Deliverable D6.1.1

Market for organic fish

Overordnet disponering:

Det blev besluttet at følgende områder skulle belyses i forbindelse med afviklingen af projekt Robustfish. I indeværende rapport er der koncentreret om markedsforhold og forbrugerne.

Værdikædebeskrivelse

Råvaren

- Værdikæden for produktion af økologisk ørred består af en række led, der starter med produktion af æg fra økologisk moderfisk
- Æggene bliver klækket og små juvenile fisk opdrættes
- Når fiskene når smolt størrelsen udsættes de i opdrætsanlægget
- Produktionsstørrelsen kan være 250 g (portionsstørrelse), eller overvintre til efterfølgende år hvor de udsættes i saltvandsdambrug (ca. 1 kg store)
- De saltvandsopdrættede fisk tages op og primært rognen repræsenterer en høj værdi, men resten af fisken sælges f.eks. til røgning

Alle disse operationer kan varetages af et enkelt firma, eller der kan være individuelle aktører i samtlige led.

Produkter

- Ørrederne transporteres til slagteri
- Der kan ske en slagtning, afblødning og udtagning af indvolde (til fersk portionsørred i vakuumpakning)
- Fisken kan fileteres og derefter røges (til røgede ørredfillet i vakuumpakning)

Alle disse operationer kan varetages af et enkelt firma, eller den endelige forarbejdning kan se i et andet firma.

Marked

- Produkterne sælges direkte til supermarkeder i Europa, eller igennem en grossist, der varetager eksporten
- Kunden køber produktet hos detaillisten

Ovenstående er belyst i en brochure om "Kvalitet af opdrætsørred" fra 2007, der er vedlagt som bilag

Regulering: mærkningsordninger, love og forordninger

Økonomi for produktionen

Markedsopbygning

Trends og tendenser

Litteraturstudie: forbruger undersøgelser

D6.1.1 består af en række bidrag fra de deltagende institutter og virksomheder i forhold til den overordnede disponering. Der er desuden tre bilag, der er indsat sidst i rapporten:

1. Brochuren ”Kvalitet af opdrætsørred” – Fra opdræt til forbruger
2. Dansk Akvakulturs strategi for udvikling af økologisk fiskeopdræt i Danmark
3. Pjecen: ” Økologisk opdrætsfisk – fra dambrug til havbrug”

Sammendrag Dansk

Markedet for økologiske fisk

Danmark er nu Europas største producent af økologiske regnbueørreder, med en samlet produktion i 2014 på 1.080 tons. De økologiske producenter af regnbueørred har vist sig at have en bedre økonomisk indtjening per produceret enhed, end tilsvarende konventionelle producenter. Der blev genereret en 8 % højere indtægt per enhed og en solvens på 28 % i 2012, hvilket er betydelig bedre i forhold til tilsvarende konventionelle producenter (solvens er et udtryk for kreditværdighed). De danske producenter og tilhørende forarbejdningsindustri er nu i front på markedet for økologiske ørreder.

I dag er det muligt at levere råvaren kontinuerligt igennem året. Produktkataloget er udvidet betydeligt, da også store regnbueørreder fra et saltvandsdambrug er blevet godkendt som økologisk produceret.

Der er nu flere forskellige forædlingsvirksomheder. Disse sikre flere afsætningsmuligheder for primærproducenterne. Der er flere primærproducenter, der har tilladelse til "stalddørssalg". Ellers kan økologiske regnbueørred primært købes i supermarkedskæderne og et begrænset antal fiskehandlere. Et område som man forventer sig meget af er foodservice sektoren, efter indførelsen af det økologiske spisemærke.

En salgsparameter for økologiske regnbueørred, kan være mærkning af salgspakkerne. Empiriske resultater viser at forbrugerne er villige til at betale mellem 24 til 38 % mere for et sådant produkt. Undersøgelsen af villighed til at betale mere for et produkt er forbundet med relativ høj usikkerhed, så den reelle betalingsvillighed kunne nærme sig forskellen for fisk med bæredygtighedsmærke i forhold til fisk uden mærke.

Der er gennemført et litteraturstudie af relevante undersøgelser af forbrugernes forventninger til økologisk fisk. Resultatet af denne undersøgelse er ikke direkte relevant, da nogle af studierne er af ældre dato (mere end 15 år gamle) eller det er studier fortaget med forbrugere, der intet forhåndskendskab havde til økologisk fisk. De seneste studier viser en mere positiv holdning fra forbrugernes side.

Fremtidige trends og tendenser indikerer, at økologisk regnbueørred produkter har en relativ god chance for at erobre en større markedsandel fra de konventionelle produkter.

Summary English

The market for organic fish

In 2014 Denmark was the biggest producer of organic rainbow trout in Europe with a total amount of 1,080 tons. The producers of the organic trout had a better economic earning than the conventional producers, measured per unit produced. The value wason average 8 % higher per unit than for the conventional producers. The solvency ratio was in 2012 an average of 28 %, which was higher than the traditional trout producers' solvency ratio (solvency ratio measure an enterprises ability to meet its debt and other obligations). The Danish producers and processing industry are now in the front on the organic trout market.

The Danish producers of organic trout are now able to keep a constant supply throughout the year. The variety of products has been increased due to certification of a saltwater facility that can supply the market with roe and bigger fish of up to 4 kg. The numbers of processing companies have increased, to the benefit of the primary producers that have more possibilities to sell their goods. At the same time there are several primary producers that have allowance to sell the organic trout as whole, gutted fish to the public. At the domestic market, organic trout can be brought into specific supermarket chains and to specific fish retailers. A new sector is 'food-service', which are rewarded with different labels accordingly to the amount of used organic food.

One important parameter for increasing the sale of organic trout could be introduction of labels on the products. A desk study has been done and the empiric results shows that the consumers are willing to pay a premium of 24 % to 38 % more for an organic product with a label on the package. Studies of consumes willingness to pay more for a certain product are normally difficult to conduct and to get reliable results. Due to this uncertainty it would be more relevant to compare the consumers' willingness to pay for fish products with sustainability labels compared to product without labels. This difference is between 10 to 13 % in favor of the labeled product.

A study of relevant consumer perception towards organic fish has been conducted. The result was that these studies are not directly relevant, either because they are too old (15 years or more), or that the consumers did not know organic fish products beforehand. The more recent the study the more positive attitudes form the consumers.

Future trends and tendencies indicate that the organic trout products are having a good possibility to conquer more market shares from similar traditional products.

Financial Performance of the Danish Organic Trout Aquaculture

1. Introduction

Evolving consumer life-styles in developing countries has posed challenge to producers of various food products. In a common global market, European producers for instance have to compete with producers from countries with lower cost of production while conforming to the stringent European and national regulations regarding the quality, environmental and health aspects of the product. In the case of organic trout production with more stringent environmental legislation, Denmark has managed to position itself as the leading producer in 2014 with a total production of 1,080 tonnes by-passing France with a production volume of 952 tonnes in 2012 (Zubiaurre, 2013). The exponential growth in organic aquaculture production indicates the sector has come to stay. But how does the economic performance of production compare with related products? In this section, the economic performance in the production of freshwater organic trout in Denmark is compared to the conventional trout and organic agricultural sector. Economic performance indicators used are the degree of profitability and the farm solvency of aggregated farms. Evidence revealed shows that organic trout farms tend to be equal or perform better than alternative conventional trout and organic agricultural farms. The average organic trout farm was able to generate income of 8% per unit value of assets and a solvency rate for 28% for 2012, values that outperform related farms in the same year. The succeeding sections are organized by giving a brief overview of the aquaculture sector followed by the financial flow and performance and finally the conclusion.

2. Overview of the Aquaculture Sector

Denmark, like many other European countries faced declining output in aquaculture production over the last decade. The total production of about 42,000 tonnes in 2009 decreased to about 39,700 tonnes in 2011. A recovery was realized in 2013 with production of about 38,000 tonnes of which rainbow trout constituted 40,700 tonnes. This reduction was due to regulation in the industry leading to reduced number of farms. However, the value of production increased from DKK 840 million to DKK 915 million in 2009 and 2011 (Denmark Statistic). The main species produced in Denmark is the rainbow trout (*Oncorhynchus mykiss*), making up about 90 percent in weight and value of production. Production of trout takes place in freshwater and marine systems. The land based freshwater typically produce small portion sized trout weighing 200-400 grams and the production techniques used are traditional ponds and recirculation systems (also called model 1 and model 3 farms)[1]. The portion sized trout are sold as smoked fillets, live, fresh or frozen products. The large trout weighing 3-4 kilograms and trout eggs (roe) are mainly produced in marine (sea cage) farms. The roe is the most important economically but the meat is also marketed. The most important market for large trout from Denmark is Japan while Germany and The Netherlands represent significant markets for the portion sized trout. The exports of Denmark represent about 32 percent of the total rainbow trout production in Europe.

The production of organic rainbow trout in the country has also shown promising development despite the strict national legislation. The first certified organic trout product hit the market shelves in 2005. With a total production of 100 tonnes in 2006 (Dansk Akvakultur, 2008), this increased to 530 tonnes to be the second largest producer after France in 2012 and then 1,080 tonnes in 2014 when Denmark became the largest producer. The Danish organic aquaculture industry is about 3 percent of the total aquaculture production volume. There are currently 2

[1] Fish farm technologies that have the ability to reduce nitrogen discharges from aquaculture to the environment and at the same time increasing the production volume per farm compared to the traditional system.

marine farms (not included in this analysis) and 11 freshwater farms certified under organic[2] (Dansk Økologisk Fiskeopdræt, 2014). Germany is the most important organic trout market for Denmark. According to Statistic Denmark, a total of 100 tonnes of seafood were exported with a value of DKK 11 million in 2012. Out of these, 51 tonnes were destined to Germany, 6 tonnes to France and Monaco and the remaining to other countries. These records exclude exports from smaller production units and hence underestimate the true export volume. About 90 percent of organic seafood productions serve the export market (Larsen, 2014).

3. Data Source and Methods

The data used in this report were sourced from the Denmark Statistic. The accounts are based on a sample of farms in the whole farm population. Following Danmark Statistik (2012) the economic performance indicators compared across farms were the degree of profitability (a variant of return on assets) expressed respectively for aquaculture and agriculture in equation 1 and 2 as

$$Degree\,\mathrm{Pr}ofitabilit\,y = ((Oper.\mathrm{Pr}ofit - Owner\,\mathrm{Re}muneration)/Assets)*100 \quad (1)$$

$$Degree\,\mathrm{Pr}ofitabilit\,y = ((Oper.\mathrm{Pr}ofit + Gen.Subsidies - Owner\,\mathrm{Re}muneration)/Assets)*100 \quad (2)$$

The difference between the two equations lies in adjusting for the general subsidies provided to the agricultural sector. This measure indicates the efficiency with which farm management has used its resources to obtain income. It reflects farm earnings before interest and taxes. The other measure used is the farm solvency ratio which tells if farms cash flow is sufficient to meet its short term and long term liabilities. The lower the solvency coefficient the greater the probability of a farm will default its debt obligations. The solvency ratio is also expressed as

$$FarmSolvency = NetCapital / Assets \quad (3)$$

Thus, the ratio of net capital at the end of year to assets at the end of the year.

4. Output and Financial Performance of Organic Trout compared to other Farms

The total financial cash flow and output for freshwater trout production in Denmark is presented in this section for the Danish farms. As discussed earlier, a significant reduction in the number of farms was observed in the traditional trout farms as shown in Table 1 due to regulation, structural adjustment and economies of scale closing down smaller farms. In 2010, the 177 farms that produced traditional trout reduced to 157 farms in 2012. Fish produced for consumption is the most important contributor to farm cash inflow. In 2010, the volume of organic trout produced for consumption for 5 farms amounted to a total of 193 tonnes compared to 12,029, 3,034, 7,228 tonnes for traditional, model 1 and model 3 farms, respectively. Considering the number of farms and the tonnages produced, it is evident that the model 3 trout farms are larger considering the production output. Production of organic trout increased to 339 tonnes with an increase in the number of sampled farms to 6 in 2012.

Table 1 Volume of Freshwater Trout Production 2010-2012 for Sampled Farms

	Organic	Traditional	Model 1	Model 3

[2] There are also 2 farms producing organic mussels with production capacities of up to 200 tonnes per year.

	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012
# of farms in the population				177	162	157	19	17	16	13	13	13
# of farms in the sample	5	5	6	89	73	72	10	11	10	12	13	9
		ton (metric)										
PRODUCTION												
Fish for consumption	193	246	339	12,029	9,438	11,158	3,034	1,857	2,869	7,228	6,444	5,021
Fry and fingerlings	1.8	2.6	3.9	3,418	4,200	5,066	694	1871	1,336	700	1,003	696

Source: Statistic Denmark

The total turnover for the organic farms in 2010 was about DKK 4.6 million and total cost of DKK 4.2 million (refer to Table 2). The corresponding average farm turnover and cost was DKK 0.915 million DKK 0.836 million per farm. The total turnover and costs in the conventional farms in 2010 was highest in the traditional followed by the model 3 and then the model 1 trout farms. However, the average per farm turnover in 2010 for model 3 was about DKK 11 million, model 1 (DKK 4 million) and traditional (DKK 2 million) and their respective average costs were model 3 (DKK 9.8 million), model 1 (DKK 3.5 million) and traditional (DKK 1.9 million). This trend reveals that the level of sophistication of a farm is directly associated with the amount of cash flows. The organic farms technology is more comparable to the traditional trout farms as they are less capital intensive compared to the recirculation farms. Generally, increases in turnover from 2010 through to 2012 tend to be followed by increases in cost for all farms and vice versa.

Turning to the Economic performance indicators, the degree of profitability[3] for organic farms in 2010 was the same as the model 3 trout farms with a value of 5 percent. This value is higher than the traditional farms which has a value of less than 1 percent and 3.7 percent for model 1 farms. In practice, organic farms were able to generate income of DKK 0.05 per DKK1 of assets value, the highest among all farms for 2010. In 2012, farms improved in their efficiency with the rate at which they generate incomes from assets relative to 2010 except for model 1 which decreased to less than 1 percent. The story in 2011 was different for organic trout farms with a solvency ratio of negative 6 percent. Farms were on the average operating at a loss as reflected in the operating profit. Deductions from the composition of the cost in Appendix 1 shows that fish cost (i.e. the cost of purchasing fry and fingerlings) is among the important costs of production but the observation from 2010, 2011 and 2012 was a dramatic increase of 367% from 2010-2011 followed by a decrease of 43% in 2012. This might be attributed to the buildup of stocks of fingerlings to be used in the following year's production hence driving the total average cost up to override the turnover. The percentage composition of costs (cf. Table 4) presents an interesting case. Feed cost is the most substantial cost across farms ranging from 38-46% per farm, increasing according to the level of sophistication: organic-traditional-model 1-model 3. The personnel cost is also among the important cost and increases according to the labour-capital intensities. Following the above order of farm types, organic has the highest personnel cost since it requires more manual labour and accounts for 20% while model 3 which is more capital intensive has the least personnel cost of 8.5%.

Table 2 Financial Performance of Organic and Conventional Trout Farms (Total Cash Flows)

	Organic			Traditional			Model 1			Model 3		
	2010	2011	2012	2010	2011	2012	2010	2011	2012	2010	2011	2012
	Million DKK											
Turnover	4.58	6.18	8.24	378.81	394.61	427.64	74.00	83.08	88.55	142.28	159.74	124.46

[3] As a rule of thumb, it is estimated that investment professionals want to see Return on Assets come in at no less than 5%.

Costs	4.18	6.30	7.34	348.32	357.26	389.22	66.40	77.12	84.85	128.59	149.16	108.82
Operating Profit	0.26	-0.32	0.61	30.49	37.35	38.42	7.60	5.96	3.71	13.69	10.58	15.63
Profit on ordinary activities	0.10	-0.49	0.40	11.81	24.62	25.09	4.47	3.48	1.35	4.17	2.03	12.26
Net profit	0.09	-0.66	0.32	8.76	20.38	19.83	6.13	3.06	1.23	4.42	2.04	11.62
Assets, End of Year	4.43	6.20	6.88	586.11	502.11	543.96	88.89	117.80	127.40	236.57	230.34	149.55
Net capital. End of year	0.98	2.12	1.95	114.16	105.96	145.89	16.19	18.35	22.05	38.64	43.94	28.41
Economic Indicators:												
Degree of Profitability pct.	5.0	-6.0	8.0	0.4	2.4	2.6	3.7	2.1	0.5	4.8	3.8	8.9
Farm Solvency pct.	22.0	34.0	28.0	19.5	21.1	26.8	18.2	15.6	17.3	16.3	19.1	19.0

Source: Statistic Denmark

The solvency of trout farms presents coefficients that appear to favor organic trout farms in all the years under consideration. In 2010, organic and traditional farms showed coefficients of 22 percent and 19.5 percent, respectively while model 1 and 3 showed 18 and 16 percent solvency rate. Considering organic trout farms, they appeared to have a lower probability of defaulting debts in 2010 compared to the other farms. The probability of debt default decreased further in organic farms, model 3 and traditional farms which contrast model 1 farms for 2012. In general, though organic trout farms could not perform well in 2011 regarding income generation from assets, they have picked up again and are performing equally or better than alternative trout farms as reflected in the economic indicators for the various years.

