seafood products in the near future, and thus on the marketing of seafood products, both on Nordic and export markets.

The LCA methodology, (for environmental impact assessment), is favoured by many industries and industrial research organisations, because of its "cradle to grave" approach, its transparency (easy to follow and understand) and flexibility. Environmental accounting of food products is gradually becoming an important competitive factor on the European and North American food markets, in keeping with the growing interest in ecological foods and the transition of the society to sustainability.

A joint approach from the Nordic countries for a method for environmental assessment of seafood products from "ocean to plate" will be an important part in demonstrating the commitment of the Nordic fishing sector to developing sustainable fishery. By using the LCA methods, the effects of the whole chain is examined, not only a limited number of parameters in the fishery as is the case in other environmental evaluation methods such as the MSC (Marine Stewardship Council).

The co-operation between the various experts, such as on fish stock management, environmental aspects of commercial fishing, LCA-methodology and industrial experts on fish production, should make it possible to identify the potentiality as well as the limitations of using the LCA in the fish industry. The fishing industry in the Northern countries will thus be better able to support the claim that it is conscious of the effects their products and product systems have on the environment.

2. OBJECTIVE

The objective of the project was to arrange a workshop with the aim to introduce the LCA method to the fishing industry and to discuss the pros and cons of using LCA as a tool to evaluate the environmental impact of fish and seafood products.

3. RESULTS AND DISCUSSION

In early 1999 an application was sent to the Nordic Council of Ministers requesting a grant that would allow a workshop to be held in accordance with the objectives stated above. The application was approved in June 1999.

A planning group, which included representatives from all the Nordic countries, was formed. The group met in Gothenburg in October 1999 to develop a preliminary program for the workshop. The invitation to participate in the workshop was sent out to more than 200 parties in the Nordic fishing industry and fish chain. In addition, the coming workshop was advertised on the web.

3.1. Life Cycle Assessment in the Fish Industry, Nordic Workshop, May 15-16, 2000 in Reykjavík

There were 36 participants from 7 countries participating in the workshop. They came from research institutes, the fishing industry and other interested parties. The lecturers came from different sectors of the industry. The lectures covered the food and fishing industry, the governmental aspect, the consumer attitudes toward organic food and eco-labelling, research status and the view of the retailers and manufacturers, see appendix (abstracts from the lecturers).

3.2. Main points from the workshop

On the first day of the workshop, representatives from the industry stated that although LCA is indeed a good tool today, it is still considered too complicated and expensive for the industry. The industry needs an easy-to-use "streamlined" LCA that it can easily use. They also stated that much more information, like a databank, is needed.

In the lectures it was pointed out that:

- During the last decade an additional class of criteria has come into focus, concerning production quality rather than product quality. This concerns environmental effects of activities in the various links in the food chain, as well as animal health and welfare. Consumer studies have repeatedly demonstrated that a majority of consumers in the Nordic Countries have a positive attitude to organic foods and willingness to buy such food, and also that the food produced in the Nordic countries has a clear environmental image on export markets. However, the proportion of consumers who regularly buy such products is much lower.
- An eco labelling is something that has come to stay and is being introduced in new sectors of commercial interest. A totally different question is, whether consumers have the necessary information to make environmentally "right" decisions related to seafood products.
- During recent years, environmental aspects have become a reality on the market. New players, in the form of environmental organisations, have become involved in the fisheries sector, drawing attention to the problem of overfishing, which is a global concern. As there are now more or less eco-labelled alternatives among all forms of food, although not yet for captured fish, plans were made to establish an eco-labelling alternative for captured fish through the MSC (Marine Stewardship Council), supported by the WWF (World Wildlife Fund) and Unilever. As a reaction, the Nordic ministers of fisheries agreed in 1996 to develop a more democratic, open and broader alternative, preferably with an already established

eco-labelling system. Currently a Nordic group is working on the development of criteria for eco-labelling. The European Commission is participating in the work as observers.

The work on the second day of the workshop focused on the research activities of LCA for fish/fishing system and seafood products. Most Nordic Countries have only just begun this work. The projects that will be done over the next few years harmonize because they all focus on different aspects in the fish industry. At the workshop in Reykjavík, a number of projects were presented, with focus on the following:

- In Norway the focus is on the fishing ships and land-processed seafood products.
- In Sweden the focus is on further development of current environmental LCA methodology to include marine environmental effects for applications in the fishery and seafood production.
- On Iceland the focus is on the advantages and disadvantages of using the LCA methodology as a tool for the fish industry to achieve control over the environmental work within the companies.
- In Finland the activities are related to LCA studies of fish farming.
- In Denmark the LCA projects are focused on developing LCA-based screening methods for environmental assessment of seafood products.

4. CONCLUSIONS AND FUTURE NEEDS FOR RESEARCH

During the discussions at the first day of the workshop it was concluded that the format used at the workshop is a very effective way to communicate information and knowledge regarding the environmental aspects of seafood products between the different parties in the seafood products chain. A workshop like this is also a good way to establish relations between researchers and those who might possibly benefit from the research results, the fishing industry. It was therefore suggested that similar workshops should be arranged in the coming years to monitor the developments both

on the fish product market including eco-labelling of seafood products and the research on environmental effects of seafood products.

During the more research-focused second day of the workshop, the participants came to the conclusion that there is a great need to continue the interactions between the researchers in the field of environmental assessment of seafood products.

