

Measuring Dutch consumers' willingness-to-pay for ethically-improved foods and supply chains through the performance of experimental auctions

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Keywords

NPD, supply chains, ethically-improved foods, willingness-to-pay, experimental auctions

Abstract

This paper presents the outcome of a pilot study on Dutch consumers' willingness-to-pay for fresh fish originating from production systems with different levels of ethical attributes, as estimated through the performance of experimental auctions. Fifteen Dutch citizens living in Noord-Holland and being regular consumers of fresh fish were selected to participate in this study. Two experimental sessions were held in December 2003. Information regarding the subjects, their knowledge about fish production systems and the perceived relevance of different ethical attributes was collected prior to the actual auction rounds. The ethical attributes assessed were selected based on the outcome of a previous collage and focus group study. The type of auction mechanism employed was the second-price, sealed bid auction. The results obtained indicate that Dutch consumers might be willing to pay more for ethical benefits to be introduced in fish production, namely for those perceived to be associated with food safety. Nevertheless, these findings also point out that consumers' may not always value the ethical attributes they consider relevant in a consistent manner, especially if these seem to contradict their beliefs regarding the different fish production systems.

1. Introduction

Today's EU animal production systems face a major challenge. On one hand, they have to deal with society's demand for production strategies that are safer, more environmental-friendly and ensure better animal welfare. On the other hand, they must address food suppliers' aspirations for economic sustainability, good public image and new, added-value products. The study of consumers' perceptions and beliefs regarding meat and fish production systems, as well as their

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Please cite as: Costa, A.I.A. (2005). Measuring Dutch consumers' willingness-to-pay for ethically improved foods and supply chains through the performance of experimental auctions. 18th Scandinavian Academy of Management Meeting, August 18-20, Århus, Denmark.

incorporation in the design of ethically-improved foods and supply chains, is key in providing successful answers to this challenge. Moreover, the ability to quantify consumers' willingness-to-pay (WTP) for ethically-improved food is crucial for the economic sustainability of the animal production sector and the generation of added-value goods.

This paper presents the outcome of a pilot study on Dutch consumers' WTP for fresh fish originating from production systems with different levels of ethical attributes, as estimated through the performance of experimental auctions (Alfnes & Rickertsen, 2003; Lusk, 2003). Experimental auctions simulate active market environments with the aim of (1) estimating consumers' valuations of goods, and (2) uncovering the determinants of these valuations, namely the effect of different attribute levels. Consequently, they can assist producers in establishing the design and the pricing strategy for new or improved foods (e.g., fish deriving from production systems with a high level of environmental-friendliness), and determining the potential profitability of producing and selling these goods already at the design stage (Hayes, Shogren, Fox & Kliebenstein, 1996). Furthermore, experimental auctions are said to have the following advantages *vis-à-vis* other methods for estimating consumers' WTP, like choice experiments or contingent valuation analysis:

- They are incentive compatible, *i.e.*, a participant's dominant strategy is to truthfully reveal his or her valuation of the good being auctioned;
- They take place in a non-hypothetical context, with real products and real money being exchanged;
- They take place in an active trading environment, in which consumers' can incorporate market feedback and be accountable for their valuation and buying behaviour (Lusk, 2003).

This paper starts by describing the socio-demographic characteristics of the consumers' sample studied and the experimental research procedure followed. Next, the findings obtained are presented and discussed. Finally, the potential applications of the research methodology employed in food product development are outlined, as well as guidelines for future research in this field.

2. Subjects and experimental procedure

Fifteen Dutch citizens resident in the province of Noord-Holland, stating to be frequent consumers of fresh fish and regular meal cookers in their households, were selected to participate in the study based on a brief screening questionnaire. Table 1 provides a description of the socio-demographic characteristics of this subject sample.

Table 1: Socio-demographic characteristics of the subject sample.