Table 3 Financial Performance of Organic Trout and Agricultural Farms (Total Cash Flows)

a.		--------Organic Trout------			---------Agriculture-------			-------Dairy cattle---------		
		2010	2011	2012	2010	2011	2012	2010	2011	2012
1	Number of farms in the pop.				640	655	637	386	386	393
2	Number of Farms in the Sample	5	5	6	183	224	191	123	140	128
		----------Million DKK----------								
30	Turnover	4.58	6.18	8.24	2,580.48	2,957.98	3,384.38	1,910.70	2,178.58	2,457.82
50	Costs	4.18	6.30	7.34	2,295.04	2,567.60	2,897.71	1,720.40	1,906.07	2,152.07
70	Operating Profit	0.26	-0.32	0.61	285.44	391.04	486.03	190.30	272.52	306.15
100	Net profit	0.09	-0.66	0.32	14.08	163.10	171.35	8.49	115.80	99.04
110	Assets, End of Year	4.43	6.20	6.88	26,639.36	27,511.97	27,845.18	17,607.39	17,140.72	17,832.38
138	Net capital. End of year	0.98	2.12	1.95	7,431.68	5,005.51	4,348.80	4,773.66	2,709.33	2,449.57
	Economic Indicators:									
152	Degree of Profitability pct.	5.0	-6.0	8.0	5.0	2.0	2.0	1.7	2.4	2.1
153	Farm Solvency pct.	22.0	34.0	28.0	28.0	18.0	16.0	27.0	16.0	14.0

b. Continuation		-------Other Cattle---------			-------------Pigs-------------			-------Crop Production-----		
		2010	2011	2012	2010	2011	2012	2010	2011	2012
0000	Number of farms in the pop.	77	76	62	..	26	28	79	87	75
0005	Number of Farms in the Sample	11	22	11	..	11	13	30	32	24
		----------Million DKK ----------								
0290	Turnover	96.71	126.39	110.42	..	217.75	281.29	144.41	193.66	245.40
0470	Costs	98.79	130.80	106.76	..	177.14	224.25	124.82	147.73	186.75
065	Operating Profit	-	-		..			..		

5		2.08	4.41	3.60		40.61	57.06		45.94	58.58
0720	Net profit	-8.86	-19.30	-1.18	..	25.92	34.44	-0.03	21.14	10.28
0995	Assets, End of Year	2,920.76	2,661.44	1,938.12	..	1,004.90	1,267.36	3,547.81	4,726.28	4,797.83
1170	Net capital. End of year	1,004.70	689.32	409.20	..	109.20	137.26	1,123.14	1,098.64	965.10
	Economic Indicators:									
3530	Degree of Profitability pct.	0.2	0.3	0.2	..	4.6	4.6	1.4	2.1	2.1
3542	Farm Solvency pct.	34.0	26.0	21.0	...	11.0	11.0	32.0	23.0	20.0

Source: Statistic Denmark

How then does the organic trout farms compare to the traditional organic agricultural farms? Table 3 presents the total cash flows and financial performance for the organic trout and the organic agricultural sector (for full time holdings by type of farm). Table 3b presents the continuation of the farm types presented in Table 3a. The turnover for the various farm types increased from 2010 to 2012 just as observed in the organic trout farms. Likewise, the total costs mimicked the pattern of turnover development.

Again, the organic trout farms in 2010 had higher degrees of profitability that was equivalent to the organic agriculture, a value of 5 percent income generation over assets. This was higher than alternative organic farms like the dairy cattle (1.7), other cattle (0.2) and crop production (2.1). Agriculture and other cattle could not improve while dairy cattle and crop production improved slightly. Pig performance appears to be stable in all years. The farm solvency ratios however indicate that in 2010, organic trout farms had the highest probability of debt default while other cattle and crops had the lowest probability of default with a respective solvency value of 34 and 32 percent. The changes in 2012 however showed the contrary as organic trout farms had 28 percent solvency rate, the highest compared to other organic agricultural farms. At least in 2012, the economic indicators revealed that the organic trout farms were performing better financially than other organic non-seafood sectors. Putting things in perspective, this has been possible due to the prevalence of price premiums in the organic sector. The organic trout production is quite small representing about 2.7 percent of trout production and 2.5 percent of total aquaculture production[4]. This means that with such a smaller share, price premiums become essential for the financial sustenance of the sector.

Table 4 Average Cost of Organic Trout per Farm and Percent Cost Distribution of Trout Farms

		-Organic Trout Average Cost Trend-			**--Percentage Dist. of Avg Cost per Farm in 2012--**			
		2010	2011	2012	Organic	Traditional	Model 1	Model 3
51	Sell and Dist	1.8	4.0	15.2	1.2	1.2	1.1	0.2
52	Fish	72.0	336.2	189.5	14.9	18.5	15.3	16.7
53	Feed	374.0	438.8	485.0	38.1	36.0	42.6	46.1
54	Electricity	…	…	…	…	6.2	9.6	9.5

[4] Market share is calculated using 2014 organic trout production volume against 2013 aquaculture volumes based on the assumption that the production output for aquaculture in 2014 would not change significantly.

55	Other Variable C	87.4	129.8	124.3	9.8	3.5	2.7	2.6
56	Op. And Mn. Equip	54.0	50.2	76.5	6.0	7.6	5.9	5.1
57	Op. Property	62.4	56.6	50.2	3.9	2.9	2.4	2.4
58	Admin	21.6	15.8	28.3	2.2	3.3	2.3	2.2
59	Personnel	163.2	227.8	254.7	20.0	15.6	11.4	8.5
60	Depr.	26.8	40.8	48.0	3.8	5.3	6.7	6.7
50	Total Cost	863.2	1300.0	1271.7	100	100	100	100

Source: Statistic Denmark

Conclusion

Denmark is setting the pace as the leading producer for organic trout despite the stringent national/EU organic legislation. Production output over the past years has been promising with high demand from the European markets and more importantly Germany. The question raised is whether the economic performance of organic trout farms compares with the conventional trout farms and other organic agricultural farm types? Farm account statistics from Statistic Denmark using financial performance indicators like the degree of profitability and farm solvency ratio shows an impressive organic trout sector. Though organic trout farms could not generate enough income from farm assets in 2011 like the case in 2010, they picked up in 2012. Generally, organic trout farms tend to be equal or better in generating income per unit value of assets and have higher solvency ratios, indicating lower probability of default than alternative conventional trout farms and organic agricultural farms. An average organic trout farm was able to generate incomes of 8% per unit value of assets and a solvency rate of 28% for 2012, a value that economically outperforms other comparable farm units.

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Source: The Danish AgriFish Agency's Aquaculture register, October 24, 2014.

Markedsforhold for økologiske opdrætsfisk

1.0 Indledning

I dette afsnit gives en kort beskrivelse af udviklingen af de markedsmæssige forhold for produkter af/med danske økologiske akvakulturprodukter: Fisk, muslinger, tang og skaldyr – men med særlig fokus på økologiske fisk og produkter med disse – som status ser ud i foråret 2015.

Herefter beskrives så udtømmende som muligt hvilke produkter med danske økologiske akvakulturprodukter, der findes på henholdsvis det danske og de udenlandske markeder, samt hvem der producerer og markedsfører disse, med vægt på de danske hovedaktører.

2.0 Produkter

Da de første danske økologiske akvakulturprodukter så dagens lys på det danske marked (efteråret 2005) var det i form af opdrættede økologiske ørreder, som blev slagtet og solgt direkte fra dammene på Skravad Mølle Dambrug nord for Viborg.

De økologiske ørreder blev primært afsat til lokale forbrugere med hang til økologi – og til friske fisk direkte fra dammen.

Med tiden steg produktionen af de økologiske opdrætsørreder til en grad så der kunne garanteres kontinuerlige leverancer året rundt. Og i dag er antallet af akvakulturprodukter, som produceres i Danmark til konsum øget fra blot regnbueørred fra produktion i ferskvandsdambrug til at udgøre følgende liste af mulige produkter:

Ferskvandsdambrug:

- Portionsørred ørred i størrelser fra typisk ca. 200 gr/stk – 4000 gr/stk (flest omkring 200 – 500 g/stk)

Foto: Fiskehuset – Thisted

Den mest almindelige ørred, der produceres er en regnbueørred, men der produceres også bækørred, kildeørred og guldørred (en forædlet regnbueørred) i Danmark.

Havbrug:

- Ørred i størrelser fra typisk ca. 1000 gr/stk – 5000 gr/stk (flest omkring 3 – 4 kg/stk)

Foto: Bisserup Havbrug

Den mest almindelige ørred, der produceres er også her regnbueørred, men der produceres også guldørred (en forædlet regnbueørred) i Danmark.

Linemuslingeanlæg:

- blåmuslinger

Tanganlæg:

- sukkertang

Foto: Hjarnø Tanganlæg

Krebsebrug:

- flodkrebs

Foto: Villy J. Larsen, Dansk Akvakultur

3.0 Forarbejdning

Vigtige eksempler på forarbejdede produkter med danske økologiske akvakulturprodukter:

Danforel:

Røget økologisk ørredfilet. Vigtigste danske produkt med økologisk ørred i skrivende stund. Har flere gange været tilgængelig i danske detailbutikker. Mest hos IRMA. Stort eksportprodukt gennem længere årrække. Største aftagerlande er Schweiz, Italien og Tyskland.
Link til produktoversigt: http://www.danforel.com/Default.aspx?ID=5

Ravnstrup Mølle Ørredslagteri (RMØ):

Renset, is pakket hel ørred. Sælges i Danmark typisk til grossister, røgerier eller direkte til fiskebutikker. Godt eksportprodukt – særligt til tyske aftagere (grossister, røgerier mv.)
RMØ leverer desuden økologiske ørreder til en tysk aftager, der producerer babymad på dåse.
Link til hjemmeside: http://www.ravnstrup.dk/uk-fr.htm

Fiskehuset Thisted:

Indkøb af friske ferske økoørreder fra danske ferskvandsdambrug, som renses, evt. filletteres og evt. røges (kold- eller varmrøgning) før videresalg til diverse aftagere i hele Danmark. Også salg af øko-ørredrogn.
Link til produkt oversigt: http://www.fiskehuset.com/pl/%C3%98KOLOGISKE-%C3%B8rreder_6561.aspx

Bisserup Fisk:
Friske ferske økoørreder fra egen produktion i havbrug, som renses, evt. filletteres og evt. røges (kold- eller varmrøgning) før videresalg til diverse aftagere i hele Danmark. Hovedvægt på salg til restauranter, fiskehandlere og direkte til forbrugere – herunder stor-køkkener.
Link til hjemmeside: http://www.bisserupfisk.dk/

Musholm:
Friske ferske økoørreder fra egen produktion i havbrug, som renses, evt. filletteres og evt. røges (kold- eller varmrøgning) før videresalg til diverse aftagere i hele Danmark. Hovedvægt på salg til grossister, detail og stor-køkkener. Stort salg til eksport.
Link til hjemmeside: http://musholm.com/oekologi/

Vilsund Blue:
Friske ferske øko-blåmuslinger fra line-produktion. Sælges typisk som ferske muslinger i 1 kg's pakninger – eller som forkogte, frosne muslinger med skal i 1 kg's pakninger.
Hovedparten til eksport. I Danmark sælges mest til grossister, detail og stor-køkkener.
Link til hjemmeside: http://vilsund.com/

Hjarnø Havbrug (Tanganlæg):
Frisk ferske øko-sukkertang fra line-produktion. Helt nyt produkt. Sælges p.t som frossen tang i 2 kg's pakninger, til hvem som måtte henvende sig til producenten. Afsætningen er under udvikling.
Link til hjemmeside: http://www.havbrug.dk/

Vigtige eksempler på udenlandske økologiske akvakulturprodukter, hvor råvarer i form af eksempelvis frossen økologisk laks importeres til Danmark og forarbejdes på danske fabrikker - oftest med henblik på re-eksport:

Hjerting Laks:
Fersk og røget økologisk laks
Link til hjemmeside: http://hjerting-laks.dk/

Varde Laks:
Fersk og røget økologisk laks
Link til hjemmeside: http://www.vardelaks.dk/

Rossini Caviar:
Primært røget økologisk laks
Link til hjemmeside: http://www.rossinicaviar.com/

4.0 Markeder

Direkte salg:

Normalt foregår dette som såkaldt "stalddørssalg" – altså som fisk, der ketches op af dammen og straks efter renses og overrækkes til forbrugeren som et helt friskt produkt uden yderligere form for forarbejdning. Salget er ikke stort, men vigtigt for de lokale forbrugere og for fremvisning af erhvervet – eksempelvis i forbindelse med åbent hus arrangementer.

Fiskebutikker (specialbutikker):

En håndfuld danske fiskebutikker forhandler økologiske fisk – men salget er bestemt ikke overvældende. En årsag hertil kan være, at diverse tilladelser som skal søges dertil bliver opfattet som en barriere af fiskehandlerne.

Der findes dog også fiskehandlere som har taget de økologiske fisk til sig - eksempelvis:

- Fiskehuset – Thisted, Thisted
- Tvilling Fisk, København
- Fiskehallen Gilleleje, Gilleleje
- Kongsbak Lassen, København

Detailhandel:

I skrivende stund er det vigtigste produkt med økologiske fisk, som kontinuerligt findes i de danske detailbutikker vel nok en 100 gr's pakning med økologisk røget laks fra "Levevis". Et produkt som oven i købet fik en pris af Politiken i 2014.

Foto: Villy J. Larsen – Dansk Akvakultur

Danforels økologiske røgede ørredfilet i 125 gr's pakninger og Musholms økologiske havørredprodukter findes også mere eller mindre kontinuerligt hos IRMA. IRMA har klart det største sortiment med økologiske fisk og skaldyr. I 2015 har IRMA indgået et samarbejde med Fiskehallen i Gilleleje om levering af økologiske fisk og skaldyr.

I sommeren 2015 forventes økologiske linemuslinger fra Vilsund Blue at blive tilgængelige i et flertal af danske detailbutikker.

Foto: Villy J. Larsen – Dansk Akvakultur

Frosne økologiske varmtvandsrejer fra Fregat, forhandles ligeledes kontinuerligt i en række danske detailbutikker – herunder hos COOP.

Foto: Villy J. Larsen – Dansk Akvakultur

Foodservice:

Foodservice sektoren er de senere år blevet særligt interessant, efter indførsel af reglerne for det økologiske spisemærke, som netop kan opnås af storkøkkener, der indkøber flere og flere økologiske råvarer. Hertil kommer regeringens målsætning om minimum 60 % økologi i alle offentlige storkøkkener inden 2020.

Vigtigste grossister med levering til storkøkkener (visse steder med særlige leveringsaftaler til offentlige storkøkkener) hvor økologiske fisk og skaldyr indgår i sortimentet:

- Hørkram Foodservice: http://viewer.zmags.com/publication/233490a8#/233490a8/8 (særligt side 4 - 7)
- Inco
- Solhjulet
- Fiskehuset – Thisted
- Tvilling fisk
- Kongsbak Lassen
- Skagenfood

Eksport:

I 2015 eksporteres langt hovedparten, anslået 80 – 90 % af den samlede danske produktion af økologiske fisk og skaldyr, til udlandet – primært til Schweiz, Tyskland, Italien, Holland og Frankrig.

Læs et eksempel på dette arbejde i følgende rapport – særligt side 17 - 19:
http://pure.au.dk/portal/files/47780495/th_gersen_Haandbog_om_eksportparathed.pdf

Læs også følgende rapport om eksport af danske økologiske fødevarer:
http://pure.au.dk/portal/files/47780315/th_gersen_eksportstrategi.pdf

5.0 Del konklusion

Fra den første danske økologiske ørred lå tilgængelig for forbrugeren i 2005 og til i dag, er der sket en stor udvikling i tilgængelighed og sortimentsudbud for produkter med danske økologiske fisk og skaldyr.

Hertil kommer at danske opdrættere af økologisk opdrætsørred, økologiske blåmuslinger og økologisk tang er blandt Europas største producenter, hvilket har stor betydning for leverancesikkerhed til såvel forædling, som til forbrugerne.

6.0 Litteratur

DFU-rapport nr. 69. 1999. Vedrørende udvikling af en mærkningsmodel for økologisk akvakultur produktion. 28 p.

DFU-rapport nr. 146-05. 2005. Introduktion af økologi og kvalitetsmærkning på danske pionerdambrug. (Pedersen, L.-F., Larsen Villy J., Henriksen, Niels H.) 142 sider.

Forskningscenter for Økologisk Jordbrug og Fødevaresystemer. 2006. FØJO-rapport nr. 21. Økologisk fiskeopdræt. Rapport fra en vidensyntese om udviklingsmuligheder inden for økologisk fiskeopdræt i Danmark. 110 sider.

Havbrugsudvalget. 2003. Udvalget vedr. udviklingsmulighederne for saltvandsbaseret fiskeopdræt i Danmark. Ministeriet for Fødevarer, Landbrug og Fiskeri, 109 sider

Landbrugets Rådgivningscenter. 2001. Sektionen for Økologi. Omlægning til økologisk drift – før du går i gang. 26 sider

Landbrugsforlaget. 2003. Økologisk Landbrug. 232 sider ISBN: 87-7470-825-2

Larsen, F. & R.S. Rasmussen. 2004. Undersøgelse af fiskevelfærd, kvalitet og miljøbelastning i ørred- og åleopdræt. Litteraturgennemgang; rapport fra Ferskvandscentret, 151 sider.

Larsen, Villy J. 2008. Økologisk fiskeopdræt i New Zealand - 2008. Grøn Hverdag.

Pedersen, L.-F. & Larsen, V.J. 2002. Erfaringer med økologisk opdræt i England. Ferskvandsfiskeribladet, nr. 11, side 248-250.

Pedersen, L.-F. & Larsen, V.J. 2003. Økologisk ørred opdræt i Sverige. Dambrugeren, nr. 3 side 11-12.

