Financial Performance of the Danish Organic Trout Aquaculture[1]

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Summary

In this study, we compare the economic performance of organic trout farms to conventional trout and organic agricultural farms. 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 2010 and 2011, 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.

1. Introduction

Evolving consumer life-styles in developed countries have posed a 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 1080 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 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 aquacultural 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

[1] Acknowledgement: This work is part of RobustFish. RobustFish is part of the Organic RDD 2 programme, which is coordinated by International Centre for Research in Organic Food Systems (ICROFS). It has received grants from the Green Growth and Development programme (GUDP) under the Danish Ministry of Food, Agriculture and Fisheries.

trout constitute 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*), occupying 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 size trout weighing 200-400 grams and the production techniques used are traditional ponds and recirculation systems (also called model 1 and model 3 farms)[2]. The portion size 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 Netherlands represent significant market for the portion size 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 1080 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 marine farms (not included in this analysis) and 11 freshwater farms certified under organic[3] (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

[2] 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.

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

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 12029, 3034, 7228 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		
	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 DKK0.915 million DKK0.836 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 DKK11 million, model 1(DKK4 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 (DKK1.9 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[4] 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 DKK0.05 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 model1 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 fall 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 (also in Appendix 1) 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-

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

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
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
0655	Operating Profit	-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 are performing better financially than other organic nonseafood 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[5]. This means that with such a smaller share, price premiums become essential for the financial sustenance of the sector.

Conclusion

Denmark is setting the pace as the leading producer for organic trout despite the stringent national 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

[5] 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.

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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Appendix

Appendix 1 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
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