	Experimental auction subjects	n=15
Gender	Male	7
	Female	8
Age	19-34 years old	1
	35-54 years old	7
	55-74 years old	7
Marital status	Married	13
	Single or divorced	2
Household composition	1 adult	2
	2 adults	7
	2 adults/ 1-3 children	6
Education level	Middle	9
	High	6
Job status	Paid job	7
	Retired	4
	Student/unemployed	4
Income class (gross, Euro/year)	< 10 000	1
	10 000 – 20 000	4
	20 000 – 30 000	4
	> 30 000	6

Two, ninety-minute experimental auction sessions, one with 7 and the other with 8 subjects, were held in December 2003 in IJmuiden, the Netherlands. The auctions were conducted in Dutch by two researchers knowledgeable about the methodological procedure. The first fifteen minutes of each session were dedicated to the introduction of the subjects to each other, the researchers and the general aim of the session – to sell and buy fish through an auction market. Information regarding the subjects' perceived level of knowledge about three different fish production systems – fisheries, open-sea fish farming and inland fish farming-, as well as the perceived relevance of ethical attributes that could be associated with these systems, was then collected. The subjects' level of

knowledge was assessed through the question *How high do you consider your knowledge about this fish production system to be?*, with answers being given on a 5-point scale (from 1=very high to 5=very low). Subjects were also asked to pick what they perceived to be the 5 most relevant ethical attributes out of a list of 6-10 attributes for each production system and to rank them by order of relevance (from 1=most relevant to 5=least relevant). The attributes listed had been generated previously during a combined collage and focus group study on Dutch consumers' views regarding ethically-improved fish production systems (Costa, Dekker & Jongen, 2003; Costa & Kole, 2004). All subjects consented to take part in the experimental auctions, but received no initial endowment in cash to participate (Loureiro, Umberger & Hine, 2003). Subjects did receive, however, a small gift for their participation in the study at the end of the sessions.

The type of experimental auction employed was the second-price, sealed bid auction, also known as the Vickrey auction (Vickrey, 1961), as designed by Shogren, Shin, Hayes and Kliebenstein (1994) and later modified by Alfnes and Rickertsen (2003). The design of the experimental auction sessions is depicted in Figure 1.

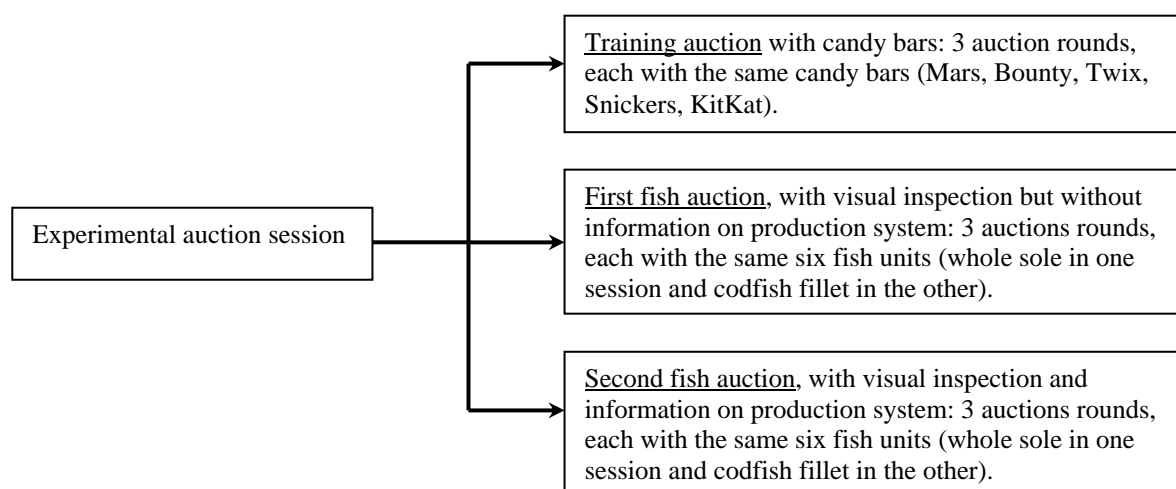


Figure 1: Design of the experimental auction sessions.