Projekt: ”Introduktion af økologi/kvalitetsmærkning på danske pionerdambrug” (2001 - 2006)

Projekt: ”Implementering af økologisk produktion på en flerhed af danske fiskeopdrætsanlæg” (ØKOFISK II) (2006 – 2008)

Projekt: ”Udbredelse af information om økologisk fiskeopdræt i Danmark og aktuelle produkter herfra” (ØKOFISK-INFO) (2009 – 2013)

Projekt: ”Videreudvikling af dansk økologisk akvakultur”. (ØKØ-AKVA-1) (2010 – 2014)

Comparison of Seafood and Agricultural Ecological Premiums

Summary

The report compares ecolabelled seafood premiums observed in the market with consumers' stated willingness to pay premiums. Also ecolabelled premiums in the agricultural sector were examined. The next issue addressed was the sensitivity of changes in the price and premiums of ecolabelled seafood. Empirical findings showed that all things being equal, consumers stated willingness to pay reflects in their actual market behavior though they may pay less than stated. Premiums observed in the aquaculture (24-38%) appear to be generally higher than the fisheries (10-13%). Stated premiums for environmentally sound seafood production however ranged from 15-50%. In the agricultural sector, revealed premiums mostly seem to lie in range of 10-50% with few extremes and stated premiums in the range of 4-300%. Fresh and perishable organic food products tend to attract higher premiums. Stated premiums were conditioned on a number of factors but most evident was consumer's level of knowledge about ecolabel programs and the aesthetic quality comparable to conventional products. Though premiums varied by consumer segments, reduction in premiums were associated with increase in the number of consumers eager to switch to organic products. Also ecolabelled agricultural products generally appear to be more elastic than conventional products, an indication that reduction in prices would increase the market demand.

1. Introduction

Ecolabelling is a voluntary market based incentive created to reward producers who practice environmental or ecological sound principles. Consumers have generally shown positive attitudes towards the patronage and valuing of eco-food products. However, skepticism remains whether consumers have translated their willingness into real purchasing behavior. In this paper, evidence on consumers' willingness to pay premiums and the real premium paid on ecolabelled seafood products are gathered and compared along with other ecolabelled agriculture premiums. Furthermore, empirical evidence regarding the sensitivity of consumers to price premiums and the price elasticity of demand or price flexibilities for ecolabelled products are considered. This is important because information on price differentials between ecolabelled and conventional products are useful but not sufficient for policy purposes, needed in addition is the price sensitivity of demand. It gives information on whether the barrier of high ecolabel prices can be reduced to increase demand. The price elasticity is theoretically assumed to be equal to the reciprocal of the direct price flexibility estimated from inverse demand systems. However, in practice the reciprocal of the price flexibility is absolutely less than the true elasticity for reasons not discussed here (Nielsen, 1999 and Houck, 1965). Also of interest is the deduction from literature if the degree of premium paid varies with the degree of attributes associated with the ecolabel. For instance, are consumers' valuations of ecolabels with few attributes such as the MSC the same as Organic labels which have more strict requirements and principles? Sustainable or ecolabelled food products considered in this study are defined as products that have been produced under a set of standards that address environmental issues, animal welfare and/or social justice concerns, making it fit for a seal or logo.

The aquatic environment has not been immune to the movement of sustainability from various fractions consistently raising concerns about the overexploitation of resources and its effect on the environment. The demand for seafood[5] is on the increase as the per capita global fish

[5] Seafood - although has the word sea, which denotes marine origin – typically refers to all fish products such as shellfish and row, irrespective of the source ; aquaculture or wild caught, marine or freshwater (Cooke et al., 2011)

consumption changed from 10 kg to 19 kg from 1960 to 2012 (FAO, 2014). However, fish stocks in the oceans are depleting. This is driven by the fact that traditional command and control techniques are insufficient on their own to effectively address the challenges facing the fisheries industry, especially overexploitation (Roth et al., 2001). In attempt to meet the global demand for fish food, aquaculture has also evolved and production growth has been quite tremendous. It is anticipated that within the next few years fish demand from aquaculture would bypass the capture sector (ibid). The practice of fish farming has also come with various negative externalities that have been documented in literature (rf. Xie *et al*., 2013; Biao and Kaijin, 2007).

In order to maintain ecological balance, ecolabelling that rely on independent third-party verification that products meet certain environmental standards (Wessels, 2001) has been the tool used to create market based incentives for better management of the environment (Roheim *et al*., 2011). Ecolabels can be classified under one of the purposes of food labelling identified by Albert (2014); protect and promote health, protect the environment and promote sustainable production, promote social well-being and protect culture and in relation to new technologies. Ecolabels can also be classified by the degree or intensity of requirements needed to be observed. Within the seafood industry, Thrane *et al*. (2009) distinguish between single attribute and multi-attribute ecolabels. An example of the single attribute is Dolphin Safe Tuna which minimizes/avoids by-catch in fisheries. The multi-attribute was also disaggregated into those focusing on the environmental impact at the fishing stage (e.g. MSC) and those focusing on the entire life-cycle of the product chain (e.g. KRAV in Sweden). An organic label in the seafood industry is only possible in aquaculture and also focuses on the entire product chain. In most countries, aquaculture and agriculture fall under the same labelling system possibly due to high level of consumers' confidence in known labels (e.g. the red-Ø in Denmark, KRAV in Sweden, Naturland in Germany). The KRAV and Naturland which are organic in origin have also designed standards for fisheries. A question left for future inquiry is that given these different standards under the same label/logo, would consumers value organic aquaculture the same as fisheries ecolabels or as organic agriculture?

Other known labels are the Soil Association (UK), Label Rouge (France), Marine Ecolabel Japan and the now up and coming Aquaculture Stewardship Council founded in 2010. The most celebrated and studied seafood ecolabel is the MSC founded in 1997 with the coalition of World Wildlife Fund and Unilever. In 2014 for instance, the number of fisheries engaged in the MSC program was over 300 collectively accounting for 10 percent of global annual harvest of wild capture fisheries. The retail market value grew to $4.8 billion in over 100 countries (MSC, 2014). MSC is attributed a success in the creation of sustainable fish market rather than sustainable fisheries (Ponte, 2012), due to its inability to prove that its certification system has had positive environmental impacts and the marginalizing of fisheries in low income countries (ibid; Ponte, 2008).

Complying with the standards set for ecolabels comes with tradeoffs for producers that could result in reduced output, increased input costs and hence lost profits. Besides, the certification process also comes with associated costs. The implication is that consumers who opt for the environmentally friendly products need to compensate producers for the extra costs internalized to ensure continual protection of the ecological base. Hence, the necessary condition for price premiums is consumer's ability to differentiate products at the retail level (Blomquist et al., 2014) which is achieved with ecolabels. However, one should note that observing a premium at the downstream does not necessarily imply transmittal to the upstream level (Roheim *et al*., 2011 and Sogn-Grunvåg *et al.*, 2013), neither does it provide any information about the supply chain cost structures (Sogn-Grunvåg *et al.*, 2013). The existence of premium on ecolabels is an indication that consumers obtain higher utility when they

consume ecological food products. Likewise firms make higher profits and though sustainable production may not be achieved as pointed by Ponte (2012), it seems rational to keep providing food products with ecolabels to the market. The concerns raised at the beginning of the paper are addressed and where possible, intuitions and motivations for the observed premiums given. In the next section, a brief description is given about the structure or methods under which the study is organized, followed by the empirical evidence review and finally the conclusion of the paper.

2. Methods

This review was purely based on desktop literature search of peer reviewed journals and on few cases working papers or grey literature were included if found relevant. Much concentration was given on the European countries and where lacking other geographic areas added. The premiums reviewed were grouped under revealed and stated premiums for seafood and non-seafood (agriculture) products. Revealed premium shows those estimated from actual market purchases while the stated are estimated from consumers' willingness behaviors without actually purchasing the product. Data for the revealed approach were generally obtained from firms, retail scanner data and in-store personal observation while the stated ones were from consumer surveys and choice experiments done in person, mail, telephone or online. Consumer responses to price premiums were reviewed from stated preference studies while price elasticity/flexibility of demand was estimated from total market demand methods. Studies for ecolabelled agricultural products dominate the literature while the seafood is limited. No study was identified in relation to price elasticity of ecolabelled seafood possibly due to the fact that the ecolabelled seafood market is still young limiting data availability.

3. Empirical Evidences of Ecological Price Premiums

In this section, evidence on ecological premiums and price sensitivity are presented by grouping them under revealed and stated valuation findings as well as under seafood and non-seafood products. The order begins with revealed-seafood, revealed-agriculture, stated seafood and stated-agriculture.

3.1 Revealed Seafood Premiums along the Value Chain

This subsection puts together empirical evidence from the seafood market on observed premiums along the value chain. Aarset *et al*. (2000) appears to be the first seafood gray literature to estimate price premiums for organic salmon. The analysis was first based on the application of the LOP in a product space such that price differences between conventional and organic salmon result in non-integrated market if the two products are different (not considered substitutes). Aggregation for data characterized by irregular spacing of observations in time presented statistical problem. However, comparing actual price averages from 1996-1997 of the Norwegian producer Giga reveals that fresh organic salmon commanded a premium of *24%* while smoked organic salmon attracted a premium of *38%* compared to their conventional alternatives. Regression of the price differences on the destination countries (Germany, Japan, Belgium and Switzerland), distribution channels (retailer and restaurants) and product categories reveals less clear cut results on the respective premiums. But the authors observed that Germany and Switzerland were high premium buyers, signaling the value of ecolabels attached to salmon products in the countries compared. Norwegian restaurants and retailers were also attractive than importers, wholesalers and exporters. Nonetheless, a value added product (smoked salmon) attracted higher premium than fresh product which could be explained by the relative easiness in their preparations for consumption.

The succeeding analysis of ecolabelled seafood products using actual data have concentrated on the hedonic theory of explaining price formation based on the Lancastrian economics (Lancaster, 1966). The model assumes that the consumer has a demand function for each attribute inherent in a product and maximizes the utility linked to each attribute subject to a given budget constraint. Based on Rosen (1974), the product price is specified as a function of product attributes. Though such models have been used in disentangling product attributes, its application in the seafood sector using actual data started[6] with Roheim *et al*. (2011). Alternative ways identified in estimating the marginal willingness to pay premiums using observed market data is by inferring from inverse demand systems (Baltzer, 2004 and Smed, 2005).

Roheim *et al*. (2011) made use of IRI[7] Infoscan data in the London metropolitan market area. This analysis was a retail level data measuring product flow through supermarkets. The authors assessed how much premium is being paid by consumers of the MSC-certified seafood ecolabel specifically for frozen processed Alaska pollock products. The revealed premium was pegged at *13.3%* after controlling for product attributes like brand, product form, package sizes and process form. As opposed to our intuition from the results of Aarset *et al*. (2000) on value addition, the high value added products "breaded and battering" attracted low premium compared to "smoked". This is explained by the fact that value addition could be perceived as masking less quality products generated along the supply chain Roheim *et al*. (2011). They raised the fact that, observing premiums at the retail level does not indicate the prevalence of premiums at the producer level nor its transmittal. This could be explained by the existence of oligopsony market power in the ecolabelling supply chain exercised by supermarket retail chains. Thus the retail chains claim certification if they should purchase. This restricts producers who want to sell to certify their products even without premiums.

Blomquist *et al.* (2014) addressed this concern on premium transmission in the Swedish market for MSC-certified Baltic cod. Knowing the necessary condition for price premiums at the producer level is product differentiation at the retail level, the authors used personal observed in-store data to estimate a joint premium for ecolabels[8] of seafood at *10%*. At the upstream, *no* significant premium (-0.3%) was observed for MSC certified landings for fishermen in the cod fishery after conducting robust analysis on data from log books and landing tickets obtained from SwAM[9]. No general conclusion can be made on the flow of price premiums along the chain but at least for the Swedish cod fishery, this is the mystery revealed. One should treat this evidence with caution since the retail data was based on a simple difference test whiles the landings data was based on a more robust hedonic analysis. However, if this is indeed the case then one become curious whether the premium paid by consumers are retained by the retail chains who likely have market power or somewhere else along the supply chain.

In contrast to the production level evidence from Blomquist *et al.* (2014), Asche and Guillen (2012) had already studied price differences in the monthly data categorized according to the type of fishing gears in the Spanish hake market in Barcelona. It is known that MSC certifications are also associated with the type of fishing gear method, but this study was not based on MSC certified products. It is included due to its relevance in capturing the premium for various fishing gears. The more detrimental gears, trawl and gillnet were discounted at a premium of 1.74 euros and 4.39 euros per kg (approximately 15% and 50% respectively) compared to the long-line capture. Asche and Guillen (2012) indicate the implication is that,

[6] We are unaware of any gray literature that existed on hedonics of ecolabelled seafood before Roheim *et al*. (2011).
[7] Information Resource Inc.
[8] MSC and KRAV (a Swedish ecolabel)
[9] Swedish Agency for Marine and Water Management.

the perceived quality reduction when a trawl is used is assumed to be substantially less than the effect of gillnet.

A major limitation on the use of scanner data is its inability to provide the type of ecolabel affixed to the product, requiring Roheim et al. (2011) to resort to arduous means to discover such information. Hence Sogn-Grunvåg *et al.* (2013) made use of in-store observations from seven different retail supermarkets in the UK. Premiums were estimated for one of the sustainable capture methods, "line-caught" and MSC-certified chilled pre-packed cod and haddock products. Hedonics estimation revealed "line-caught" was rewarded for its sustainable concept with a premium of *18%* and *10%* for cod and haddock respectively. The MSC-ecolabel commanded marginal values of 10% premium on haddock products, a value that corroborates Roheim *et al*. (2011). Similarly in another study in the UK-Glasgow, Sogn-Grunvåg *et al.* (2014) conducted another in-store observation on cod and haddock. Considering the same sustainable features of the products, line-caught attracted a high premium of 24.6% over the fishing gear trawl. MSC labels were commanding a premium of 12.7%, also closer to previous estimations. The exceptional feature of this study was distinguishing between the value placed on private uncertified ecolabels such as "Forever Food" and "Birds Eye". These products turned out to be 10% cheaper than products without the ecolabels. An indication that there are some hidden complexities in the supply-demand relationships within and among the major processors or alternatively indicates a significant sensitivity to third party verifications.

The organic seafood (farmed fish) market in the UK was studied by Asche *et al*. (2012). Evidence revealed organic fish attracted a premium of *25%* while MSC labelled products had a premium of *13%* for a wide range of fresh chilled and frozen farmed and wild salmon products. This differential in premiums between the two ecolabels is expected as it is more costly to provide organic seafood given its comprehensive requirements. The authors observe however, a substantial variation in MSC premiums across retail chains while organic premiums remained stable. The summary of findings for revealed and stated empirical studies for seafood is shown in Table 3.1, while the premium range for this subsection is presented in Table 3.2.

Table 3.1 Study Characteristics of Seafood Ecolabelled/Sustainability Premium

Study	Product	Country	Year	Premium	Value Chain Level	Data Source	Type of Sustainable Practice
Seafood: Revealed:							
Aarset *et al*. (2000)	Fresh Salmon	Norway	1996-1997	24.0	Producer/ Processing	Giga-Producer	Organic
"	Smoked Salmon	"	"	38.0	"	"	"
Roheim *et al*. (2011)	frozen processed Alaska pollock	UK	2007-2008	13.0	Retail	IRI Infoscan	MSC
Blomquist *et al.* (2014)	Baltic cod	Sweden	2011-2012	10.0	Retail	Personal Store Observation	MSC+KRAV
"	"	"	"	0.3	Landings	Landing ticket+log books	Non-MSC
Asche and Guillen (2012)	Hake	Spain	1998-2004	15.0	Wholesale	Mercabarna Wholesale Market	Long-line/trawl
"	"	"	"	50.0	"	"	Long-line/gillnet

Sogn-Grunvåg *et al.* (2013)	chilled cod	UK	2010-2012	18.0	Retail	In-store Observation	line-caught
"	chilled haddock	"	"	10.0	"	"	line-caught
"	chilled haddock	"	"	10.0	"	"	MSC
Sogn-Grunvåg *et al.* (2014)	cod and haddock	UK	2010-2012	25.0	Retail	In-store Observation	line-caught
"	"	"	"	13.0	"	"	MSC
"	"	"	"	10.0	"	"	Certified/Private noncertified
Asche et al. (2012)	wild salmon	UK	2012-2013	13.0	Retail	In-store Observation	MSC
"	farmed salmon	"	"	25.0	"	"	Organic
Seafood: Stated:							
Olesen *et al*. (2010)	Salmon	Norway	2010	15.0	Retail	Choice Experiment	Animal Welfare
"	"	"	"	17.0	"	"	Organic
Rudd et al. (2011)	Salmon	Canada	2011	35-50	Retail	Choice Experiment	Reduced PCBs
Uchida et al. (2014a)	Salmon	Japan	2014	26.0	Retail	Choice Experiment	Ecolabel
"	"	"	"	44.0	"	"	EcolabelxLocal
Uchida et al. (2014b)	Salmon	Japan	2014	20.0	Retail	Auction	MSC

" indicates – the same value as the previous cell, * non-ecolabel but relevant for its environmental/ecological implication. A/B indicates the premium of A relative to B (thus, B received a discounted). Source: Author's Compilation

How sensitive are consumers to price premiums of ecolabelled seafood. Studies analyzing quantity-price sensitivities in the framework of demand systems for sustainable seafood rarely exist. However, it could be inferred that sustainable fishery practices could lead to better fish quality in the context of EU freshness grading. Hence Roth *et al*. (2000) explored the demand for fish quality in Denmark using an inverse almost ideal demand system to estimate price flexibilities. It was revealed that for cod and salmon, own price flexibilities were larger for Quality-Extra (-0.8 and -1) than A-quality (-0.4). The reverse was seen for plaice and mackerel with the respective Quality-extra of (-0.3,-0.8) and A-quality (-0.7,-0.8) own price flexibilities. By inversion, the lower the price flexibility the higher the elasticity and a value of less -1 indicate that price is flexible.