- The representatives from the industry stressed the need to develop "quick and clean" methods for doing LCAs within a reasonable time- and cost frame. This requires the development of methods and a database and can be the long term outcome of this project.
- The data from measurements in the field must be stored in a similar format in the different LCA projects in the Nordic countries in order to facilitate data exchange and peer reviewing. Joint databases must be discussed and recommended to use of all parties. This will be the topic of one of the future workshops.
- There are a number of difficult problems to solve when applying LCA methodology to seafood products, which should be jointly discussed and decided on. A joint Nordic best practice for LCA of seafood products should be developed.
- Transfer of knowledge between the fisheries experts and the LCA researches should be promoted as many other environmental aspects than those covered in the LCA are of interest to the market.
- An interactive website (a chat) between the researchers in the field should be established for easy communication between the various parties regarding the scientific issues. The website should also include a more generally available part for discussion with interested parties in the fish product chain and the general public.

APPENDIX,

PROCEEDINGS FROM THE WORKSHOP







PROGRAMME

LIST OF PARTICIPANTS

ABSTRACTS



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PROGRAMME

Monday May 15th 2000

- 08:30 Registration
- 09:00 **Opening:** Prof. Hjörleifur Einarsson, Director, Iceland Fisheries Laboratories, Iceland

LCA AND FISH INDUSTRY Chariman: Svante Svensson, Orkla Foods, Norway

- 09:15 **Consumer attitudes towards organic fish products.** Tino Bech-Larsen, MAPP Centre, Denmark.
- 10:15 **A retailer company's views on environmental assessment and LCA**. Pär Björkman, D&D Dagligvaror AB, Sweden.
- 10:45 **Coffee**
- 11:00 **Development of a joint eco-labelling system for seafood in the Nordic countries.** Staffan Larsson, Fiskeriverket, Sweden.
- 11:45 **Governmental aspect of LCA, exemplified by the Swedish environmental strategy.** Staffan Larsson, Fiskeriverket, Sweden.
- 12:30 *Lunch*
- 13:30 **LCA and quality management.** Ilmo Aronen, Raisio Group, Finland
- 14:15 **LCA and the seafood industry**. Kristoffer Sunér, ABBA Seafood, Sweden
- 15:00 **Coffee**
- 15:15 **How does the consumer value environmental aspects of foods?** Per-Olov Sjödén, Uppsala University, Sweden.
- 15:45 **Development of LCA and other environmental assessment/communication metods.** Dirk Piwowarczyk, PE Product Engineering GmbH, Germany.
- 16:30 **Issues in seafood marketing Oceans of opportunities and concerns.** Alda Möller, Consultant, Iceland
- 17:00 **Summary: Svante Svensson.** Where do we go from here?



PROGRAMME

Thuesday May 16th 2000

09:15 **Opening**: Dirk Piwowarczyk, PE Product Engineering GmbH, Germany.

Status of LCA IN THE FISHERY RESEARCH Chariman: Thomas Ohlsson, SIK, Sweden

- 10:00 **LCA research priorities. Results from the LCA Net Food Project.** Pär Olsson SIK, Sweden.
- 10:45 **Coffee**
- 11:00 **Eco Labelling.** Jonette Braaten, NFH, Norway
- 11:50 *Lunch*
- 13:00 **The relevance and use of environmental management systems and performance indicators in the fish processing industry.** Rabbe Thun, VTT, Industrial Environmental Economics, Finland
- 13:45 LCA status in the fishery research. Denmark: LCA examples. Per Christensen, Aalborg University, Sweden: Friederike Ziegler, SIK Finland: Frans Silvenius, FGFRI
- 15:15 **Coffee**
- 15:40 LCA status in the fishery research (contin.) Norway: Svein Aanondsen, SINTEF Iceland: Eva Yngvadóttir, IFL
- 16:30 **Discussions**
- 17:00 **Summary: Thomas Ohlsson.** What is the need for research and what are the possibilities?



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CONSUMER ATTITUDES TOWARDS ECOLOGICAL AND CONVENTIONAL FISH.

Tino Bech-Larsen Assistant Professor, PhD The Aarhus School of Buisness Department of Marketing Haslegaardsvej 10,DK 8210 Aarhus V

Abstract

The Nordic Council of Ministers has set focus on the development of sustainable fishing through a number of activities. The aim is to aid the understanding of concepts and relationships in fishing and the ecology of the marine environment.

In a joint project The MAPP Centre at the Aarhus School of Business and Norges Fiskerihøgskole have conducted focus groups in Germany, Denmark and Spain with the aim of investigating

- consumers' knowledge and attitudes towards fishing, marine environment and sustainability
- consumers' expectations and demands with regard to ecological fishing and fish as a food product
- consumers' knowledge, attitudes and trust in labelling of fish and ecological food products

Apart from a description of the results of the focus groups the presentation will review a number of MAPP studies of consumer attitudes to conventional fish.