Three auction trials were conducted in each session: a training trial with 5 simultaneous auctions of candy bars, a first trial of 6 simultaneous auctions, based only on the participants' visual inspection of 6 fish units, and a second trial of 6 simultaneous auctions, in which extra written information about each of the 6 fresh fish units was provided. The fish units were acquired at the local fishmonger, had all the same origin and were selected to appear as similar as possible to each other in shape, size, colour, etc. In the first session, entire soles were auctioned, while in the second one the auctions concerned cod fish fillets. Subjects were asked to provide their bids in Euro/kg of fresh

fish. The extra information supplied was based on the outcome of a combined collage and focus group study (Costa, Dekker & Jongen, 2003) performed earlier, namely on the results concerning consumers' views on ethically-improved fish production systems and their attributes (Costa & Kole, 2004). Labels depicting the extra information associated to each of the 6 fresh fish units auctioned in both sessions are listed at the end of this paper (Appendix 1).

The training trials with the candy bars were run to demonstrate the auction mechanism to subjects and let them actively learn about its properties. Subjects had also previously being given precise written instructions regarding the auction mechanism, the sequence of the trials and how they would be conducted. Within each trial, three auction rounds were conducted to allow subjects to refine their bids to more accurately reflect their valuations. Subjects were informed that, nevertheless, only one of the rounds in each trial, established by a random draw, would be binding. The aim of this procedure was to avoid wealth and demand reduction effects (Alfnes & Rickertsen, 2003). To avoid substitution effects subjects were allowed to buy only one product alternative per auction trial (*i.e.*, one candy bar, plus one kg of one type of fish). If one participant was the highest bidder for more than one alternative in one round, he or she was allowed to choose which alternative to buy. The remaining alternatives went to the second highest bidder for a price equal to the third highest bid. If several subjects shared the highest bid, a random draw determined the winner. Subjects paid in cash for the products they won at the end of each auction trial (including the training trial) and were assured that, irrespectively of the written information provided, the fresh fish units they acquired were perfectly fit for human consumption, fresh and safe to eat.

3. Results and discussion

3.1 Level of knowledge about fish production systems and perceived relevance of ethical attributes

Subjects perceived themselves to be more knowledgeable about fisheries (Mean=2.5, SD=0.7) than about inland fish farming (Mean=3.4, SD=0.8) or open-sea fish farming (Mean=3.6, SD=0.8), which is not surprising given the relative degree of dissemination of these three types of production systems in the Netherlands (Daan & van der Mheen, 2004).

The mean and standard deviation values of the perceived relevance of the ethical attributes associated with the three different fish production systems are depicted in Table 2. These results

Table 2: Perceived relevance of the ethical attributes associated with three fish production systems - fisheries, open-sea fish farming and inland fish farming (n=15; from 1=most relevant to 5=least relevant).

	Mean ± SD perceived relevance for fisheries	Mean ± SD perceived relevance for open-sea fish farming	Mean ± SD perceived relevance for inland fish farming
Only fish of suitable size is caught	2.1±1.3	not in attribute list	not in attribute list
Practiced outside the reproductive season	2.6±1.2	not in attribute list	not in attribute list
Only fish of adequate species is caught	3.3±1.3	not in attribute list	not in attribute list
Small-scale enterprise	4.1±1.7	6.0±0.0*	5.8±0.6*
Practiced only during a few weeks/year	4.3±1.6	5.7±0.8*	not in attribute list
Practiced in coastal areas only	4.5±1.8	5.7±0.5*	not in attribute list
No antibiotics in feed	not in attribute list	3.3±2.0	4.0±2.1
Fish grown in clean, running water	not in attribute list	3.4±1.6	3.9±1.8
No additives in feed	not in attribute list	3.5±1.8	3.6±1.9
Fish grown with plenty of space	not in attribute list	3.6±2.1	4.0±2.2
Fish are fed algae and shrimp only	not in attribute list	3.9±2.0	4.2±2.2
Use of green energy only	not in attribute list	not in attribute list	4.4±1.7
No artificial breeding employed	not in attribute list	4.1±1.5	4.5±1.2
Use of system to filter and recycle water	not in attribute list	not in attribute list	4.8±1.7
Waste created used in agriculture	not in attribute list	5.9±1.3*	5.8±0.4*