Table 3.2 Summary: Revealed Premium Range for Seafood

Type of Ecolabel	Premium Range (%)
Organic Aquaculture	24 - 38
MSC in Fisheries	10 - 13
Fishing Methods	10 - 50

3.2 Revealed Agriculture Price Premiums and Demand Elasticities

How much premium has been paid on agriculture food products produced from ecologically sound practices? Beginning with the hedonic related modeling of price premiums, Galarraga and Markandya (2004) observed prices from five UK retail markets between 1997 and 1998. Analysis of the data revealed consumers were paying a premium of about 10.7% for fair-trade/organic coffee compared to their conventional counterparts. On the Italian market,

Carlucci *et al*. (2013) identified yoghurt to be a highly differentiated product such that the products price formation was influenced by a number of functional attributes. Among these, it was evident that consumers pay a marginal price of 28% if the yoghurt was labelled as organic in the retail stores.

In a comparative study of the actual household demand for organic food products in Denmark and Great Britain, Wier et al. (2008) estimated the average premium of organic products as compared to the conventional variants of the same product and for different user groups. The average price premium for organic milk was considerably higher in Britain (40%) than Denmark (15%) and the difference was explained by the excess supply of organic milk due to favorable government subsidies in Denmark at the time. In Denmark, the highest premiums were organic fruit (43%) followed by eggs (40%). In Britain eggs accounted for the highest premium of 133% followed by vegetables (73%). Generally, premiums ranged from 25 to 133% in Britain and 13 to 43% for Denmark. These countries compared to other European countries sell greater share of organic food products through the mainstream conventional retail channels. As indicated by Hamm et al. (2002) supermarket chains in Denmark have been much quicker including organic product lines in their shelves than other countries and this has the advantage of selling at a lower price premium. According to Økologisk Landsforening (2013), 90% of organic food in Denmark is sold via discounters, supermarkets and warehouses along with conventional while less than 10% are sold in specialized organic food alternative joints.

Baltzer (2004) use actual purchasing weekly data from COOP Denmark A/S to estimate the marginal willingness to pay for egg varieties in the framework of the Almost Ideal Inverse Demand System. Among the varieties of eggs, organic eggs commanded the highest marginal willingness to pay premium of 58%, barn eggs, 43%, free-range eggs 15% and pasteurized eggs 28%. The barn eggs and free-range varieties indicate various degrees of animal welfare in the production process, which is valued less compared to the organic. Similarly, Smed (2005) identified consumer willingness to pay organic premiums for Gfk scanner data for the period 2000-2002 for skimmed milk to be 7%, 21% and 8% in three periods where different milk varieties were introduced to the market. Respectively, organic light milk attracted 9%, 14% and 7% while organic whole milk attracted 12%, 11% and 21% premiums in the periods. At least in Denmark and most countries, the premiums on ecolabelled products are estimated to be positive, indicating consumers are rewarding production practices that internalize environmental costs.

But how sensitive are consumers to the price of ecolabelled products? Wier et al. (2001) estimated elasticities for organic foods using the GfK store level scanner data from 1997-1998. Results showed that quantities demanded were more sensitive to own price changes for organic foods (-2.27) than for conventional foods (-1.13). A sensitivity analysis showed that a decrease in the price premium of 20% increases the consumption share of organic dairy and meat products from 10% – 15% , bread and cereal products increase from 5% - 7%, fruit and vegetable products increase from 4% - 6%. This indicates that price is an obstacle to organic consumption as lower price premiums induce considerable portion of consumers to buy more organic products. In both a standard and variety demand models, Baltzer (2004) show evidence of elasticities greater than unity for all egg varieties. At low levels of demand, organic eggs were valued highly than welfare (barn and free-range) and pasteurized eggs while at high demand levels, egg varieties appear to converge at low price premiums. Similarly in the Danish milk market, Smed (2005) showed that the elasticity of demand for organic light and skimmed milk were higher than their conventional substitutes except for whole milk.

Does the above trend apply to other European markets? Jonas and Rosen (2008) used GfK data from the period 2000-2003 from the German milk market to determine price elasticities. In their result, own price elasticities for conventional milk was almost unity (-1). The demand for

organic milk on the other hand was estimated to be highly price-elastic product (-10). Monier et al. (2009) similarly explores the French market for organic milk and eggs from the TNS Worldpanel data for 1998-2005. For the two products, conventional demand were more or less unitary price-elastic (-0.78 for eggs and -1.02 for milk). In the organic market, situations contrasted as demand was more price elastic for eggs (-2.38) and price-inelastic for milk (-0.38). The French market typically contrasts the German milk market for organic milk. In a more recent market analysis Schröck (2012) also contrasts the findings of Jonas and Rosen (2008) in the German milk market using the same GfK Homescan panel data but for a latter period (2004-2008). Estimated own price elasticities for both organic and conventional milk were less than unitary. Though the contrasting elasticities in Jonas and Rosen (2008) and Schröck (2012) could be due to differences in methodologies and assumptions towards elasticity estimation, one could also ask if consumer behavior is changing over time due to some structural changes.

Fourmouzi *et al.* (2012) relied on the Taylor Nelson Sofres (TNS) British household panel data from 2005-2006 to analyze demand systems for organic and conventional fruits and vegetables. The conventional and organic groups of each product appeared to be direct substitutes, and the organic were seen as luxury goods. With respect to each product's own price elasticities, conclusions showed organic vegetables and fruits were highly price elastic compared to their non-organic counterparts. The respective estimated own price elasticities for organic fruits and vegetables were -1.59 and -1.39. The conventional on the other hand was -0.50 for both products. Generally, the sensitivity of demand to prices varies from consumption markets due to differences in methodological estimations and consumer preference heterogeneity. However, evidence revealed here suggests that the demand sensitivity to prices of ecolabelled food products is higher[10] than the conventional substitutes. Implying that the ecolabelled product price development presents an interesting mechanism as significant fall in prices would increase demand, all things being equal.

Table 3.3 Summary: Revealed Premium Range for Agriculture

Type of Ecolabel	Premium Range (%)
Organic in Agriculture	10 – 50 (133)
Welfare related	15 - 40

Value in parenthesis is extreme upper bound premium

3.3 Stated Seafood Ecological Premiums

Knowing how much consumers have been paying on food products labelled to be ecological, we review evidences on the stated premiums. Thus, how much did consumers indicate they were willing to pay on food products that address their concern relating to environmental and ethical issues? Beginning with Olesen *et al*. (2010), the authors applied a non-hypothetical choice experiment to evaluate how much consumers in Norway were willing to pay for organic and welfare-labelled farmed salmon. All things being equal, consumers were willing to pay a price premium of *15%* and *17%* respectively for organic and welfare-labelled salmon as compared to the conventional alternatives. Premium for the organic salmon however varied by color, such that, a paler organic salmon[11] resulting from the restrictive pigment additives in feed led to a price less than the conventional and welfare-labelled salmon. The colour of food is used as an indication for food quality and so though premium foods may be desired by consumers, a resulting reduction in the aesthetic property could significantly lead to discounts.

[10] Except for the French milk market in Monier et al. (2009) and Shrock (2012) in Germany.

[11] Salmon fed from feed approved by the British Soil Association with strict restriction on pigment additives i.e. allow only natural additives.

As further indicated by Olesen *et al*. (2010), the *2%* premium difference is an indication of close substitutability and/or diminishing marginal returns for added attributes, given the comprehensive nature of the organic salmon compared to the welfare. On the colour effects, Alfnes *et al*. (2006) found the effect of colour on willingness to pay for salmon was concave in nature as colour changes from paler to redder colour. This indicates that the optimal colour to achieve a good price as a producer lies between the extremes; possibly equivalent to the known conventional salmon colour.

Looking at the tradeoff of Canadian consumers in Ontario are willing to make between the types of production and health attributes of salmon, Rudd *et al*. (2011) considers attributes like the local impacts on the environment, level of omega 3 fatty acids, level of PCBs in flesh and the region of origin. Based on internet survey choice experiments, it was shown that producers who reduced the environmental impacts of salmon production attracted modest premiums, thus consumers cared less about the environmental soundness of salmon production. However, they were strongly averse to increased levels of PCBs, such that their wiliness to pay tradeoff for reduced PCBs was within the range of *35%-50%*. This implied the promising market for salmon production using reduced levels of fish meal and fish oils. In a qualitative study in the neighboring US, O'Dierno et al. (2006) estimated qualitatively that about 14 percent of consumers were willing to pay 50% or more premium on organically grown seafood through a telephone survey for selected markets. On the other hand, 21 percent were willing to pay up to 50% more premium over a conventional seafood costing $1 per pound (identified in females with larger household size). Thus, more consumers are attracted to lower premiums, than higher ones.

Price premiums paid on ecolabelled seafood were shown to be inhibited by the lack of information dissemination to consumers in Uchida *et al*. (2014b) for Japanese consumers. Using a sealed bid second price auction to elicit the willingness to pay for consumers in Tokyo, it was revealed consumers were willing to pay a premium of *20%* for MSC ecolabelled salmon. This premium was only observed after participants were provided information on the global status of fish stocks and the purpose of MSC label program. Hence, the key to unlocking the potential in ecological seafood products according to Uchida *et al*. (2014b) is to inform consumers about the need for ecolabelling. Similarly in Denmark, Daugbjerg *et al*. (2014) and Smed and Anderson (2012) confirm this information effect that in order to promote green consumption effectively or increase the probability of organic volume shares, ecolabelling schemes must be accompanied by information campaigns on the production aspects covered by the label to ensure consumer understanding or provide information regarding the negative aspects of the conventional systems. The lack of adequate knowledge may undermine the potential of eco-labelling as an environmental policy instrument. According to Uchida et al. (2014a), the ways in which consumers perceive information (positively or negatively) affect their valuation of the ecolabelled product. Perceived positive information (information accepted to be interesting and credible) increases ecolabelled seafood products while exaggerated information has insignificant effect on the willingness to pay. Consumers in Japan were found to be willing to pay 26% for ecolabelled salmon, 44% if ecolabelled salmon was produced locally in Hokkaido.

Though price premiums on ecolabelled food products may serve to encourage the adoption of sound and ethical production practices, consumers react to the magnitude of the premium. For example, Johnston et al. (2001) found in a comparative contingent valuation study that at no premium, the probability of choosing certified ecolabelled salmon and cod was 88% for US consumers and 74% for Norwegian consumers. However, an increase in price premium to 50% for the ecolabelled seafood reduced the US consumers' probability of choosing the premium food to 68% and Norwegians to 32%. This reveals that the sensitivity of consumers to price

premium changes is quite heterogeneous across geographic markets. Wessesls *et al*. (1999) also used similar approach and found a positive premium price difference averaging $1.5 between certified and uncertified cod and salmon in the US. Further analysis showed that consumers were less likely to choose certified products over uncertified products for an increase in premium. This effect was shown to be greater for cod than for salmon. Estimates from a conjoint analysis from Jaffry et al. (2000) indicate that consumers in Denmark and UK were willing to pay a premium of £ 0.7 pounds for seafood certified as coming from sustainably managed fishery, thus, an MSC-like certification system.

Most studies using the stated preference approach provide the general backing that consumers have positive attitudes towards ecologically friendly seafood products. These studies usually estimate the probabilities of choosing such foods, consumers' perception and motivations. For example evidence in the UK suggests that the presence of a label conveying a fish coming from sustainably managed fishery, for cod fillets increases the probability of being chosen by 7% compared to a fish with quality label. This was the largest effect among all attributes and fish species that were investigated (Jaffry *et al.*, 2004). Other studies include Donath (1999), Brécard et al. (2009), Salladarré et al. (2010) and Johnston and Roheim (2006) who show consumers have varying positive attitudes towards ecolabelled seafood products but few estimate willingness to pay premiums for various environmental/ecological attributes.

Table 3.4 Summary: Stated Premium Range for Seafood

Type of Ecolabel	Premium Range (%)
Organic	17 - 50
Chemical Residues	35 - 50

3.4 Stated Agriculture Ecological Premiums

For studies based on consumers' willingness to pay premium for agriculture products, a lot of studies have been conducted in many EU countries and around the world. Stated premiums reported from consumers have generally shown a positive support with varying motives and perceptions. Diving peripherally on evidences, Wier and Calverley (2002) provide a review of earlier[12] studies on consumer willingness to pay premiums. It is indicated that 5-30 percent of consumers buy organic food when the premium is higher than 30%, premiums of 10-30% attract 10-50 percent of consumers whiles premiums between 5-10% attract 45-80 percent of consumers. This illustrates that though consumers indicate positive willingness to pay premiums, they are quite sensitive to prices as lower premiums will increase the patronage of ecolabelled food products.

Among the Danish households, consumer preferences for organic and locally produced apples compared to an apple imported from outside the EU was investigated by Denver and Jensen (2014) in an online panel survey. For high perceived organic consumers, the willingness to pay premium was 12.20 DKK/kg (174%) for organic apples and 22.60 DKK/kg (323%) for locally produced apples compared to a price of 7 DKK/kg for conventional apple from outside of EU. The average and neutral perceived organic consumers on the other hand have respective premiums of 5.40 DKK/kg (*77%)* and 19 DKK/kg (*271%)* for organic and local apples. Janssen and Hamm (2012) advice for organic products to be labelled with well-known organic certification logos that consumers trust. The study which covers selected European countries estimated the willingness to pay premiums for organic eggs and apples. In Denmark for instance, the government organic logo commanded the highest premium of 52% and 54% respectively for apples and eggs as compared with the old EU and Demeter logos for organic.

[12] 2000 and beyond.

Similar trend was observed in Germany (51%, 92%) and Czech Republic (56%, 53%) respectively for apples and eggs. For UK, Switzerland and Italy, the highest premium was observed for labels that were well-known and trusted with perceived strict organic standards and control systems.

In the cities of Navarra and Madrid in Spain, Gil *et al.* (2000) used a direct contingent valuation method to estimate consumers' willingness to pay premiums for organic food products. For both potential and actual organic consumers, willingness to pay premiums were similar ranging from 15%-25% while the "unlikely consumers" were reluctant to pay premiums. Among the range of products, the premium was higher for meat, fruits and vegetables indicating that organic attributes are more valued in fresh and perishable products. The valuation of meat was attributed to the food scares that had taken place in Europe, like BSE and dioxins. Ureña *et al.* (2008) investigated regular food shoppers for home consumption in Castilla-La Mancha (Spain). Among products analyzed, fruits and vegetables were products for which a higher percentage of consumers were willing to pay a premium with very extreme price sensitivity. Thus, at 5% premium on organic fruits, 83.7% of the respondents were willing to pay a price premium while at 20% premium, only 42.2% showed some willingness to pay. The highest premiums observed for all consumers were fruit (17%), dairy (16%) and vegetable and tubers (15%). Dried fruits, jam and medicinal/aromatic plants attracted lower premiums of 4%, 6% and 7% respectively. The distribution of premiums varied with the type of consumers (regular or irregular organic consumers). The result corroborates the findings of Gil et al. (2000) that, valuation of organic products depends on the degree of perishability of the product; as fresh products tend to attract higher premiums.

Table 3.5 Summary: Stated Premium Range for Agriculture

Type of Ecolabel	Premium Range (%)
Organic	10 – 100 (4-330)

Value in parenthesis is extreme lower-upper bound premium ranges

4. Conclusion

Ecolabelling as a tool for managing the environmental impact of the seafood industry has gained immense recognition over the last decade. This has led to the proliferation of various ecolabels used as a means of creating market based incentives to encourage the adoption of ecologically sound practices. Though it is yet to be proven whether these ecolabels have achieved sustainable fisheries, there is no doubt the creation of sustainable fish markets have been successful especially at the retail sector. The success has been driven by firms profit motives and high utility arising from consumption. Ecolabels for aquaculture are also growing. Skepticism limits the adoption of environmentally good practices at the production level due to the fear of not been rewarded with the costs internalized. Studies on green consumerism indicate that consumers are willing to reward producers of eco-products, but whether consumers are actually paying premiums is a concern still in debate. In this study, stated premiums in the seafood industry were compared to revealed premiums and for other ecolabelled agricultural products. Also, consumer responses to premium changes and the price elasticity/flexibility of demand for ecolabelled products were considered.

Findings confirm the general assertion that consumers are willing to pay premium for ecolabelled food to reward producers who adopt sound environmental practices. These positive attitudes have also reflected in actual purchasing behaviors though paid premiums may differ from stated premiums. For example, with the exception of landing prices for MSC-certified Baltic cod in Sweden all ecolabelled seafood certified by a third party has associated positive premiums. For revealed ecolabelled seafood premiums, organic aquaculture premiums lie in the range of 24-38% which was higher than fisheries (especially MSC) with 10-13%. Other

sustainable fishing methods like the line caught attracted premiums from 10-25% while unsustainable fishing methods were discounted due to the perceived reduction in the quality of the fish. Another observation was that private ecolabels were discounted since such labels lack third party certification and hence an indication of minimal trusts in the supply system. Value added seafood products can command higher premiums but the type of value addition (processing) could also be perceived as masking bad product quality and lead to a discount.

From the limited stated premium studies, premiums for seafood ranged from 15-50%. Organic labels which have much broader standards tend to be valued higher than labels with narrower standards such as fish welfare. Consumers appear to be willing to place higher values on farm related labels than fisheries while issues of chemical pollutants that affect health through fish consumption tend to be valued much higher than environmental concerns. Within the agricultural sector, organic labels were dominant in studies and values placed on products varied a lot. Many of the actual estimated premiums lied in the range of 10-50% with few extremes. Compared to Aarset *et al*. (2000) on organic products with existence of premiums, the range identified in Europe was 12-50% between 1995 and 1997. One should take these figures with caution since the plethora of studies on organic agriculture could not all be reviewed. For stated agriculture products, premiums varied by the degree of perishability and freshness of the product (thus, valuing as low as 4% or high as 300%). These premium observations were influenced by consumers having in-depth knowledge (information effect) about the ecolabel and maintaining an aesthetic quality similar to the conventional products.