Life Cycle Assessement in Fish Industry

Pär Björkman, D&D Dagligvaror, May 15th, 2000 Reykavik, Iceland

Winning the consumers confidence

- We are meeting a growing demand for fresh and frozen fish. It's healthy, tasteful and for the moment being, not connected to any scandals. Like the meat and poultry industry. Some of our supermarkets are even selling more fish than meat the last two years. Especially in the two major cities in Swden, Gothenburg and Stockholm.
- We are being paid by the consumer and the consumer is a strange being. One can say that the consumer i claimed by many, controlled by few, at least by them selves. The consumer want's to be social and environmental responsible. But during the shopping trip in the supermarket other things suddenly become more important, low price, finding a quick dinner to the kids who are very hungry etc. But, and this is important, the consumer generally likes to spend her/his money in a supermarket that are a responsible member of the society.
- LCA is a very useful tool for the industry to gain knowledge of what it is doing and what the impact to the environment is. The knowledge and experience should then be used to strengthen each companys brands. The LCA-methodology, and results, are to complicated to be mass communicated to the consumers. But for consumers who are keen on learning more they should be available through a web site for example.
- We want to be a responsible member of the society and will work with parnterns who also wants that. We think that three basic rules should be use to reach that goal:
- 1. All fish we are selling must be correct labeled. Using only the official and approved names.
- 2. D&D think it is neccessary to quickly develop rules for sustainable fishing. There are two reasons for that, future generations should have the possibility to eat a wide range of fish, and biodiversity in itself is important for the stability of the ecosystem.
- 3. To ensure all this, third party certification is the best way to win the consumers confidence.

DEVELOPMENT OF A JOINT ECO-LABELLING SYSTEM FOR SEAFOOD IN THE NORDIC COUNTRIES

Staffan Larsson Fiskeriverket Box 423, 401 26 Göteborg, Sweden

Abstract

During recent years, environmental aspects have become a reality on the market. New players in the form of environmental organisations have become involved in the fisheries sector drawing the attention to the problem of over-fishing, which is a global concern. As there now are more or less eco-labelled alternatives among all forms of food, although not yet for fish, plans were made to establish an ecolabelling alternative for captured fish through the MSC (Marine Stewardship Council), supported by the WWF (World Wildlife Fund) and Unilever. As a reaction the Nordic ministers of fisheries agreed in 1996 on developing a more democratic, open and broader alternative, preferably with an already established eco-labelling system. There is today a Nordic working group developing criteria for eco-labelling. The European Commission is participating in the work as observers. In Sweden, there is a project involving all stakeholders within the sector, including fishermen, processing industry, retailers, environmental and consumer organisations, working for developing an eco-labelling system through an established certifying organisation. The intention is to develop a pilot project and a system that could be applied elsewhere. LCA is and will be used as a method to provide information and identify environmental problems throughout the food chain. A LCA-project through SIK (The Swedish Institute for Food and Biotechnology) is directly linked to the work.

GOVERNMENTAL ASPECT OF LCA, EXEMPLIFIED BY THE SWEDISH ENVIRONMENTAL STRATEGY.

Abstract

The Swedish Government and the Parliament decided in 1997 on an ambitious environmental program based on the overall objective to hand over a society to the next generation in which all the main environmental problems have been solved. More specifically by year 2020 our impact on the environment should have been reduced to a long-term acceptable level. Sweden shall be a model for ecological sustainable development.

For the implementation of such an objective a strategic planning has been carried out involving same 20 authorities. A number of environmental quality objectives

have been formulated and decided by the Parliament. For the fisheries there are two main objectives

- A balanced marine environment, sustainable coastal areas and archipelagos
- Sustainable lakes and watercourses

In order to fulfil these objectives seven sector objectives have been formulated and for each one of them a number of measures. Among them to conduct environmental analysis, environmental impact assessment and life cycle analysis. LCA will be a useful instrument to provide information for implementing the strategy.

LCA and Seafood industry

Introduction

Abba Seafood is represented on the Nordic markets with high quality seafood products. Abba Seafood has approximately 700 employees and a turnover on 160 million Euro. The company is a division of Orkla foods

Abba Seafood environmental work

Abba Seafood has an environmentally awareness and a proactive environmental program mainly focused on our internal environmental impact.

Environmental facts about Abba Seafood:

- One of seven company guidelines is "Environment and ethics"
- Abba Seafood is currently implementing ISO 14001 at the different company premises.
- Participating in the fishing LCA that SIK is conducting (See program 16/5)
- Representing Seafood industry in Eco-label "green fish" workgroup (See program 15/5)
- Co-financing surveys of the marine conditions along coastlines near our production plants e.g. the Swedish West-coast from Gothenburg to the Norwegian border

Industrial use of LCA

What use does Seafood industry have of environmental performance evaluations?

Process

- To reduce the environmental impact of our production methods
- To reduce environmental impact caused by our suppliers or retailers
- Legal aspects -The EU packaging directive and its essential requirements
 - -The new (1999) Swedish law for the environment has a lifecycle perspective

Products

- Product development Packaging and ingredients purchasing
- Consumer information EPD and other types of environmental information
- Performance criteria for Seafood, a standard for fishing as the "FSC" criteria is in forest industry.
- Customer information Consumer information must be easy to adopt because of the short time a consumer use when buying food products. The MSC label and the Nordic Eco-labelling are two alternatives.

Possible use of LCA within Seafood industry

Internal environmental work

When deciding areas for environmental focus.

In relations with governmental representatives to show compliance with legislation

To be more secure in the environmental approach then improving a product or a process.

External environmental work

Developing a code of conduct for marine raw material

In contact with suppliers and when deciding environmental purchasing criteria

When developing new logistics systems in collaboration with chain stores.

In marketing

To fulfil the environmental expectations in our brands When new or modified products are presented to chain store

Life cycle assessment- Does it have to be scientifically certain?

"LCA-Light" better than assumptions

The need for an easy to use, easy to communicate, fast to conduct and affordable environmental evaluation method is obvious.