* attributes not picked up from the lists by subjects were ranked 6th, labelled “irrelevant” and included in the mean estimation.

show that subjects did perceive certain practices, such as respecting the legal limits imposed on the size, species and life-cycle stage of the fish caught, to be relevant ethical attributes of fisheries. The level of agreement between subjects on which ethical attributes could be relevant for fish-farming practices was, however, comparatively smaller. Nevertheless, it is possible to conclude that attributes which can be related to food safety aspects like not administering antibiotics or additives in feed and providing fish with ample space and clean water during growth were consistently found to be more relevant than others related with environmental-protection, for instance. The fact that the same ethical attributes were generally ranked lower in perceived relevance for inland farming than for open-sea fish farming may be explained by the level of credibility of the association between the ethical attributes and the production system. A previous

study (Costa & Kole, 2004) has shown that a similar sample of subjects had a highly negative view regarding inland fish-farming, which could explain why certain ethical attributes, though found relevant in themselves, were not believed to be possibly associated with such an “unethical” production system.

3.2 Willingness-to-pay values

Given the low number of participants, and the fact that different fish units were auctioned in the two experimental sessions, the results obtained underwent descriptive statistical analysis only. Table 2 shows the WTP values yielded by the first and second experimental auction sessions performed. These results are also depicted in a graphic form in Figures 2 and 3, respectively.

Table 3: Willingness-to-pay (WTP) values in Euro/kg fresh fish yielded by the two experimental auction sessions. The two fish auction trials in each session are denoted by 1 and 2, respectively.

	Mean WTP± SD in Euro/kg for sole (n=7)	Mean WTP± SD in Euro/kg for cod (n=8)
WTP1A	5.87±1.24	8.51±1.31
WTP2A	8.32±1.90	9.11±1.58
WTP1B	5.82±1.26	8.23±1.50
WTP2B	7.36±1.47	8.95±1.62
WTP1C	5.88±0.88	7.92±1.24
WTP2C	4.78±2.29	8.16±1.08
WTP1D	5.81±0.69	8.22±1.19
WTP2D	8.01±1.80	8.24±0.87
WTP1E	6.91±1.65	8.08±1.06
WTP2E	4.58±2.25	7.74±1.05
WTP1F	6.52±1.15	8.24±0.86
WTP2F	7.82±2.15	8.38±1.33

A = Fisheries without ethical attributes

D = Open-sea fish farm with ethical attributes

B = Fisheries with ethical attributes

E = Inland fish farm without ethical attributes

C = Open-sea fish farm without ethical attributes

F = Inland fish farm with ethical attributes

The results depicted in Table 3 show that the average valuations given by participants to the fresh fish units auctioned were below current market prices for these foods (on average for sale on local supermarkets at the time of the experiment for approximately 20 Euro/kg for the whole sole and 22

Euro/kg for the codfish fillet). Three alternative explanations for this outcome can be provided: (1) the participants were not used to shop regularly for these fish species, so they were not aware of their real market prices; (2) the participants were not used to value fish products in Euro/kg, using other units instead (pounds, whole fish, packed portion, fillet, etc.); (3) the market environment created by the experimental setting was not credible, leading participants to expect that they could acquire the fish at prices lower than those practiced in real markets. Nevertheless, participants valued the cod fillet higher than the whole sole, which indicates that they were at least aware of the price differential between these species in the actual market.