Whereas higher price premiums on ecolabelled products serve as market-based incentives, consumers of ecological food products are more sensitive to the price gap. It was evident that the numbers of consumers tend to increase for reduced premiums. Premiums also varied by consumer segments. Likewise, the price elasticity of demand for ecolabelled non-seafood products was found to be generally more elastic than conventional food products. This has significant implication for policy since mechanisms developed to cause reduction in ecolabelled prices would increase the demand for ecolabelled products. Not the same can be said about the elasticities of ecolabelled seafood products given the nonexistence of related demand system inquiries. A limitation identified in this study was that studies differed spatio-temporally, by the type of product or markets and study methods. This creates difficulty in critical and specific comparison, leading to abstraction of results.

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Consumer perception towards organic fish

Our literature study reflects that only a few studies have focused on organic fish consumption and consumer behavior, although consumer preferences are the driving factor behind the growth of organic aquaculture. Despite the rapid growth, organic aquaculture is still in its infancy, and organic aquaculture products still represent a market niche.

Robertson et al. (1999) conducted a survey of New England residents to understand consumers' knowledge and attitudes towards marine aquaculture and found that most respondents (53.6 percent) were unfamiliar with aquaculture. Although aquaculture is increasingly supplying the American market, many consumers still do not have a clear understanding of fish farming.

A Greek study Batzios (2003b) showed that Greek consumers have a greater preference for exploitable shellfish than for cultured ones. This seems to be the case for aquaculture products in general. The study mentions urban consumers as an exception. They seem to have overcome this habit. The reason for this mistrust is lack of confidence Greek consumer's exhibit towards cultured fish and seafood in general, owing to the fact that they have not had adequate information on cultured fish nutrition and the possible existence of veterinary drug residues in the edible tissues, or consider their taste unsatisfactory. (Batzios, 2003b/2003a).

A consumer study by Aarset et al. (2000) documented consumer perceptions of farmed organic salmon production in five countries (France, Germany, Norway, Spain and United Kingdom) and found that, overall, the majority of consumers remained doubtful that salmon could be farmed organically. In the figure below the main conclusions from the five countries are presented.

France	**Germany**	**Norway**	**Spain**	**UK**
Should be healthier and taste better Might be too expensive	Very ignorant of fish farming practice Concerns of potential practices related primarily to personal health No "artificial" inputs should be used at all	Knowledge of practice Doubtful of suitability of salmon for organic production	Unaware salmon farmed Negative view of concept of farming fish Organic should taste better	Quite ignorant of fish farming practice Doubtful of suitability of salmon for organic production

Fig 1. Views towards the concept of organically farmed salmon Aarset et al. (2000)

A number of respondents from all five countries questioned whether salmon that was farmed could ever be organic, although they appeared less skeptical about other farmed species, organic pigs for example. This might be due, in part, to the fact that salmon is seen as a "wild" species. This is not altogether surprising, given that wild capture fish supplies still greatly outnumber those from farmed sources in the major international markets (FAO, 2000).

Many of the Spanish consumers and some from other countries were unaware that the Atlantic salmon they ate was most likely to be farmed. There were also some difficulties in defining the term “artificial input” for many respondents, although it was generally seen as something that should be minimized or avoided. Some respondents felt that medication could be an exception although German consumers in particular appeared very concerned about their use. A number of specific issues relating to stocking density, appropriate food inputs and other production concerns were discussed in the groups. *(Aarset, 2004)*

There is also the potential for farmed salmon to affect general perceptions of organic food in a negative way if it is perceived to be anything less than organic. Once again, the picture overall is negative and provides little good news for regulators, producers or indeed certifiers. Establishing credible standards for organic farmed salmon may prove difficult as most respondents were ignorant of current fish farming practices and had a somewhat idealistic view of how fish are farmed. It may be that a labelling scheme based on a “green” grading system would be more appropriate than the use of the term organic for a fish product that has been farmed. *(Aarset, 2004)*

O’Dierno et al. (2006) showed that 62% of consumers in the USA purchased organic seafood products in general from time to time, 13% were committed to the purchase of organic items whenever possible and 23% never purchased them. In contrast, approximately 25% of the respondents expressed the belief that organic seafood products are not significantly different from conventional seafood products and should not have higher prices. In addition, it is interesting that statistically significant linkages were found between the cluster solutions and monthly family disposable income, educational level, and householder age. These results support findings from previous studies (Batzios et al., 2003a; Ward et al., 2004) that showed that income, age and education are the principal determinants of consumers’ behavior towards organic production and certified food products. O’Dierno et al. (2006) found a correlation between consumers’ educational level and interest in purchasing organic seafood. Consumers in the over-65 group were less interested in purchasing organic seafood, but the committed consumers in this age category were willing to pay a significant price differential.

In Olesen et al (2010) the *appearance* of the salmon meat is discussed. Since the appearance of the food is important for most consumers, it is vital for the success of organic salmon that the organic feed producers will be able to produce an organic feed with better pigmentation ability at an acceptable price. The organic salmon used in this study (Olesen, 2010) were fed food approved by the British Soil Association, which applies strict criteria for the pigment additives, allowing only natural additives such as shrimp shells. The new Norwegian standards for organic salmon that permit pigmentation additives in the feeds from algae, yeast, and bacteria makes it easier for the feed producers to produce certified organic feed with good pigmentation ability. The color issue is also discussed in Pelletier and Tyedmers, (2013).

In Vanhonacker et al (2013) the general consumer *perception* toward sustainable production is analyzed through a web-based survey to 221 participants. Many consumers underestimate the ecological impact of animal production. Well-known alternatives such as organic meat, moderation of meat consumption and sustainable fish are accepted, although willingness to pay is clearly lower than willingness to consume. Alternatives for more sustainable meat

consumption were suggested and from the list of alternatives towards a more sustainable diet presented to the participants, reduced meat consumption (amount of meat per meal) was the most popular, followed by consuming sustainable farmed fish, meat types with lower environmental impact and organic meat. These alternatives all received a distinct positive evaluation score and were perceived as good, realistic and acceptable alternatives that would provide effective and long term solutions (Vanhonacker et al, 2013).

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Trends og tendenser

Denne gennemgang af trends og tendensers betydning for fremtidigt salg af økologiske produceret ørred, skal ses som et subjektivt øjebliks billede, baseret på observationer foretaget på tradeshows, branchens magasiner, diverse rapporter og ikke mindst general viden om forbrugere og fødevarer.

Husholdningerne i de industrialiserede lande har gennemløbet en dramatisk udvikling de seneste 50 år. Fra traditionelle familiebaserede husholdninger til i dag, hvor 40 % af samtlige husholdninger i de større byer består af en enkelt voksen, med eller uden børn. Denne udvikling er sket samtidig med, at gennemsnitslevealderen er forøget og at de ældre aldersgrupper er blevet mere købedygtige.

Denne udvikling er klart slået igennem på produkter som økologisk ørred, i form af mindre pakninger og slag af mindre fisk. Den traditionelle forbruger af opdrætsørred har været tysktalende husholdning med en gennemsnitsalder på over 50 år. Potionsørred har været det dominerende produkt og har været en relativ billig råvare.

I dag vil sådanne produkter ikke appellerer til single husholdningerne. Enten skal ørreden være forarbejdet, dvs. fileteret og røget eller også skal den indgå i et convient produkt, som salat, tærte eller burgerbolle. Den mest udbredte trend er i dag, ready to eat produkter til de mindre måltider og ready to cook produkter, der kan tilberedes/anrettes med mindst mulig indsats i de mindre husholdninger.

Vurderingen er at de økologiske produkter fra danske virksomheder der pt. er på markedet, følger denne udvikling ganske godt.

Fremtidige tendenser

At spå om fremtiden er altid forbundet med problemer. Men der er flere parametre, der kan inddrages.

Befolkninger i de industrialiserede lande bliver ældre. Landene bliver mere præget af multikulturelle strømninger, især indenfor madkultur. Tidligere tiders fysiske arbejde bliver afløst af IT-baseret aktiviteter. Der sker en koncentration af befolkningerne i større bysamfund, med deraf følgende ”fremmedgørelse” overfor fødevareproduktion. Information bærere som labels og anden anprisning vil få endnu større betydning.

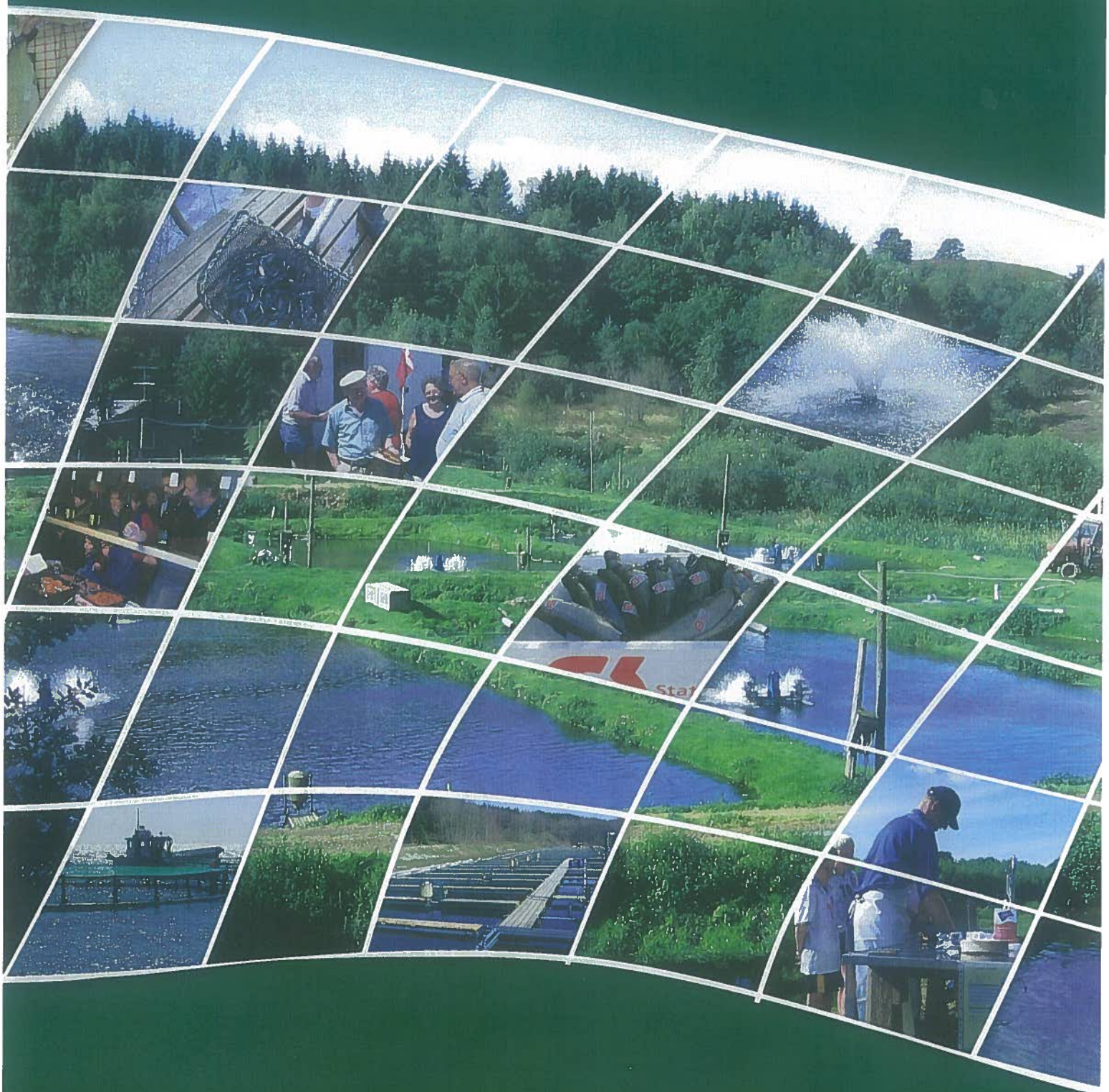
Hvis alle disse tendenser ses under et, så vil et specielt produkt som økologisk ørred have gunstige markedsvilkår. Det vil opfylde forbrugerens ønske om ”tættere på naturen” produktion, kunne anvendes til at differentierer den enkelte forbruger fra mængden, med information om at jeg spiser økologisk fisk – dermed er jeg bæredygtig og naturvenlig.

Catering branchen vil fortsat blive udbygget. De forbrugere der ikke selv ser sig i stand til at tilberede fisk/fiskeprodukter, vil være oplagte kunder til ready too eat produkter. I USA finder størstedelen af fiskeforbruget sted udenfor de enkelte husholdninger.

Vil opdrætsbranchen være klar til, at tage disse fremtidige tendenser op og indarbejde dem i deres produkt portefølje? Der sker en stadig innovation indenfor de enkelte produkttyper – der kan blot henvises til det seneste seafood show i Bruxelles i april 2015. Denne udvikling genfindes i produktionen af økologisk ørred, så der er rigelig plads til at udvide produkt sortimentet.

Kvalitet

af opdrætsørred



Fra opdræt til forbruger

Kvalitet – en fælles sag

Fra æg til færdig fisk

Dansk akvakultur er inde i en omstillingsproces. De danske forbrugere efterspørger i stigende grad produkter direkte fra producenten. Hermed er der åbnet op for etablering af direkte salg fra de danske dambrug/havbrug til forbrugerne. Et stigende antal dambrug sælger i dag fisk direkte ved "stalddøren", eller har taget næste skridt og åbnet en "dambrugs-butik". Dette hæfte kan forhåbentlig give inspiration og nyttig oplysning til dambrugeren omkring spørgsmål om kvalitet og andre emner, der optager forbrugerne, når de køber opdrættet fisk.

Produktion af gode og sunde spisefisk er en tillidssag, hvor både avlsdambrug, yngeldambrug, foderproducent, produktionsdambrug/havbrug alle har et ansvar for, at det færdige produkt er et sundt og velsmagende produkt, som danske forbrugere kan nyde godt af.

I produktionskæden er det vigtigt hele tiden, at have fiskens kvalitet for øje. Kvalitet kan betyde mange ting. Det kan være hos avlsdambrugene der har ansvar for, at øjenæg eller yngel, der leveres til yngeldambrugene har de rette genetiske egenskaber, der giver grundlag for opdræt af kvalitetsfisk uden deformitet og tidlig kønsmodning.

Kvalitet i yngelopdræt kan betyde, at opdrættet sker under gode forhold, så der ikke opstår gælleproblemer, der senere giver deforme og grimme gællelåg. Samtidig skal fiskene holdes i så godt et opdrætsmiljø, at behovet for medicinering og brug af hjælpestoffer minimeres.

I produktionsdambrugene, hvor det endelige opdræt til færdig spisefisk foregår, skal fiskene holdes under forhold, hvor naturlige vækstrater giver en velproportioneret fisk. Samtidig skal opdrættet foregå med størst mulig hensyn til dyrevelfærd, og mindst mulig brug af antibiotika og hjælpestoffer.

Foderfabrikanterne har ansvar for at anvende råvarer, der i opdrættet giver sunde og velsmagende fisk.

Kvalitet for forbrugerne betyder, at fisken er frisk, at den er et sundt og velsmagende produkt som kan spises uden frygt for sundhedsskadelige stoffer. Og at den smager godt.

Derfor er den sidste håndtering fra dam til disk i forretningen også af stor betydning.

I denne brochure beskrives, hvad der forstås ved kvalitet i de forskellige led i produktionskæden, samt hvad man som fiskeopdrætter og butik kan gøre for at sikre opdrætsfiskens kvalitet gennem kæden.

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Dansk Akvakultur

DTU

indhold

side

Opdræt i Danmark

Historisk

Opdræt af regnbueørred i Europa startede i 1881-82, da de første æg blev indført fra USA til Europa. Det første dambrug i Danmark med regnbueørred blev startet i 1894 ved Kolding. Herefter tog udviklingen fart, og allerede i 1907 var der ca. 50 dambrug i Danmark. Opdrættet udviklede sig især i Jylland, hvor de største og bedste vandløb findes. I 1989 toppede antallet af dambrug med 510 stk. hvoraf de fleste fandtes i Ringkøbing og Vejle amter.

Ferskvandsdambrug er oftest anlagt ved åløb, hvor der er et naturligt fald i terrænet. Her bygges en dæmning, der kan stemme vandet op. Fra åen ledes vandet gennem fødekanaler frem til dammene, der er udgravet i jorden. Fra dammen ledes vandet gennem bundfældningsbassiner og tilbage til åen.

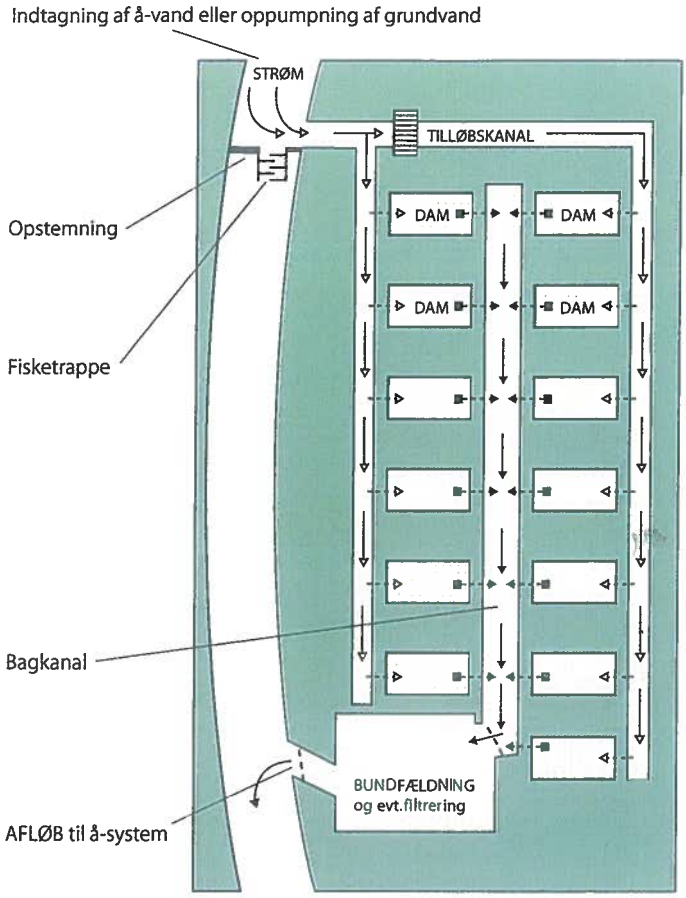
I perioden fra 1997 og fremefter er antallet af ferskvandsdambrug faldet dramatisk. Dette skyldes især, myndighedernes opkøb af dambrugernes rettigheder til at opstemme åvandet for herved at skabe fri passage i vandløbet mv. I 2004 var der 342 dambrug i drift.