- High cost and the time needed for a complete LCA reduce the industrial interest -Where is the commercial LCA?
- ISO 14001 and requires continuos environmentally improvements with lifecycle perspective but without need to conduct a complete LCA.
- In most new legislation the company must prove compliance with legislation and governmental guidelines (e.g. have a life cycle perspective, use substitution principle, look for BAT)
- A "LCA-Light" to support decisions when purchasing or developing new products (EU's packaging directive, New production methods, When choosing between suppliers with different production methods)
- Consumers and customers rarely ask for a complete LCA but expect companies to act environment friendly.

HOW DOES THE CONSUMER VALUE ENVIRONMENTAL ASPECT OF FOOD?

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There is extensive documentation concerning the "traditional" criteria for food choice among consumers: taste (sensory aspects), quality, nutritional and health aspects, convenience and price. During the last decade, an additional class of criteria has come into focus, concerned with production quality, rather than product quality. This concerns e g environmental effects of activities in the various links in the food food chain, as well as animal health and welfare. Two specific types of food have been studied extensively: GMO-foods and organic foods. In the study of consumer responses to organic foods, attitudes and purchases have been the primary foci of interest. Thus, it has been repeatedly demonstrated that a majority of consumers in the Nordic countries have a positive attitude to organic foods and to buying such foods. However, the proportion of consumers who regularly buy such products is much lower.

Within the framework of a Swedish research programme "FOOD 21 - sustainable food production", we have performed interview as well as questionnaire studies of consumer responses to the purchase of four specific types of food items, milk, meat, potatoes and bread. Our findings confirm the results obtained in studies in other Northern European countries: close to 70% of Swedish cosumers consider it very good, wise, and important that they buy the organic varieties of these foods. However, only 5-10% states that they "often or very often" do so. Our studies demonstrate some of the major barriers that prevent consumers from "acting according to their attitudes". (1) The purchase criterion "organically produced" is of much lower importance than the traditional criteria of taste, quality, nutritional aspects and price. (2) The most prominent factor in consumer perceptions of the organically produced foods is that they are more expensive. (3) The organically produced foods are not perceived by most consumers to have better taste or better "quality". However, the organically produced foods are perceived by many consumers to be healthier than conventional varieties. We have made an extensive analysis of consumer beliefs about the "health" and "environmental" consequences of their (eventual) purchase of organic foods (i e what they think will be the consequences of such purchases). Also, we have studies the extent to which such beliefs are associated with their attitudes to and purchase of such foods. The findings are remarkably consistent: beliefs about "health" (e g

"if I buy organic foods for my children, this would improve their health") are more strongly associated with positive attitudes and purchases than are "environmental beliefs" (e g "if I buy organic foods, this would reduce pollution of the environment"). However, the associations are stronger between the performance of "environmentally friendly behavior" (e g recycling, energy saving) and positive attitudes/purchase of organic foods. Thus, consumers who have a positive interest in environmental issues buy organic foods more often than those who do not share that interest. However, this does not imply that their main motive is environmental. Our recent, still preliminary analyses demonstrate that the strongest motive for the purchase of organic foods in both these groups is "health". This is most likely a reflection of the fact that the "traditional" motives for food procurement and consumption are of a primarily "egoistic" nature, whereas "environmental aspects of food production" are of a more altruistic nature. The possible implications of these findings for the understanding of consumer responses to organic fish products will be discussed.







ig Services	Life Cycle Assessment (LCA) 14040ff Main Features
mium Consultir	LCA studies the environmental aspects and the potential impacts
- Prer	 Throughout a product's life (cradle-to-grave)
PE Group	 General categories of environmental impacts: Resource use Human health
Germany	 Ecological consequences
Canada	
Japan	Life Cycle Assessment in the Fish Industry; Nordic Workshop May 15-16, 2000; Reykjavik, Iceland



















J Services	Life Cycle Assessment (LCA) 14040ff Reporting (2)
m Consulting	 To allow the reader to comprehend the complexities and trade-offs inherent in the LCA study
0 - Premiur	 The report shall also allow the results and interpretation to be used in a manner consistent with the goal of the study
PE Group	 When the results of the LCA are to be communicated to any third party, a third-party report shall be prepared
Germany USA Canada	
Japan	Life Cycle Assessment in the Fish Industry; Nordic Workshop May 15-16, 2000; Reykjavik, Iceland

















Control of the sessement in the Fish Industry; Nordic Workshop May 15-16, 2000; Reyljavik, Izedand



Services	Environmental Performance Evaluation ISO 14031 Applications
onsulting (Organizations with an Environmental Management System (EMS) in place can use EPE information to track performance in relation to the organization's:
ium C	 environmental policy, objectives, targets, and other environmental performance criteria.
- Prem	Organizations without an EMS may use EPE as a tool to: identify key environmental spaces
Group -	 determine which aspects to treat as significant set environmental performance criteria, and
문 Germany	 evaluate their environmental performance against these criteria.
USA	
Canada	
lapan	Life Cycle Assessment in the Fish Industry; Nordic Workshop May 15-16, 2000; Reykjavik, Iceland





ng Services	Pattern
onsulti	Flow of products and services
Group - Premium Co	Raw materials Intermediate Final goods Retail & Consumers Waste & res mgmt Phase 1 Phase 3 Phase 2
문 Germany	Increasing Scope & Intensity of Integrated Product Policy
USA Canada Japan	Source: E&Y EU Study Life Cycle Assessment in the Fish Industry; Nordic Workshop May 15-16, 2000; Reykjavik, Iceland