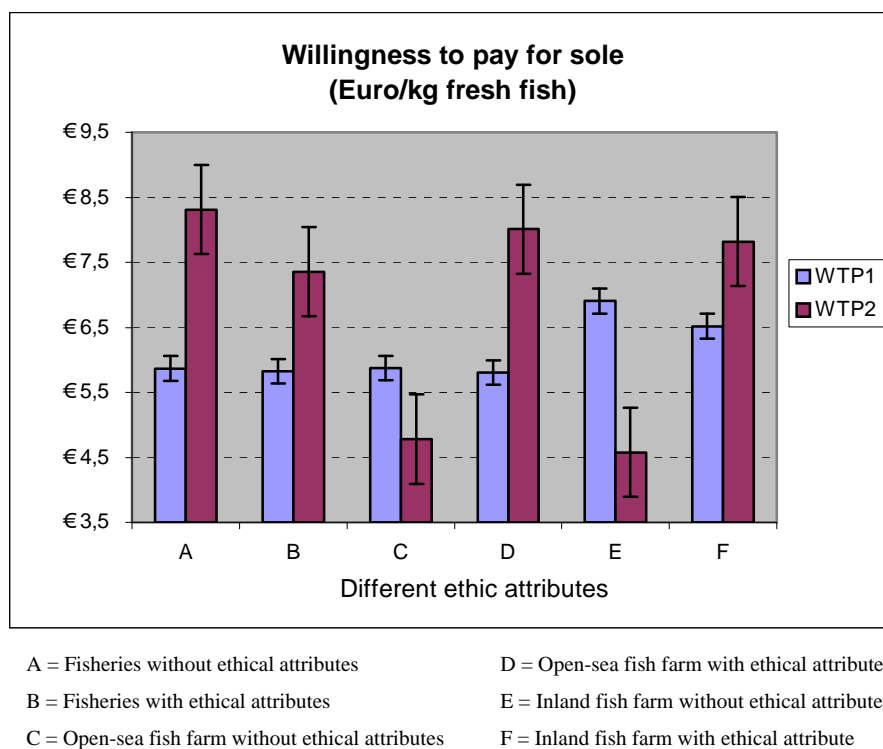
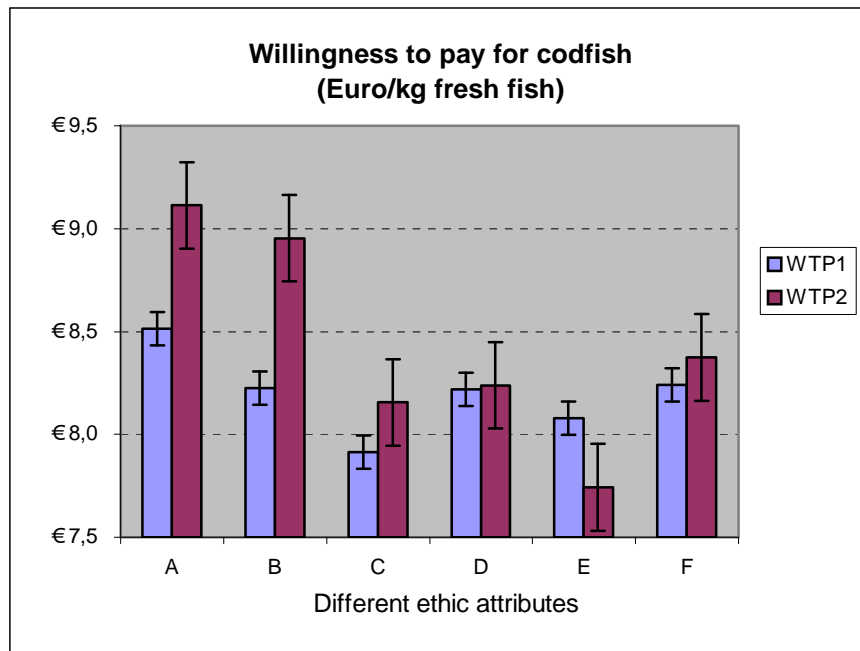


Figure 2: Willingness-to-pay (WTP) values in Euro/kg for whole fresh sole

As can be readily seen from the data depicted in Figure 2, the WTP for the whole sole before information was supplied was highest for alternatives E and F, and lowest for all remaining alternatives in an approximately equal manner. In the second auction trial, alternatives A and D were the most valued by the participants, while alternatives C and E were the least valued. C and E were also the only alternatives with a decreased valuation relatively to the first trial.