Produktionen fra dambrugene er faldet fra ca. 35.000 tons i 1989, da produktionen var højest, til 29.000 tons i 2004. Det mest almindelige produkt er en opdrætsfisk, der opfodres til en vægt af 200-250 gram/stk. og 300-500 gram/stk., de såkaldte portionsørreder.

Inden for de sidste år er der sket en udvikling i opdrætsteknikken, idet der er bygget flere dambrug hvor vandet i højere grad renses og genbruges (recirkuleres). Såfremt denne teknik vinder yderligere indpasning, kan man forvente at produktionen igen vil kunne øges.

Dambrugene varetager forskellige opgaver. Alvsdambrugene producerer æg og yngel til salg til andre dambrug. Æggene bliver typisk solgt, når øjnene kan ses i de befrugtede æg – "øjenæg".

Øjenægene sælges til yngelproducenterne, der har specialiseret sig i at producere "sætte-fisk", fisk i størrelserne 5-8 cm længde eller 10-12 cm længde. Fiskene er nu så store, at de kan sættes direkte ud i jorddammene hos produktionsdambrugene, der fodrer dem op til salgsstørrelse.



Skematisk illustration af et dambrugs opbygning.

Her under: Et modeldambrug.

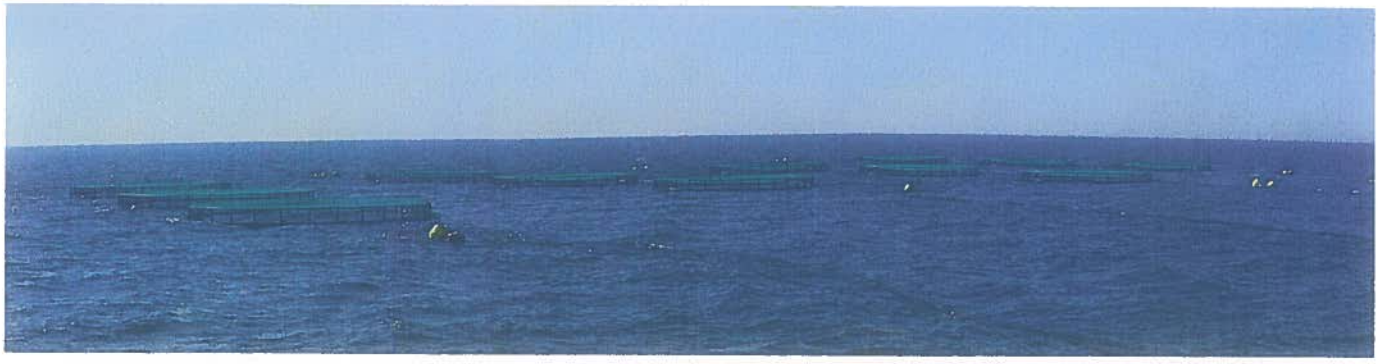
Saltvandsopdræt

Allerede i 1960'erne blev det forsøgt at sætte regnbueørred ud i saltvand. Forsøgene blev gjort i områder med lavt saltholdighed, brakvandsområder. På Holmslands Klit, blev der udgravet saltvandsdambrug, der pumper saltvand ind fra Ringkøbing Fjord. På en række kraftværker blev der etableret saltvandsdambrug, hvor det varme kølevand blev pumpet ind i dammene for at fremme væksten i vinterperioden.

I slutningen af 1970'erne blev der etableret en række havbrug. Et havbrug er anlæg, hvor netbure ophænges på flydere. Driften af sådanne havbrug er begrænset til sommerhalvåret, da is i vinterperioden kan ødelægge anlæggene. På havbrug opdrættes regnbueørreder til omkring 3-5 kg. Dette kan gøres ved, at der indkøbes store sættefisk (0,5-1,0 kg/stk.) om foråret, og fiskene tages op i november/december.

I 2004 var der 8 saltvandsdambrug og 23 havbrug. Fra saltvandsdambrugene blev der produceret 1.181 tons og fra havbrugene 7.570 tons.

Det er ikke blot regnbueørreder og andre ørredarter, som bækørred, der opdrættes i Danmark. Opdræt af ål foregår i indendørs anlæg, hvor vandet renses og genbruges (recirkulerede anlæg). Ved at anvende denne teknik kan der holdes en temperatur på 20-25 °C året rundt, hvilket giver optimale vækstbetingelser for ålene. Der er en mindre produktion af aborre, pighvarre, sandart og laks.

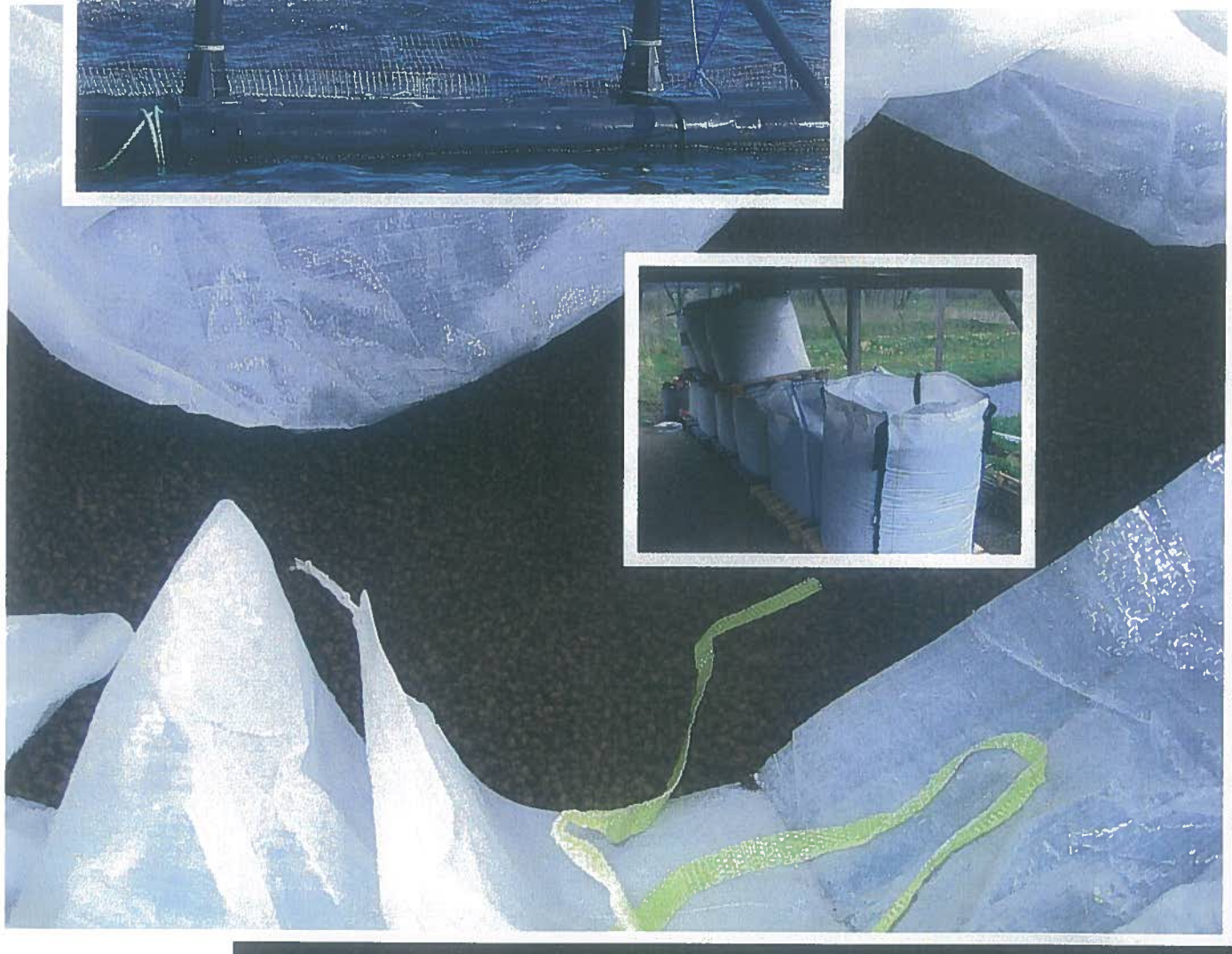


Fodring af fiskene

Til fodring af fiskene anvendes færdigt fremstillet foder i form af foderpiller af varierende størrelse. Den største bestanddel af foderet er fiskemel og fiskeolie, soyamel, hvedemel, samt vitaminer og mineraler. Ved at tilføre denne foderblanding damp under højt tryk forklistrer (ekstruderer) hvedemelet. Det binder de øvrige dele af foderet sammen, så det kan formes som en foderpille. Inden for de sidste 5 år er efterspørgslen på fiskemel steget kraftig især til det kinesiske opdrætserhverv. Det har medført, at der mange steder forskes i at erstatte fiskemel med planteproteiner, da det er en væsentlig billigere proteinkilde.

Foderet, der anvendes i havbrug, tilsættes farvestoffer for at give kødet den røde farve, de fleste forbrugere efterspørger når de spiser store laksefisk.

Foderpillerne bliver skudt ud gennem rør over fiskene i havbruget.



Sygdom og medicin

Alle dyr kan blive syge, og syge dyr skal behandles, så de kan blive raske igen. Ørreder kan rammes af en række bakteriesygdomme, der kan kureres med antibiotika og svampesygdomme, der behandles med svampedræbende midler. Det er lovpligtigt at tilkalde en dyrlæge, hvis besætningen bliver syg.

Behandling af syge fisk foregår ved, at en dyrlæge undersøger fiskebestanden, stiller en konkret diagnose, hvorefter han kan udskrive en recept på foder, der indeholder den rette medicin. Samtidig skal dyrlægen meddele, hvor lang tid der skal gå inden fiskene igen kan sælges som spisefisk.

Området er reguleret af en meget detaljeret lovgivning.

Miljøpåvirkning

Ferskvandsdambrug påvirker miljøet på flere måder. For at dambruget kan få vandet til at løbe ind i kanaler og damme, må der som oftest foretages en opdæmning i vandløbet. Dette kan medføre at vandløbet i tørre perioder næsten kan tørre ud. Ny lovgivning på området betyder, at der nu skal være vand i vandløbene året rundt.

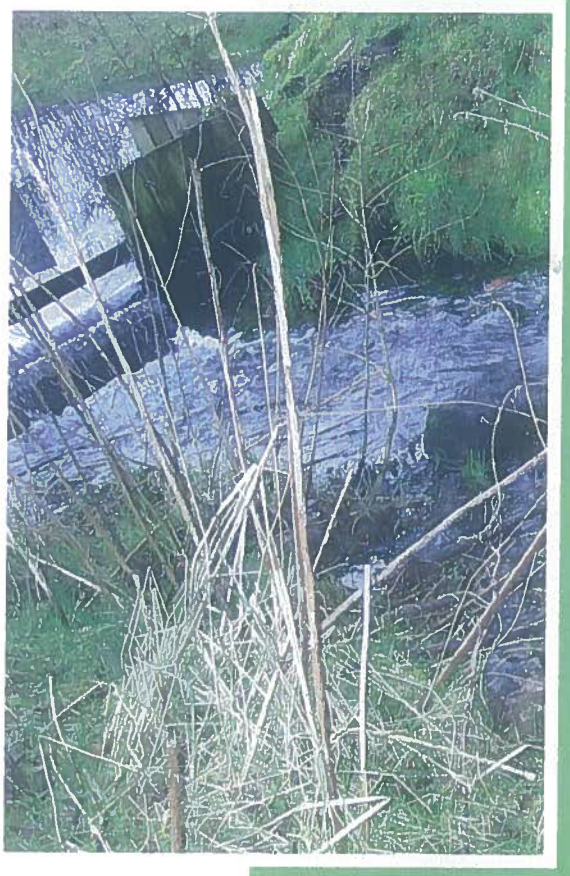
Når fiskene fodres, fremkommer der naturlige affaldsstoffer. Proteinet i foderet omdannes til fiskekød og affald i form af ammoniak. I naturen omdannes ammoniak til nitrat af bakterier, der lever i vandløbne. Denne omdannelse kræver ilt, der tages fra åvandet med mindre produktionsvandet renses før det ledes til recipienten.

Nitrat fra fiskeopdrættet virker som gødning for planterne i åerne og evt. for de søer eller havet hvor åvandet udmunder. Dette giver øget plante- og algevækst.

Udover nitrat er der organiske affaldsstoffer i form af foderrester og fækalier. Hvis disse stoffer udledes til åerne, medfører det et øget iltforbrug i åerne for at nedbryde disse stoffer.

I 1989 blev ferskvandsdambrug underlagt kontrol i henhold til bekendtgørelsen om ferskvandsdambrug. Dette har medført, at der er indført en lang række forureningsbegrænsende tiltag på dambrugene (renseanlæg mv.), samt at driften er optimeret betydeligt.

Med fremkomst af recirkulerede dambrug forventes det, at der vil ske en yderligere reduktion i udledningerne. Der er etableret en række "model-dambrug" i de senere år, hvor den anvendte teknologi kan overføres i mere eller mindre målestok til de traditionelle dambrug.



Kvalitet af opdrætsfisk

Hvad er kvalitet af opdrættede fisk? Det afhænger af den person der køber produktet. Alle fødevarer bliver mindst bedømt på en sammenhæng mellem pris og behov.

Derfor vil kvalitet i denne sammenhæng være de egenskaber som aftageren ønsker. Dette hæfte omhandler direkte salg til den endelige forbruger, så derfor må det være forbrugernes ønsker, der afgør, hvad der er kvalitet. Under forudsætning af, at produktionen er økonomisk bæredygtig.

Hvilke ønsker har forbrugeren da? – Forbrugerne kører ofte lange afstande for at købe den levende fisk på dambruget og et stort antal undersøgelser af forbrugernes ønsker til fisk har vist, at friskhed er den afgørende kvalitetsparameter.

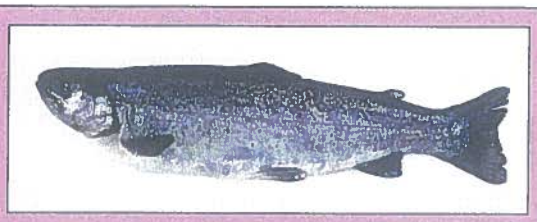
Såfremt forbrugeren ikke ser, at fisken bliver slagtet, gælder det om at bevise over for forbrugeren, at fisken er nyslagtet. Og hvordan gør man så det? Ved at bruge kvalitetsvejledningen for portionsørred og store ørreder.

Kvalitetsvejledning for portionsørred og stor ørred til brug for forbrugerne.

Nedenstående skema kan du bruge til at bestemme om fisken er forholdsvis frisk – altså har været død i kortere tid – eller om den har været død lidt for længe. Skemaet beskriver, hvordan små ørreder og store ørreder ændrer karakter over tid. Ud fra en vurdering af skind, øjne, gæller, lugt, bughinde og tekstur er det muligt at bestemme, om fisken har været død i mere eller mindre end 4 dage.

Opdrætsørreder, der udbydes til salg til forbrugerne som hel fersk fisk eller som filet, bør ikke være mere end 4 dage gammel, regnet fra det tidspunkt, hvor fisken er blevet slagtet.