EPR in Sweden - End of Life Vehicles Supplemental Proposals eco-labelling system should be introduced for motor vehicles waste minimization plans required of industry OEMs should mark all components and materials to facilitate sorting and recycling Vehicle Recycling Fund - charge payable on registrati second charge to be an producers finance recycling

 Vehicle Recycling Fund - charge payable on registration second charge to help producers finance recycling operations

Life Cycle Assessment in the Fish Industry; Nordic Workshop May 15-16, 2000; Reykjavik, Io

CRITERIA FOR MODERN DAY ENVIRONMENTAL MANAGEMENT

CURRENT

 Companies must demonstrate sound environmental management of their own operations - EMS, regulatory compliance, corporate environmental reports, audits

EMERGING

 Companies must demonstrate above + how their products contribute to upstream and downstream impacts - the product and the product system are becoming the focal point

Life Cycle Assessment in the Fish Industry; Nordic Workshop May 15-16, 2000; Reykjavik, Iceland



Issues in seafood marketing - Oceans of opportunities and concerns

Dr. Alda Möller, Consultant

Seafood marketing is like most other food marketing based on the day to day business of matching supply and demand and surviving in an environment of increasing competition. Survival involves continually improving the products, improving the service to customers and staying competitive in prices. Survival in seafood marketing also depends increasingly on a stable supply base and it seems that seafood marketeers have an extra difficult job of maintaining overall stability in an highly unstable environment.

Seafood has a very generally accepted image of being among the most healthy foods and a necessary part of a healthy diet. There is no doubt that this is one of the main reasons why many people in western countries keep fish in their diet and are willing to pay high prices for good fish. Fish is considered good for your heart, it is good for your calorie control and therefore also good for your general diet conscience. Seafood is also very tasty and appetising when it is at its best and therefore has a great future on the market - if supply and prices can be managed well enough and if the public image of fish is not damaged in some other way.

It is now recognised that the seafood business of the future must be based on the sustainable utilization of marine resources and it must be seen by the general public to be working in harmony with its environmental responsibility.

One of the main tasks for Iceland in international co-operation must be to improve the understanding of the most appropriate fisheries management practices and advocate control of marine pollution.

The presentation also illustrates the changes in global fish supply in recent years and how this is affecting marketing and may adversely affect species specificity in fish products. The talk also touches on various food safety issues and the environmental issues affecting the seafood industry.

Finally the presentation describes a new website of the Icelandic Ministry of Fisheries. The website, called the Information Centre for Responsible Fisheries is found at <u>www.fisheries.is</u>



















ing Services	Sources of Uncertainties		
	GOAL AND SCOPE	IMPACT ASSESSMENT	
Ö	- Selection of functional unit	- Category selection	
niur	- Goal dependent study	- Category modeling	
- Prer	- System definition	- Assignment procedures	
Group	INVENTORY	WEIGHTING and NORMALIZATION	
F	- Data quality (DQI)	- Value choices / value systems	
Germany	- System modeling	- Methodological uncertainty	
	- Functional unit calculation	- Spatial differentiation	
	- Allocation and cut-off's	- Dose-response characteristics	
Japan	Life Cycle Assessment in the Fish Industry; Nordic Workshop May 15-16, 2000; Reykjavik, Iceland		





LIFE CYCLE ASSESSMENT - LCA NETWORK ON FOODS

Pär Olsson

SIK-The Swedish Institute for Food and Biotechnology, Göteborg

Why LCAnet Food?

Life cycle assessment (LCA) is a method for analysing and assessing the environmental impact of a material, product or service throughout its entire lifecycle, i.e. 'a cradle to grave' approach. LCA supports decisionmaking but does NOT make decisions. The objective of this FAIR project is to focus on the use of LCA in the food chain, and a network of 32 members (Europe-wide) has been formed; (LCAnet Food).

Objectives

The concerted action aim:

- 1. To build a European network for Life Cycle Assessment within the food chain.
- To evaluate and report the state of the art of present LCA-methodology with special emphasis on applications and knowledge gaps within LCA works dealing with the entire food chain.
- 3. To develop a Strategic LCA Research Programme focused on the food chain.
- 4. To initiate and promote the formation of a paneuropeic data base for LCA within the food chain

Three core themes (each with a working group) have been identified:

- (i) demands for environmental information and communication
- (ii) methodology;
- (iii) data for food LCA (i.e. data bases and software).

The working groups have addressed the stateof-the-art and have developed a research programme for the food chain. Some goals for a food LCA include:

(a) learning and/or raising awareness (e.g. provision of information; hot spot identification)

(b) operational decisions (e.g. short term optimisation as related to production systems and product improvement).

(c) strategic decisions relating to long-term strategic planning e.g. in the areas of policy, legislation, priority-setting, criteria for suppliers, eco-labelling and choices between conventional and organic farming.

Results:

Direct results:

Six reports have been made dealing with:

- The state of the art of the present LCAmethodology as well as its practical application within the food chain.
- Three theme reports, one literature survey.
- Final report, including a strategic research programme for the food sector.

Apart from these reports a broadly accepted data base structure have been established, including primary (non-allocated) published data from government, research and industry.

Indirect results:

 The formation of the network enables researchers and industry people to meet and together develop methods and procedures within the LCA field.

Benefits

The shaping of the network itself promotes the use of LCA within the food chain. The data base structure will act as an important part in the shaping of a European net of data bases, and it will also be an important tool for industries going into environmental management programmes like ISO 14 000 and EMAS

LCAnet Food homepage:

www.sik.se/affomr/miljo/lcanetf.html

ECO-LABELLING IN THE FISHERIES SECTOR - CAN WE MAKE IT GOOD?