A = Fisheries without ethical attributes
 B = Fisheries with ethical attributes
 C = Open-sea fish farm without ethical attributes
 D = Open-sea fish farm with ethical attributes
 E = Inland fish farm without ethical attributes
 F = Inland fish farm with ethical attribute

Figure 3: Willingness-to-pay (WTP) values in Euro/kg for cod fish fillet.

The results depicted in Figure 3 show that the WTP for the codfish fillet before information was supplied was highest for alternative A (followed closely B, D and F), and lowest for alternative C. In the second auction trial, alternatives A and B were the most valued by the participants, while alternatives C and E were the least valued ones. Alternatives A, B, C and F had an increased valuation in the second trial, while alternative E's valuation decreased relatively to the first trial. The provision of information did not seem to alter the participants' valuation of alternative D. The statistical measures of dispersion presented in Table 3 and in Figures 2 and 3 were smaller for the first auctions trials than for the second auction trials in both sessions. This indicates that (1) participants were generally not able to infer any important value differences between the 6 fish units auctioned in each session based on their visual inspection, and (2) the provision of information about the production systems and their levels of ethical attributes changed the participants' valuations of the units according to their own individual valuation of the different attribute levels displayed by each unit (which was thus seemingly different between participants). This also means that the aim of assuring that any differences observed in the participants' WTP values in the second auction relatively to the first one would result only from differences in perceived value originated

by the information supplied - and not from any others cues in the fish units-, was achieved. Differences between participants' WTP values were, nevertheless, slightly higher in the first codfish auction than in the first sole auction. This can be probably explained by the higher degree of uncertainty displayed by subjects as to the value of the cod fillets relatively to the value of the whole soles.

Based on the results presented so far, the WTP values of the first session participants' after the provision of information can be ordered in the following manner:

- 1st highest WTP = "standard" fisheries
- 2nd highest WTP = ethically improved open-sea fish farm
- 3rd highest WTP = ethically improved inland fish farm
- 4th highest WTP = ethically improved fisheries
- 5th highest WTP = "standard" open-sea fish farm
- 6th highest WTP = "standard" inland fish farm

In turn, the WTP values of the second session participants' after the provision of information can be ordered in the following manner:

- 1st highest WTP = "standard" fisheries
- 2nd highest WTP = ethically improved fisheries
- 3rd highest WTP = ethically improved inland fish farm
- 4th highest WTP = ethically improved open-sea fish farm
- 5th highest WTP = "standard" open-sea fish farm
- 6th highest WTP = "standard" inland fish farm

These results indicate that participants in both sessions gave a higher valuation to fish originated from "standard fisheries", even if that meant compromising on some desirable ethical aspects they found relevant when asked about the perceived importance of ethical attributes, like refraining from catching fish of inappropriate size or species. Fisheries seemed to be almost always preferable to aquaculture, unless fish farming systems displayed improved ethical attributes. This is in agreement with the data collected from the combined collage and focus group discussion, which points in the same direction (Costa & Kole, 2004). Moreover, fish farming in the sea seemed to be generally preferred to inland aquaculture, unless inland systems displayed improved ethical attributes which sea aquaculture did not. Finally, the results also show a clear WTP for systems in which some

perceived safety risks are removed by way of the improvement of ethical aspects such as the absence of feed additives and antibiotics, as well as the use of only naturally occurring fish species (thus not genetically modified or artificially bred).[this is reaffirmed by results in 3.1](#)

4 Conclusions and recommendations

This paper presented the results of an exploratory investigation of Dutch consumers' WTP for fresh fish originating from production systems with different levels of ethical attributes. These preliminary results gave some indication that consumers' may be willing to pay for some ethical benefits of production systems, namely those they perceive to be associated with safety. Nevertheless, the results of this study also indicate that consumers' are not always consequent in their valuation of the ethical attributes considered to be relevant, if this contradicts their acquired beliefs towards fish production systems. Given the small size of the subject sample used, these results should not be taken as reliable indications of WTP to pay trends of Dutch consumers in general.