Portionsørred



	0-4 dage opbevaret ved 0°C	Over 4 dage opbevaret ved 0°C
Skind	Klar med perlemors skær og tydelig rød stribe	Mat
Øjne	Klare, sort pupil	Mælket og grå
Øjnes form	Konvekse	Flade eller indsunkne
Gæller	Røde, klart slim	Brunlige, mælket og klumpet slim
Lugt hvor gællerne er fjernet	Metal, neutral	Sødlig og harsk
Tekstur	Fast og elastisk	Meget blød

Stor ørred

	Dag 0-5 opbevaret ved 0°C	Over 5 dage opbevaret ved 0°C
Skind	Klart perlemorsskær	Mat
Lugt	Frisk tang, neutral, vandmelon	Metal, lidt sur
Øjne	Klar hornhinde og sorte metalskinnende pupiller	Uklar hornhinde og grå pupiller
Øjnes form	Konvekse	Flade eller indsunkne
Gæller	Røde med klart slim Lugter af frisk tang, neutral	Lyserøde/blege med mælket og klumpet slim. Lugter af metal, sur og lidt fermenteret

Håndtering – fra dam til butik

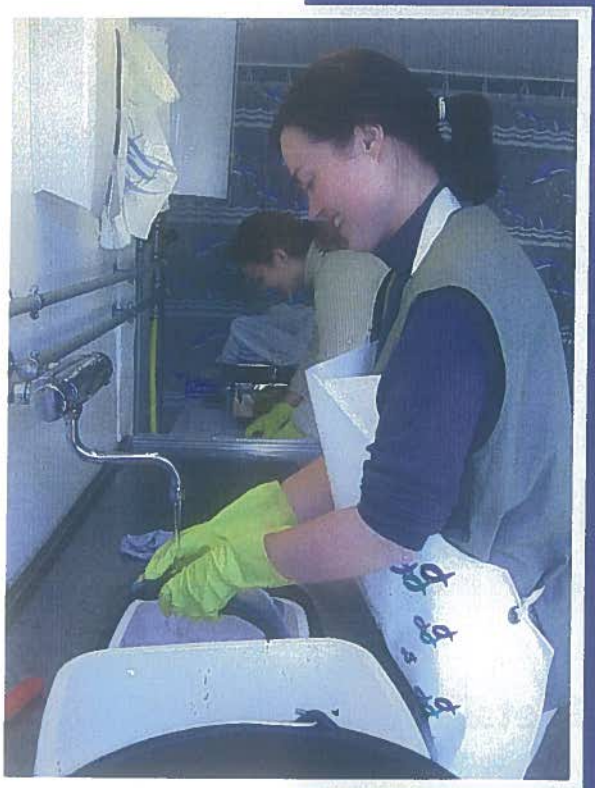
Salg af fisk fra eget dambrug i egen butik, skulle ikke give anledning til kvalitetsproblemer overhovedet, da rækken fra producent til salg er den kortest mulige. Alligevel er der flere (kvalitets-) faldgruber. Vi kender alle lystfiskeren, der fanger en fisk en sommermorgen og vender tilbage i løbet af dagen for at spise fisken om aftenen. Hvis det har været en dejlig sommerdag med over 20 °C hele dagen, med frisk vind og direkte sol, så er denne fisk "belastet" så det svarer til, at den har brugt mere end 50 % af den maksimale holdbarhedstid opbevaret i smeltende is.

Dette eksempel viser, hvor de kraftigste påvirkninger kommer fra i forbindelse med håndteringen af fisk. Høje temperaturer, kombineret med vind og direkte sollys, udtørrer og opvarmer fisken. Denne opvarmning vil holde sig i mange timer, efter fiskene er placeret i kølerum.

En anden kvalitetsforringelse sker ved hårdhændet behandling. Når der arbejdes med den samme råvare i en lang periode, fastlægges der et sæt rutiner. Der kan være risiko for, at man langsomt glemmer, at det er en fødevare, der arbejdes med. Selvom fisken ser frisk og ubeskadiget ud, har den måske været udsat for uhensigtsmæssige løft, for mange fisk i samme opbevaringsbeholder, trykskader osv. Disse påvirkninger ses først når fisken fileteres, som små eller større blodpletter i muskelvævet.

Det er derfor vigtigt, at dambrugeren til stadighed tager håndteringsrutinerne op til kritisk revision. Er der ændringer, der kan indføres, som sikrer en mere skånsom håndtering? Er der udstyr der kan anvendes, som giver en bedre transport eller opbevaring osv.? Det værste, der kan ske er, at en person der arbejder med fødevarer siger, "at sådan har vi altid gjort og det er godt nok for mig!".

Dødsstivhed – Rigor Mortis



Dette fænomen opfattes normalt som et noget uhyggeligt begreb, men er en normal tilstand pattedyr og fisk gennemløber, når de dør. Hvis man ikke er klar over, hvad rigor mortis indebærer, kan man risikere at ødelægge muskelvævet/fileten af den fisk, der fremlægges til salg. Det behøver ikke at ske medens dambrugeren håndterer eller opbevarer fisken. Det kan lige så godt ske, efter at forbrugeren har købt fisken. Derfor er det vigtigt at vide hvad der foregår.

Lidt teori kan måske skabe en større forståelse for denne proces, men det skal straks nævnes at forløbet af rigor mortis hos regnbueørreder og andre lignende fiskearter ikke er fuldt klarlagt.

Når fisken dør, bliver den på et tidspunkt stiv som et bræt. Årsagen er, at der frigives energi i musklen, der bevirker, at den trækker sig sammen – op til 25 %. Hvis denne sammentrækning sker hurtigt, kan der opstå skader på musklen, muskelfibre kan rives over. Hvis fisken er fileteret før rigor mortis, trækker fileten sig sammen og samtidig presses vandet ud af fileten. Når fileten tilberedes vil den virke "gummiagtig" og tør. Dette sker mest i magre torskefisk – fedtindhold på 0,7-1 %. Denne samme reaktion findes hos de fede fisk, men ikke så udpræget – regnbueørreder har et fedtindhold fra 5-10 %.

Nu kan tre rigor mortis-tilstande beskrives.
1: før dødsstivhed eller præ rigor (mortis),
2: dødsstivhed eller rigor (mortis,)
3: efter dødsstivhed eller post rigor (mortis).

Fisken som lystfiskeren fangede en varm sommerdag, gennemløb alle tre tilstande. Fisken var præ rigor i maksimalt 1 time, da fisken var udmattet af kampen med lystfiskeren og havde brugt al sin energi i sine muskler, derefter var den i rigor i 2 timer på grund af den høje temperatur, og den resterende del af dagen var den i post rigor.

Hvordan skal man så behandle sine opdrætsfisk? Det afhænger af årstiden og fiskens temperatur. Selv en kold forårs- eller efterårs dag skal man straks efter aflivningen køle fisken ned til mellem 0 og 2 °C. Dermed stoppes rigor mortis-processen og fisken kan opbevares i flere dage før den indtræder i rigor. Lovgivningsmæssigt skal fisken hurtigst muligt nedkøles til en temperatur, der svarer til smeltende is.

Når fisken sælges til forbrugeren kan det være hensigtsmæssigt, at der på varme dage gives en lille ispose med, eller at fisken pakkes ind i et isolerende materiale. Det er ikke uden grund at ordsproget "gårsdagens avis er kun egnet til at pakke fisk ind i" er opstået. Avispapir isolerer, og hvis det er fugtigt, vil fordampningen sænke temperaturen yderligere. Husk at sige til køberen, at fisken hurtigst muligt skal opbevares koldt, den skal ikke ligge i en varm bil, hvor temperaturen let kan stige til 40 °C.

Hvis der er en optimal kølekæde, kan fisken, hvis den tilberedes om aftenen, stadigvæk være præ rigor. Fisken vil da, hvis den tages direkte ud af køleskabet gennemløbe rigor mortis processen på panden eller grillen. Dette kan bevirke at fileten kan blive enten gummiagtig eller smuldrende. Derfor: sig til forbrugeren, at fisken skal checkes for om den er dødsstiv. Hvis det er tilfældet, skal fisken tilberedes skånsomt, dvs. langsom opvarmning.

Kvalitetsindeksmetoden

– En objektiv metode til bestemmelse af sensorisk kvalitet

QIM anvender et pointsystem, der giver resultater som afspejler forskellige kvalitetsniveauer af fisk på en simpel og veldokumenteret måde. Ud fra QIM er det muligt at forudsige restholdbarheden, det vil sige: hvor lang tid man kan lagre fisken i is, før den ikke længere er egnet til konsum.

QIM er baseret på specifikke sensoriske egenskaber for hel fisk, som f.eks. udseende, lugt eller fasthed. De enkelte sensoriske egenskaber bedømmes vha. et pointsystem fra 0 til 3 point. Pointværdien for alle egenskaberne lægges sammen hvorved der fremkommer en samlet pointværdi, som betegnes kvalitetsindeks (QI – quality index). Meget friske fisk har en QI værdi på nul, hvorefter QI-værdien stiger med faldende sensorisk kvalitet.

QIM er udviklet således at der er sammenhæng mellem den sensoriske kvalitet udtrykt som QI og lagringstiden i is. Dette gør det muligt, at forudsige restholdbarheden i is.

Hvordan anvendes QIM?

Sensoriske bedømmelser af hel fisk udføres generelt af trænede dommere på fiskefabrikkerne, i modtagelsen, produktionshallen eller på auktionerne. Prøveudtagning er meget vigtig, men ikke anderledes end ved andre kvalitetsanalyser. Bedømmelsesområdet skal med hensyn til støj og lugt være så neutralt som muligt. Ligeledes er lyset vigtigt. Det skal helst svare til dagslys.

Det er vigtigt når QIM anvendes, at bedømmeren har sat sig grundigt ind i de forskellige sensoriske egenskaber. Der findes en QIM-manual, der er udkommet på en række sprog heriblandt dansk. Manualen er til støtte ved QIM-bedømmelser og træning af nye dommere. I manualen er der en plan for bedømmelser, forklaring af de parametre der bedømmes og farvefotografier, som illustrerer fisk med forskellig sensorisk kvalitet. Sensorisk bedømmelse af dampede fileter bliver ligeledes introduceret, og en del af manualen beskriver de faciliteter som anvendes ved sensorisk bedømmelse, samt udvælgelse og træning af dommer.

Manualen kan bestilles på hjemmesiden www.QIM-Eurofish.com.

Der kan læses mere i artiklen "Kvalitetsindeksmetoden – et objektivt mål for hvor frisk fisken er." i Fisk & Hav, nr. 58, side 42-47, skrevet af Grethe Hyldig og Ditte Green-Petersen. Artiklen kan findes på Danmarks Fiskeriundersøgelsers hjemmeside: *www.difres.dk*. Gå til *Publikationer*, derefter *Fisk og Hav* og vælg til sidst *nr. 58*, hvor du finder artiklen på side 42.

Muddersmag

Muddersmag eller jordsmag kan være et problem ved ørreder opdrættet i jorddamme og recirkulerede opdrætsanlæg. Problemet skyldes et nedbrydningsprodukt fra alger der hedder geosmin. Problemet findes dog kun på et mindre antal opdrætsanlæg i Danmark. Eventuel muddersmag kan fjernes fra fiskene, hvis de sættes i bassiner med rent vand i 2-5 dage inden de slagtes. Det er derfor vigtigt, at fisken kontrolleres for mulig muddersmag og i fald problemet konstateres, at fisken da sættes til "afsmagning" i god tid inden de skal slagtes.

Fiskens udseende

Et andet kvalitetstegn på fiskene er deres udseende. Her er det vigtigt, at fisken har hele og pæne finner. Dette sikres ved tilpas fodring og tilpas antal fisk i dammene i forhold til dybde, iltforhold etc. Derved undgås finnebid og samtidig demonstreres, at der tages hensyn til dyrevelfærd i opdrættet.

Det ses ofte, at fiskene har forkortet halestykke, der giver fisken et klumpet udseende. Spisekvaliteten er dog ikke påvirket af dette, men det er vigtigt enten at forklare forbrugeren om problemet eller anvende fiskene til andet formål, hvor udseende ikke har nogen betydning.

Ligeledes er det vigtigt, at fiskene ikke presses/fodres for hårdt i opdrættet. Dette giver meget dybe og uformelige fisk.

Farven på fiskekødet er et omdiskuteret emne. På det tyske marked og blandt danskere, der jævnligt spiser portionsørreder er den naturlige farve på fiskekødet – oftest beige – fuldt accepteret. Forbrugere, der har deres kendskab til laksefisk fra de opdrættede laks og store ørreder fra havbrugene, er vant til at kødet er rødligt. Denne farve stammer fra tilsætning af farvestof – astaxantin – til foderet. Dette kan give anledning til en god dialog mellem opdrætteren og forbrugeren.

Fra slagtning til salg

Optagning og slagtning af fiskene er et meget vigtigt punkt i hele håndteringen af fiskene. Fejlagtig slagtning af store ørreder kan medføre store økonomiske tab. Samtidig er dette et kritisk punkt i hele håndteringen set ud fra forbrugernes synspunkt. Forbrugeren forventer, at opdrætteren behandler sine dyr godt!

Dambrug

Slagtning foregår efter, at fiskene bedøves med elektrisk chok eller aflives med slag i hovedet.

Havbrug

I dag anvendes de fleste steder en metode til slagtning af store regnbueørreder, hvor fiskene overføres til et kar med vand, der er mættet med CO2. Herved bedøves fiskene og gællebuerne kan skæres over, så fiskene dør og afblødes. Dette foregår ude ved netburerne eller på større slagterier. Herefter åbnes fiskene og indvolde og rogn tages ud. Når fiskene slagtes i november/december er der normalt store mængder rogn i ørrederne, der forarbejdes til kaviarprodukter.

Butiksindretning

Ved direkte salg fra dam- eller havbrug kan man benytte sig af to former for salg. Det ene er "stalddørssalg". Her er der tale om salg direkte til forbrugeren, og det kræver, at dambruget er registreret hos fødevareregionen. Dette salg må kun omfatte slagtning, rensning og levering i mindre omfang af fisk fra egen besætning. Ved stalddørssalg må der ikke indrettes nogen form for slagte- eller butiksfaciliteter.

Ønsker man et direkte salg af større omfang, skal der indrettes en butik, virksomheden skal autoriseres og butikken godkendes af Fødevareregionen. Ansøgning om autorisation fremsendes til den Fødevareregion, hvor virksomheden er hjemmehørende. Sammen med ansøgningen, skal fremsendes tegninger og beskrivelse af virksomheden, samt beskrivelse af de påtænkte aktiviteter. I forbindelse med autorisationen, skal der udarbejdes et egenkontrolprogram, der fremsendes sammen med ansøgningen.

Egenkontrol

Ud fra gældende lovgivning skal virksomheder, der er autoriseret udføre egenkontrol for at sikre, at der ikke opstår fødevarerisici. Egenkontrollen gennemføres ud fra HACCP-systemet – fastlæggelse af nødvendige procedurer og udpegning af kritiske kontrolpunkter. Der skal føres dokumentation for kontrollens gennemførelse. Egenkontrolprogrammet skal udarbejdes med hensyn til de aktiviteter, der ønskes etableret i butikken. Til udarbejdelse af egenkontrolprogrammer, kan man søge hjælp hos Danmarks Detailfiskehandlere, der har en branchekode (model) for, hvordan egenkontrolprogrammet kan opbygges.

I forbindelse med forarbejdning af fiskene i form af filetering, gravning eller røgning er egenkontrolprogrammet et værktøj der kan dokumentere, at gældende lovgivning er overholdt.

Forarbejdning

De normale aktiviteter der foretages i dambrugsbutikkerne omfatter slagtning og rensning af ørreder fra 200 til 500 g/stk.

Rensning

Traditionelt udtages gællerne ved slagtning af portionsørreder. Men hvis fisken ikke sælges i kundens nærvær, bør man lade gællerne side i. Dette skyldes, at gællerne er en vigtig del af fisken til friskhedsbestemmelse af fisken.

Herefter udtages indvolde mm. I den forbindelse er det vigtigt, at rense fiskene for nyreblod langs med rygbenet, således at bughulen af fisken er ren og renset for blodrester. Husk at oplyse forbrugeren om, at en nyslagtet fisk er svær at tilberede, og man bør opbevare den i køleskab (max. 5 °C) i ca. 1 døgn før den tilberedes – se afsnit om dødstivhed/rigor mortis.

Filetering

Nogle dambrug foretager filetering af fiskene. Såfremt fisken ikke sælges straks, er det meget vigtigt, at fileten nedkøles og opbevares ved en temperatur under 2 °C, i henhold til gældende lovgivning.

Gravning

Gravning af fileter af ørred i en lage af sukker og salt tilsat krydderurter skal ske under strenge hygiejniske forhold. Håndvask, rene knive, skærebrædder borde og arbejdstøj er vigtigt, og der må ikke foregå anden forarbejdning i området, hvor arbejdet med gravning foregår. Fisken skal fryses i 24 timer ved –20 °C jfr. forarbejdning.

Røgning

Røgning foretages typisk som varmrøgning af hele portionsørred eller fileter af ørred. Inden røgningen renses fisken grundig og lægges i saltlage. Saltningstiden er afhængig af fiskens størrelse. Herefter hænges fisken til tørring i røgovnen. Efter tørringen starter selve røgningen, hvor der oftest anvendes smuld eller flis af bøgetræ til røgningen. Normalt røges fisken ved en temperatur på 65-90 °C i 2-3 timer.

Nogle virksomheder koldrøger store regnbueørreder opdrættet i havbrug. Her er det typisk hele sider af fisken der røges. Koldrøgning foregår ved en temperatur fra 20-26 °C.

Et koldrøget produkt adskiller sig fra et varmtrøget produkt, ved at man kan skære i den koldrøgede fisk uden at kødet falder fra hinanden, men holdbarheden er væsentlig kortere for det koldrøgede produkt.

Kostråd

Fødevarestyrelsen giver råd om fisk på deres hjemmeside "Alt om Kost".

Først og fremmest anbefales det, at spise fisk to gange om ugen, og variere mellem fede og magre fisk. Regnbueørred hører til de fede fisk, med et fedtindhold på 5-10 %, hvor en mager fisk som torsk indeholder under 1 % fedt.

Fisk er en sund fødevare, da den er en væsentlig kilde til sunde fiskeolier, D-vitamin, jod og selen. Det anbefales at spise 2-300 gram fisk om ugen.

Ørreder, der er opdrættet enten i dambrug eller havbrug er fodret med færdigfremstillet foder, som sikrer, at fiskene ikke indeholder sundhedsskadelige stoffer.

2 gange om ugen

www.2gangeomugen.dk

Dokumentation af produktionen

Danske forbrugere er blevet mere bevidste om hvilke fødevarer de køber og spiser. Det stiller stigende krav til, at kunne dokumentere hvordan fisken er fremskaffet.

Dette er svært for vildfangede fisk, hvor det ofte kun er muligt at fortælle, hvor fisken er fanget. Derfor kan vildfanget fisk heller ikke blive godkendt som økologisk produkt – der er ingen kontrol med hvad fisken spiser.

Hvor fisken er opdrættet, og især på eget dambrug, er det muligt, at fortælle hele historien om hvor fisken kommer fra og hvordan den har levet sit liv. Dette er en meget positiv situation, som opdrætteren skal bruge i sin markedsføring.