Jonette N. Braathen Research fellow Norwegian College of Fishery Science Breivika, N-9037 Tromsø

Abstract

As eco-labelling has become a thing to stay and it is being introduced in new sectors of commercial interest we experience a new situation. Particularly is this the case in the sectors of natural recourse management were governments traditionally has been the main decision-makers. With the introduction of eco-labels consumers are given a unique position as for defining what should be the way to manage common recourses. A totally different question is whether consumers have the necessary information/education to make the environmentally "right" decisions related to fisheries. Eco-labelling is in this respect two-headed. Representing both good intentions for better management of recourses and a positive marketing tool for producers, but also a possible negative incitement as far as management is concerned. A question is how one can deal with the two-headedness.

THE RELEVANCE AND USE OF ENVIRONMENTAL MANAGEMENT SYSTEMS AND PERFORMANCE INDICATORS IN THE FISH PROCESSING INDUSTRY

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Abstract

In addition to healthy and good quality food customers of today pay increasingly more and more attention to whether the products they choose to buy have been produced in an environmentally acceptable way. The adoption of environmental management systems (EMS) and the use of indicators (EPIs) for measuring and monitoring their environmental performance have already taken place in some proactive companies. The first steps towards the integration of the EMS with business, quality, health and safety management systems have also been taken. Sustainable production, integrated chain management, life cycle thinking and product stewardship are examples of buzzwords of the future.

As part of the European Commission's *FAIR* Programme the *ECOMAN*-project was started in the fall of 1997. The objective of this 2,5-year research project was to demonstrate the relevance and use of environmental management systems as a motor and tool for continuous improvement, and for the adoption of cleaner production methods within the European fish processing industry. Participants in the project were representatives of fish industry and research organisations in Finland, France, Portugal and Spain. Two of the companies participating in the project were from the fish canning industry (sardines and tuna fish), one company processes mainly white fish and shrimps, and one farmed salmon trout.

As a first step of the EMS design and build-up initial environmental reviews and preliminary audits of management and operational practices, in use at the industrial sites being assessed, were performed. Energy, material and waste streams were quantified, operational procedures documented and key-unit operations assessed. Qualitative characteristics of in- and out-going streams were determined, and alternative options for cleaner production methods identified. Furthermore main elements, requirements and objectives of an environmental management system, and the concept of "*Cleaner Production*" were introduced to the management staff of the plants, as well as to the whole personnel.

In addition to very simple improvements in "good housekeeping" practices more sophisticated technological changes that could reduce emissions and the amount of wastes being generated were identified. Main sources of environmental impacts were assessed and the feasibility of cleaner options analysed. Based on preliminary findings clear goals and improvement targets were set, and changes in the operational as well as management performance planned. Process modifications and new equipment were demonstrated. Substantial reductions in i.a. water usage, wastewater load, amounts of organic and packaging wastes being generated, and in air emissions and in-plant noise level were achieved. As an add-on value an improvement of the hygiene conditions of the plants was achieved.

In the Swedish-Finnish co-operation project *CTPISME*, supported by the European Commission through its *ENV* Programme, the objective was to analyse and select a limited number of indicators that can be used for assessing the performance of small and medium-sized industries from a cleaner technology perspective. One of the sectors being studied was the fish canning industry. Data on environmental management as well as on operational performance was collected, and the findings compared to best operational practices (BOP) and best available techniques (BAT). The screening of indicators followed the EPI Guidelines issued by ISO. The results will be used for mapping and rating the technology level of being used by the industry and for setting improvement targets. A general indicator-based sector independent methodology is also being developed.

LCA STATUS IN THE FISHERY RESEARCH IN DENMARK

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Abstract

In Denmark a lot of efforts have been put into developing LCA as a methodology and then primarily in relation to traditional branches of industry like iron- and metalmanufacturers, electronics etc. Just recently LCA methodologies have been extended in scope also to cover food products and among these few case studies have been undertaken in e.g. dairies, bakery, on some meat products and lately on fishproducts as well.

Untill now very few studies on fishproducts have been made in Denmark, one on Herring and another on fishmeal. But now it seems like a lot of activities are commencing within the next few months. Two larger studies are scheduled to start this spring covering a wide range of traditional fishproducts, aquaculture products and fishmeal alike. The reason for these joint efforts is that the debate on LCA on fish just recently became of political importance as the Ministry and the fishermens organisations have been engaged in debates regarding ecolabelling of fishproducts. These debattes also took place in Parliament and subsequently a neat little sum was set aside for funding this kind of research. It is hoped for that this research can provide some of the scientific foundation for eventually setting the criteria for such an ecolabel.

Besides contributing to the discussion on ecolabelling LCA on fishproducts can also be of vital importance for the fish processing industries as it can help them focus on improving their environmental performance. These improvements should not only be seen in relation to environmental management in the individual firm but also help improving their work on environmental management as it can widen the scope of the management system towards product chain management. To engage in product chain management seems for many of these firms to be the first step from having an environmental management system (ISO 14001/EMAS) to working more systematically with a cradle to grave perspective. 6-8 fish processing industries are now certified according to ISO 14001 and more of these would like to expand the scope of their environmental management system.