Concerning the methodological issues, the outcome of this study gives a positive indication of the reliability and adequateness of experimental auctions to estimate consumers' WTP for production systems displaying different levels of ethical attributes or their combinations. Participants learned the auction procedure quickly and easily, and the data obtained did not present any statistical oddities that could lead us to question the validity of its application in this context. The only remaining problems are (1) how to counteract the natural variation displayed by unbranded, fresh fish products, which may have a confounding effect on results, and (2) how to improve the credibility of the market environment created so that the more accurate WTP estimates can be determined. In any case, the outcome of this pilot investigation encourages further experimental research with laboratory auctions, so that the method can be optimised and applied in research projects investigating representative samples of the population. In this way, we will be able to fully employ the potential of this promising market research tool in the design of new products and pricing strategies for ethically improved food production systems.

Acknowledgments

This study was financed by the Animal Sciences Group of the Wageningen University, in the Netherlands, namely by the Netherlands Institute for Fisheries Research – RIVO. The author would like to thank drs. Adrian Kole, researcher at RIVO, for his assistance during the experimental auction sessions.

Appendix 1

Fish A: *This fish was caught at high seas by standard fishery practices taking place throughout the year, including during the reproductive season. There was no selection based on size, species or life-cycle stage at the moment of catch. Fish caught that was perceived to have very little commercial value was thrown back to sea.*

Fish B: *This fish was caught at sea by a small-scale enterprise dedicated to sustainable fishery practices. Catch is limited to coastal areas and periods outside the species' reproductive season. The fishery practices followed ensure that only fish of the appropriate size and species is caught.*

Fish C: *This fish was grown on a large-scale, open-sea fish farming enterprise that operates in high seas throughout the year. The cultured fish have thus access to natural flowing water and have enough room to grow. Fish are fed standard feed, with standard feed additives and antibiotics being administered to promote growth and quality and prevent diseases. The fish grown in this system are selectively bred to maximise growth and profit. This fish farm enterprise does not treat the water it uses to free it from the waste it generates.*

Fish D: *This fish was grown on a small-scale enterprise dedicated to sustainable in open sea. Fish have thus access to natural flowing water and enough room to grow. This enterprise is located in a coastal area and operates only in well-defined periods. Fish grown here get an alternative type of feed based on algae and shrimps, without being administered any additives or antibiotics. They are also not subject to selective breeding. This enterprise has uses a system that recovers organic matter from its wastewaters, which can then be used as fertiliser for agriculture.*

Fish E: *This fish was grown on a large-scale, inland fish farm. In this closed system fish are grown in tanks with water being replaced regularly. Fish are fed standard feed, with standard feed additives and antibiotics being administered to promote growth and quality and prevent diseases.*

They are selectively bred to maximise growth and profit. This fish farm has no particular waste treatment system, does not re-use tank water and is powered by a normal energy supplier.

Fish F: *This fish was grown in an enterprise dedicated to sustainable, small-scale, inland fish farming. Its fish are grown in tanks in which the number of animals per cubic meter is kept limited and water is continuously replaced. Fish have thus plenty of room to grow in fresh water. They are fed an alternative type of feed, based on algae and shrimps, without being given any additives or antibiotics. They are also not subject to selective breeding. This enterprise has developed a system that recovers organic matter from its waste that can then be used as fertiliser in agriculture. It is powered by energy from “green” suppliers only and re-uses most of its water with the help of a filtering /pumping system.*

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