To emner der oftest spørges om af forbrugeren er, anvendelse af medicin og spørgsmål om dyrevelfærd. Igen er det vigtigt, at opdrætteren fortæller den positive historie om sine "husdyr". Som i al anden husdyrproduktion, så tilkaldes dyrlægen, hvis dyrene er syge.

Hvis fiskene behandles, er der stramme regler for tilbageholdelse af fiskene, indtil de kan sælges til forbrugerne. Alle disse forhold fremgår af dambrugets driftsjournal, som kan være forbrugerens sikkerhed for at alt er gået rigtigt til. God, saglig information modvirker, at der opstår mistænksomhed og mytedannelse.

I forbindelse med forarbejdning af fiskene i form af filetering, gravning eller røgning er egenkontrolprogrammet et godt værktøj til at dokumentere, at gældende lovgivning er overholdt.

Når virksomheden er autoriseret vil man få besøg af tilsynsførende fra Fødevareregionen. Denne vil kontrollere om egenkontrolprogrammet anvendes og samtidig kontrollere om butikken lever op til gældende lovgivning. Her er det vigtigt, at deltage positivt. Resultatet af kontrollen offentliggøres på Fødevarestyrelsens "Smiley"-hjemmeside, der er tilgængelig for alle forbrugere i Danmark: www.foedevarestyrelsen.dk/Kontrol/Kontrolresultater/Smiley/

En glad "Smiley" er et godt signal, at sende til sine kunder

Ofte stillede spørgsmål

Er fisken frisk?

Ja det er den, fordi det kan man se på fiskens øjne, gæller, skind, og man kan føle hvor fast den er i kødet.

På dansk er der to udtryk der godt kan forveksles med hinanden. Frisk betyder, at fisken er slagtet kort tid forinden. Fersk kan betyde det samme som frisk, men den oprindelige betydning er, at fisken ikke er saltet. I dag bruges fersk om en fisk, der ikke har været opbevaret på frost, men kun på køl.

Vi har læst, at dambrug forurener. Er det rigtigt?

Ja det gør de i et vist omfang – men det gør al husdyrproduktion – også produktion af grise, køer, heste, høns og kyllinger. Når man fodrer dyr vil der altid fremkomme affaldsstoffer. Går der mange dyr sammen i staldanlæg eller i damme koncentreres affaldsstofferne, og så kaldes det forurening.

Når husdyr fordøjer proteiner, produceres der affald i form af ammoniak. Det kan man lugte fra svinestalde eller hønsestalde. Når fisk danner ammoniak opløses det i vandet, og omdannes herefter til nitrat. Nitrat er gødning for planter og alger, som betyder, at de vokser kraftigere i åer og søer.

Danske dambrug har i gennem mange år arbejdet for at begrænse forureningen fra opdrættet. F. eks. er foderet blevet meget bedre, og dambrugerne er blevet dygtigere til at fodre. Det har betydet, at indenfor de sidste 10 år er fodermængden, som fiskene spiser for at vokse 1 kg, faldet fra 1,3 kg foder pr. kg tilvækst til nu 0,9 kg foder pr kg tilvækst*. Alene herved er forureningen fra dambrugene faldet med 30 %. Hertil kommer, at man har etableret forskellige renseanlæg på opdrætsanlæggene – eksempelvis systemer til opsamling af fækalier (bundfældningsanlæg mv.), samt plantelaguner/rodzoneanlæg, der opsamler nitratet inden vandet ledes tilbage til åen.

**)Hvis du undrer dig over at tilvæksten er større end fodermængden, så husk at alle dyr også består af vand – hos ørreder ca. 77 % af kropsvægten.*

Har dine fisk det godt?

Ja, vi synes, at de har det rigtig godt. Når vi fodrer, sikrer vi at alle fisk får noget at æde, også de mere forsigtige. Vi måler regelmæssigt iltindholdet i vandet for at sikre, at der er rigeligt med ilt til fiskene. Vi prøver at have en tilpas mængde fisk i dammene, både så fiskene føler sig trygge, men også så de ikke bider hinanden. Ørrederne er rovdyr, og de går ikke tilbage for at æde hinanden. Hvis de er meget stressede bider de hinanden. At vores fisk har det godt kan man se på fiskene. Finnerne er pæne og hele.

Når fiskene skal slagtes, lader vi dem gå nogle dage uden at fodre dem. Her går de stille og roligt indtil vi fisker dem op. Aflivningen starter med et slag i hovedet, så fisken er død med det samme. Fra den videnskabelige rådgivning ved vi, at det er den mest humane måde at aflive fisken på.

Hvor kommer foderet fra?

Foderet bliver fremstillet i Danmark. Ørredfoder består mest af fiskemel og fiskeolie. Hertil kommer planteproteiner som f.eks. soja, hvedemel og ærtemel. De fabrikker, der fremstiller foderet, har sporbarhedssystemer hvilket betyder, at vi kan få oplyst hvor de forskellige dele af foderet kommer fra. Hermed kan det dokumenteres, at alle råvarer er sikre og sunde.

Er der medicinrester i fisken?

Nej det er der ikke. Hvis fiskene bliver syge, kommer der en dyrlæge for at tilse fiskene. Hvis der er behov for medicin, udskrives en recept på foder, hvori der er iblandet medicin. Samtidig meddeler dyrlægen opdrætteren, hvor lang tid fiskene skal gå i dammene efter at medicineringen er stoppet, før fiskene må spises. Dette sikrer, at der ikke er medicinrester i fisken.

Er der muddersmag i fisken?

Nej det er der ikke, og det ved vi, fordi fisken har gået i rent vand op til 5 dage, og vi derefter har lugtet og smagt på en kogt fisk fra dammen for at sikre, at der ikke er muddersmag.

Kan fisken bruges til sushi?

Ja det kan den. Ifølge lovgivningen, så skal al fisk der bruges til sushi fryses i 24 timer ved –20 °C. Dette skal sikre, at der ikke er parasitter eller andre skadelige mikroorganismer til stede i fisken.

Hvor længe kan den holde sig?

Hvis fisken lægges i køleskab ved ca. 5 °C straks efter at forbrugeren er kommer hjem, vil den stadig have en god og frisk smag i 2-3 dage. En hel frisk fisk vil ofte falde fra hinanden, når den steges eller koges – se afsnittet om dødsstivhed/rigor mortis. Hvis fisken er slagtet i dag vil vi faktisk foreslå, at du venter med at spise den til i morgen. Så smager den af lidt mere og er mere fast i kødet.

Har du nogle opskrifter?

Vi har nogle opskrifter stående på disken, men ellers kan man finde en lang række opskrifter på:
www.fiskehandlerne.dk og www.2gangeomugen.dk
www.danskakvakultur.dk

Dansk Akvakulturs strategi for udvikling af økologisk fiskeopdræt i Danmark
(Godkendt af DA's bestyrelse på møde den 23. februar 2009)

Målsætning

At udvikle og udbygge økologisk fiskeopdræt til et lønsomt og betydende segment indenfor dansk akvakultur.

Mål for 2018

1. Mindst 10 % af produktionen (5.000 tons på landbaserede anlæg og 5.000 tons i havbrug) skal være økologisk
2. Eksportandel heraf på mindst 50 %
3. Der opdrættes mindst tre forskellige økologiske arter
4. Den samlede forskningsindsats i økologi er på mindst 3 % af primæromsætningen
5. Senest i 2009 er der etableret et fælles europæisk regelsæt
6. Danmark er EU's førende producent af økologisk fiskefoder

SWOT (2009)

Styrker	**Svagheder**
Erfaring med økologisk produktion gennem en årrække Brancheforening som dækker hele værdikæden God logistik og nem adgang til EU's markeder Etableret støtte via Fiskerifonden	Lille kritisk masse (forsyningssikkerhed, sårbarhed,..) Højt omkostningsniveau Få ressourcer til "udvikling" Lavt produktkendskab blandt forbrugerne Få produkter med økologiske opdrætsfisk
Muligheder	**Trusler**
Stigende efterspørgsel/stor forbruger interesse Positiv mediedækning (image/profilering) "Spin-off" effekt fra økologiske projekter til det konventionelle erhverv EU-regelsæt for økologisk akvakultur åbner for lettere eksport af danske økologiske opdrætsfiskeprodukter	EU-regelsæt for økologisk akvakultur åbner for lettere import af udenlandske økologiske opdrætsfiskeprodukter For lav betalingsvillighed hos forbrugerne

Strategier

Produktionsudvikling

- Sikre politisk goodwill og nødvendige regelrammer
- Fastholde støtteordninger til omlægning, evt. under EFF
- Nemmere adgang til omlægning gennem kurser og nemmere adgang til viden

Markedsudvikling

- Gennemførelse af PR aktiviteter i primært Danmark og Tyskland - men også øvrige udland
- Udarbejdelse af relevant markedsføringsmateriale – herunder opskrifter, info-pjecer mv.
- Promovering og formidling gennem hjemmeside, artikler, indlæg m.m.
- Tilpasning og udvikling af produktudbud

Struktur/ressourcer

- Etablering af ERFA gruppe for økologiske fiskeopdrættere, herunder talsmand for disse opdrættere
- Etablering af intern ressource gruppe (økologiudvalg) med repræsentanter fra hele værdikæden
- Etablering af relevante projekter i regi af fx EFF eller innovationsloven.

Dansk Akvakulturs Økologiudvalg vurderer, at ovenstående strategi medfører et behov for gennemførsel af følgende udviklingsaktiviteter (projekter) over de kommende 3 – 5 år:

- tilpasning af drift fra danske øko-regler til drift efter kommende EU-øko-regler
- iværksættelse af markedsudviklingsaktiviteter (indland / udland)
- iværksættelse af produktudviklingsaktiviteter
- fortsat omlægning af anlæg (dambrug – men også havbrug)
- løbende gennemførsel af mindre udviklingsprojekter (græsrodsprojekter) med henblik på fortsat udvikling af økologiske metoder og ideer på de omlagte økologiske fiskeopdrætsanlæg

Lars Birger Nielsen, indehaver af Bisserup Havbrug

DU KAN STOLE PÅ Ø-MÆRKET

Økologiske fisk fra Danmark er mærket med det røde Ø, som du også kender fra andre økologiske produkter. Det røde Ø er din garanti for, at hele produktionen er foregået efter de økologiske regler og kontrolleret af medarbejdere i Fødevarestyrelsen.
EU's grønne økologi-mærke kan bruges på alle fisk, der er opdrættet og kontrolleret efter EU's økologiregler.

KUN OPDRÆTTEDE FISK KAN VÆRE ØKOLOGISKE

Vilde fisk fra hav, åer og søer må ikke sælges som økologiske. Grunden til det er, at det i naturen ikke er muligt at kontrollere de forhold, som fiskene lever under – for eksempel om fiskenes opvækst har fundet sted i et område med stor miljøbelastning.

Kun når fisk opdrættes i dambrug eller havbrug, kan der være sikkerhed for, at de lever op til de høje økologiske krav.

FISK UDEN STRESS OG MEDICIN

»Mine fisk har ingen stress, og de har derfor aldrig haft brug for medicin eller andre kemiske hjælpestoffer. Det er fordi, jeg driver havbruget ekstensivt. Det vil sige, at jeg har forholdsvis få fisk i anlægget, og jeg giver aldrig fiskene så meget foder, at de vokser for hurtigt. Jeg køber mine sættefisk (små fisk, der er klar til livet i havet) fra økologiske ferskvandsdambrug, der ligesom jeg selv producerer efter de økologiske regler«.
Lars Birger Nielsen, indehaver af Bisserup Havbrug der som landets første blev omlagt til økologisk drift i 2010. Bisserup Havbrug ligger ud for Sydsjællands kyst i nærheden af Skælskør.

ØKOLOGISKE FISK PÅ NETTET

På adressen www.okofisk.dk finder du hjemmesiden Dansk Økologisk Fiskeopdræt med masser af informationer om økologiske fisk: Salgssteder, opskrifter, pressemeddelelser, regelsæt og meget andet.

Den Europæiske Fiskerifond:
Danmark og Europa investerer i bæredygtigt fiskeri og akvakultur

Ministeriet for Fødevarer, Landbrug og Fiskeri

Den Europæiske Fiskerifond

Denne folder er udgivet af Dansk Akvakultur med støtte fra Fødevareministeriet og EU. Redaktion og projektledelse: Chefkonsulent Villy J. Larsen, Dansk Akvakultur. Tekst: Per Henrik Hansen, www.perhenrik.dk. Fotos: Preben Stentoft, www.prebenstentoft.dk, Lars Birger Nielsen, Villy J. Larsen og Per Arnesen. Layout: Peder Hovgaard, ph7 kommunikation, www.ph7.dk. Trykket i Lasertryk. Redaktionen afsluttet i september 2014.

ØKOLOGISKE OPDRÆTSFISK

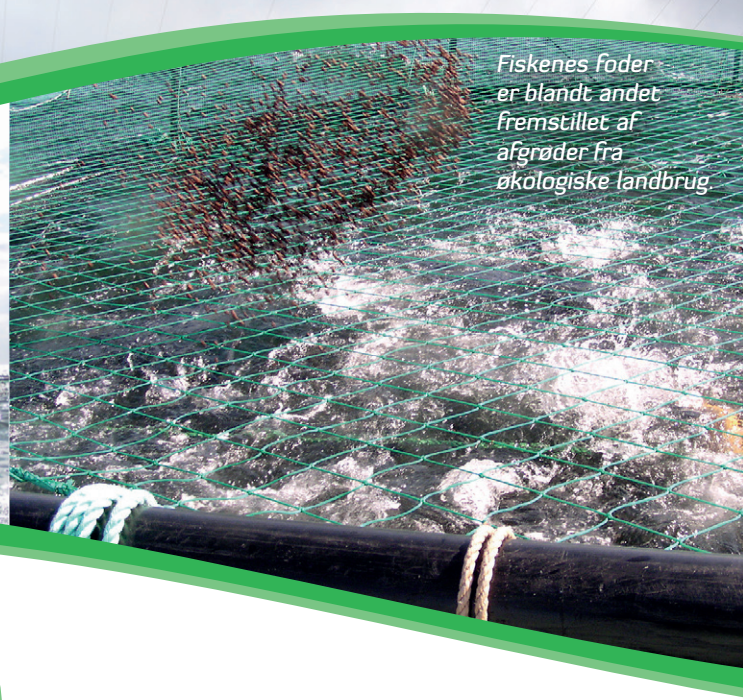
Fra dambrug og havbrug

for naturen
for fiskene
for dig

www.okofisk.dk
www.okofisk.dk

Vilde fisk skal uhindret kunne svømme forbi dambruget i det naturlige vandløb.

Der er klare grænser for hvor mange fisk, der må være i et økologisk havbrug



Fiskenes foder er blandt andet fremstillet af afgrøder fra økologiske landbrug

JA TIL REN NATUR

En række regler sørger for, at økologisk opdræt af fisk belaster naturen så lidt som overhovedet muligt.
Reglerne for økologiske dambrug og havbrug siger blandt andet at:

- Vilde fisk skal altid uhindret kunne svømme forbi dambrug, som er anlagt ved naturlige vandløb.
- Det vand, som kommer ud fra dambruget, skal altid indeholde så få næringsstoffer og så meget ilt (mindst 60 procent), at den vilde natur i åen eller bækken ikke lider overlast.
- I havbrug må der ikke bruges bekæmpelsesmidler imod alger på net og servicebåd.
- Miljøet omkring havbrug og dambrug skal på alle punkter leve op til myndighedernes krav.
- Rovdyr, fiskehejrer og andre fiskeædende fugle skal holdes borte med hegn eller andre fredelige midler.
- Der må kun anvendes nogle få særligt økologi-godkendte skånsomme midler i driften af opdrætsanlægget, f.eks. til rengøring af damme, net og udstyr.

NEJ TIL STRESS

Sunde dyr er dyr uden stress, og sunde dyr giver det bedste grundlag for fødevarer til mennesker.
Et af formålene med de økologiske regler er derfor at forebygge, at fiskene bliver stressede. Det betyder blandt andet at:

- Økologiske ørreder skal leve under forhold, der ligner naturen med strømmende vand. I dambrug skal der være mindst 60 procent ilt i vandet.
- Fiskene skal have adgang til tilstrækkelige fodermængder med naturlige ingredienser
- Klare grænser for mængden af fisk per kubikmeter vand sørger for, at de kan bevæge sig naturligt og ikke skader hinanden.
- Rovdyr som eksempelvis oddere og fiskehejrer skal holdes ude af opdrætsanlægget. Hvis en odder eller fiskehejre kommer ind til fiskene, vil det ikke alene gå ud over de fisk, som odderen eller hejren får fat på, det vil også stresse alle de andre fisk voldsomt.
- Særlige regler for skånsom håndtering af de økologiske opdrætsfisk er medvirkende til at mindske fiskenes stressniveau.

FISK UDEN FIKS-FAKSERIER

Når du spiser økologiske fisk, kan du være sikker på at:

- Fiskenes foder er fremstillet af afgrøder fra økologiske landbrug samt af fiskemel og -olie fra bæredygtige bestande af vilde fisk.
- Fiskefoderet er uden gensplejsede organismer (GMO) og syntetiske antioxidanter.
- Det er meget sjældent, økologiske fisk har brug for medicin. Men hvis de har fået medicin, skal der gå dobbelt så lang tid som for andre opdrættede fisk, før de må tages op af vandet og slagtes. Det giver dig ekstra sikkerhed for, at du ikke får rester af medicin med i købet, når du spiser en lækker øko-fisk.
- Det eneste tilladte farvestof i foderet er det naturlige *Astaxanthin*, som stammer fra eksempelvis rejer eller alger. Ved forarbejdning af de slagtede fisk må der kun anvendes tilsætningsstoffer, som er med på listen over tilladte stoffer i økologisk produktion.

www.okofisk.dk
www.okofisk.dk