Furthermore the LCA on fishproducts are very interesting in their own right as the pose old problems in a new way. One of the problems in the LCA methodologies are that many environmental effects which are of a more intangible nature are not addressed properly when counting and calculating environmental impacts. The effects on biodiversity is for example (well) known but it is not possible today to quantify it so it will become commensurable with other more easily quantifiable effects like acidification, eutrophication and so on. So it is also hoped for that LCA on fishproducts can be a lever for improving and expanding the LCA methodologies.

ENVIRONMENTAL ASSESSMENT OF FISHERY AND SEAFOOD PRODUCTS THROUGH LCA

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Abstract

This research project is focused on developing current environmental LCA methodology for applications in fishery and seafood production. Methodological development will be accomplished parallel to a case study of cod fishery in Sweden. Important environmental effects associated with fishery include impact on the stocks of the target species as well as of by-catch species, competing, prey and predator species; emissions from combustion of fuel and physical, chemical and biological impact on the seafloor. Data sources and models for estimation of data on these effects will be discussed. The results from this project could demonstrate differences in environmental impact between e.g. fishing gear used or the scale of the fishery and thereby be used to make fishery and seafood production more efficient both in terms of environment, quality and economy. Another application of an LCA is for an environmental product declaration, which can be helpful to companies and consumers making purchasing choices and, in the long run, help improving the environmental profile of seafood. Life Cycle Assessment in the Fish Industry Nordic Workshop; Reykjavik, Iceland, 15-16 May, 2000

LCA STATUS IN THE FISHERY RESEARCH IN FINLAND

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The rainbow trout is the main fish species cultured for consumption in Finland, where in 1998 its production volume accounted for 15 870 tonnes out of the 16 024 tonnes total aquaculture volume. Production in Finland is concentrated in the southwest of the country. A life cycle assessment aiming to investigate the environmental effects of Finnish rainbow trout farming was started in March 1999. The participants are Finnish Game and Fisheries Research Institute, the Finnish Environmental Centre and the Fish Farming Union of Finland.

The main aims are to assess the environmental impacts of the fish farming and its life cycle stages and to identify possible environmental improvements. Additional goals are to compare the impacts of different cultivation methods and other food products aiming at enhancing sustainable production methods and to investigate socioeconomic aspects.

A preliminary study was undertaken in 1999 aiming to identify previous LCA investigations of fish farming and other food products, to make a description of the rainbow trout farming process, to find out the environmental hot spots of the life-cycle of rainbow trout production and to investigate the possibilities for obtaining various types of information. According to the availability of data it was decided which alternative products and farming methods were to be compared with conventional Finnish rainbow trout farming.

The feed efficiency factor was shown to be one of the hot spots of rainbow trout farming. Beef and pork were selected as alternative food products. Baltic herring and Norwegian salmon were observed to be suitable alternative fish products for comparison. It was decided to use the results of some field experiments on alternative farming methods and alternative feeds in the investigation.

The system boundaries of the study start from the production of the main raw materials of feed, continue with feed processing and juvenile fish farming, then fish farming itself and end up with slaughtering. Further processing of fish and the production of antibiotics, vaccines, vitamins and antifouling materials were excluded.

LCA of rainbow trout farming in Finland

The impact assessment of rainbow trout farming and the alternative food products will be performed using a Decision Analysis Impact Assessment (DAIA) method (Seppälä 1997, 1999). The main difference between DAIA and the traditional Life Cycle Impact Assessment (LCIA) methodology is that DAIA also deals with spatial aspects of emission sources in order to identify more specific impacts. The determination of characterisation factors for long-distance emissions are based on the results of air quality and transport models taking into account the geographical situation of Finland. Furthermore, according to preliminary calculation the waterborne emissions causing aquatic eutrophication will be of greatest importance. Waterborne P and N emissions in relation to eutrophication are handled in the method by site-specific factors.

Life Cycle Assessment in the Fish Industry Nordic Workshop; Reykjavik, Iceland, 15-16 May, 2000

LCA STATUS IN THE FISHERY RESEARCH IN NORWAY

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Abstract of three Norvegian LCA-related projects in fisheries

1. ENVIRONMENTAL PERFORMANCE OF TRANSPORTATION - A COMPARATIVE STUDY

Ongoing research project with NTNU (Norwegian University of Science and Technology), DNV (The Norwegian Veritas) and (Møre Research) as project partners

Background

Pre-project "Life Cycle Evaluation of Ship Transportation - Development of Methodology and Testing"

In this project the LCA-methodology was tested and evaluated on the ferry M / V Color Festival. This ferry is en route between Oslo and Hirtshals.

The pre-project suggested the development of impact categories, with characterisation, normalisation and evaluation factors, more suited to the transport sector and especially to the seaborne transportation.

The project consists of three case studies on the environmental performance of transportation

Case 1: Paper transport Moss - Hamburg Case 2: Passenger transport Bodø - Svolvær Case 3: Frozen fish transport Ålesund - Paris

Main goal

Establish models and guidelines for the documentation and comparison of environmental performance of different transportation systems in a life cycle perspective

Subgoals

Study three different cases of transportation:

- Paper transport Moss Hamburg
- Passenger transport Bodø Svolvær
- Frozen fish transport Ålesund Paris

Choose relevant impact categories for the cases

Establish relevant weighting factors for the transport sector using:

- Scientific goals
- Political goals
- Monetary values
- Authority panel

Description of the relevant case for this workshop

Compare road and sea transportation of frozen fish from Ålesund to Paris. The transportation by road uses Color Line's ferries between Oslo and Kiel. The transportation by sea uses Nor Cargo's cargo ships between Ålesund and Ijmuiden, and truck between Ijmuiden and Paris.

Functional unit: Transfer of X tons of fish per year from Ålesund to Paris

Results:

In progress

2. MODEL FOR DESIGNING ENVIRONMENTALLY SOUND FISHING VESSELS

Ongoing research project with **Fiskerstrand shipyard** and **PE Product Engineering** as SME, **SINTEF Fisheries and Aquaculture**, **Møre Research** and the **University of Stuttgart** as research institutes.

Background

A literature study in the writer's post-graduate thesis could not find any sign of the use of LCA in the designing of fishing vessels.

The thesis also showed that the potential of environmental improvement is largest during the initiation of a fishing vessel's design process. Then a first attempt to incorporate LCA in fishing vessel design methodology was made. A simple computer model was developed to test the methodology.

The thesis was used as a basis for developing a new project financed partly by **Fiskerstrand shipyard**, partly by **The Research Council of Norway** and partly by the **EU**

Main goal

Develop a computer based design program for fishing vessels that calculates life cycle economy, life cycle energy consumption and life cycle potential environmental performance

Subgoals

- Define measures for the vessels performance (functional unit) related to economy, energy consumption and environmental performance
- Define system boundaries
- Collect data, and by applying these develop empirical formulas for the design tool

- Implement the formulas in the program
- Test the performance of the tool

Results

We are now implementing the tool in corporation with the University of Stuttgart. The tool is developed especially for the first phases of the design process. It will support fishing vessel designers and ship owners in the decision making process with life cycle economy, life cycle energy consumption and life cycle environmental performance as decision criteria's. It is designed to obtain results with a minimum of input. The user can then study the results and find out where the potentials for improvement are largest. It is then possible to make changes to the design, and run the program again to see the effect of the modifications.

It is also possible for the user to give the program detailed input and run the program again to see the results. This makes it possible for the user to refine the design.

3. LCA OF THE VALUE CHAIN OF FISH

Research project with **WestFish Aarsæther** as representative for the industry and **SINTEF Industrial Management** as research institute

Background

Growing customer demand for environmental documentation of the whole value chain of fish products: Particularly in Germany, North America

Main goal

Evaluate the ecoefficiency and ecoeffectiveness of the whole value chain¹ for frozen fish products, from fishing ground to customer, by the use of LCA

Subgoals

- Study material flow and material handling
- Reduce the use of packaging through the value chain
- Illustrate ecoefficiency and ecoeffectiveness
- Carry out a LCS or LCA
- Develop methods in order to integrate environmental aspects in the information system and production processes along the value chain

Main conclusions

Transport to market in USA/Canada contributes most to the potential environmental effects from the value chain of frozen fish products. Future projects should try to improve this part of the value chain. The second most important part of the value chain is the packaging. Choosing non-bleached paper can improve the environmental performance of the packaging.

¹ Value chain of fish products: The whole process of fishing, processing and transporting the fish to the customer

LCA STATUS IN FISHERIES RESEARCH IN ICELAND

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Abstract.

Growing consumer concern for the environment has led to increasing demands on producers in the food industry to minimize damage and strive towards sustainable development. Life Cycle Assessment is a methodology that evaluates the impact on environment from cradle to grave. It indicates where most environmental benefit can be gained. This methodology has been used in measuring the environmental impact of many food products, but never for fish.

In March 2000 a two year project started in Iceland called "Life Cycle Assessment of cod products". It is funded by the Icelandic Research Council, the Icelandic Fisheries Laboratories and the Icelandic Technical Institute.

The aim of the project is to define the usability and limitations of LCA with respect to:

- Evaluation of environmental impact of cod production.
- Environmental labelling.
- Eco-friendly product development

To achieve these aims, we have chosen the LCA of cod caught and manufactured onboard fish-trawlers. LCA will be made with internationally accepted methods (ISO 14040, and ISO 14041). The results will be used to indicate where in the life cycle of cod products the greatest environmental gains can be expected. We will collaborate with firms, and other interested parties to collect basic information on input/output in the life cycle of cod. i.e. information on chemical/energy usage for fishing, raw materials, handling, processing, packaging, transport, distribution, consumption, and waste disposal.

We predict this project will create a variety of benefits across the fishing industry. The technical benefits will come from the data collection and can be used to indicate where in the life cycle of cod products the greatest environmental gains can be expected. If there is one certain step in the process that has a large negative impact on the environment one can use that information to build or develop environmentally friendlier equipment that uses less energy etc.

The environmental benefits are in the development of eco-friendly products, selection or re-evaluation new environmentally friendlier equipment, and evaluation of the impact on the environment from cradle to grave. The financial benefits can be substantial. Experience has shown that improvements in the environmental field result in better yields from supplies and raw materials, thus companies can save significant amounts of money.

The marketing benefits in the future are also very promising. The results can be used to develop new methods and define demands for Icelandic environmental labelling of sea products.

This project is the first step in evaluating the environmental impact of cod processed onboard fish-trawlers. When the impact on the environment has been evaluated from cradle to grave it can be used as an important element in policy formulation in fishing issues.

The main uncertainty factor in this project is to find how much useable information is available within the companies and how much work needs to be done to collect these informations or if we need to do some measurements to collect necessary information for the inventory analysis, LCI. The better these informations are, the better environmental evaluation one gets

Finally we think a workshop like this one is very valuable for researchers that work with LCA for the fishing industry and think that if Nordic countries cooperate in such projects, we can influence how fish in the northern hemisphere will be environmentally labelled. That matter should not only be a matter for politicians and pressure groups to decide.