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The Beginning of Organic Fish Farming in Italy[1]

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Abstract. Italian demand for organic products is rapidly increasing, yet there is currently no supply of certified organic marine-fish. Moreover, over recent years marine fish farm profitability has been reduced because of competition from imported products. A pilot project was carried out in order to: a) define standards for organic marine fish farming; b) evaluate production costs in four farms, experimenting semi-extensive organic fish farming under proposed standards (seabream, *Sparus aurata* and seabass, *Dicentrarchus labrax*); c) estimate the potential demand for certified organic marine fish and consumer willingness to pay in order to figure out the profitability of a product differentiation strategy. This paper shows the economic results for production costs at the farm level and potential demand. The latter has been estimated using survey-data of 6,877 consumers by means of a questionnaire-interview carried out during an experimental organic marine fish promotion sale. Results show that organic marine fish farming could be a good market opportunity for some Italian fish farmers by improving consumer information on organic products, adopting a supply concentration strategy at the farm level and carefully managing semi-extensive-farming set up by proposed regulations.

Keywords: Organic fish farming, product differentiation, organic fish demand.

1. Introduction

After an increase over the few past decades, Italian demand for fisheries and aquaculture products has been relatively stable since 1995[2], but is lower than in other EC countries. The apparent yearly per capita consumption was around 10-11 kg during the '70s compared to 18 kg since 1995 (ISTAT, various years). Demand for fresh or frozen fish is relevant: 14.4 kg per capita. The 2001 at home consumption of fish is 7.8 kg/pc/year, that is 450,000 metric tons (1.2% less than in 2000) and 3648 mill Euro (8% of total food expenditure). The (unprocessed) fresh marine fish at home consumption is 1078 mill Euro (131,166 t) (ISMEA-Nielsen, 2001b, 2002)[3]. Both the actual average level of at home fresh or frozen fish demand and the rate of households consuming it (76%) are due to: a) gradual decline of traditional regional patterns (increasing consumption from north-west to south Italy); b) increasing attention to diet and the relation between food and health; c) the substantial stabilization or decrease in fish retail nominal prices over time; d) increasing market share of large scale retail (28.3% of total fresh fish demand in 1997, 40.2% in 2001), (ISMEA, 2001c, Uniprom, 2001).

Until last year households had little accurate information about the fresh fish consumed as regards its country of production or catch, its origin (wild or farmed), the production process (extensive or intensive), etc.. As a consequence of asymmetric information, prices did not provide adequate signals of quality and/or origin. An improvement is expected by the mandatory EC Reg. 2065/01, applied in January 2002, on informing consumers about the method of production and catch area of fishery and aquaculture products.

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1 Research supported by Uniprom under EC FIFG Financial Instrument for Fisheries Guidance (EC Reg. 2080/93), project coordinator Stefano Cataudella, University of Rome 'Tor Vergata'.

2 A temporary increase in fish consumption was observed mainly in November 2000 (+25.9%) and, declining, up to the end of the first semester 2001 as a substitution to meat consumption due to BSE and other terrestrial animal diseases.

3 Consumer attitudes towards fresh fish are quite different with regard to at-home-consumption (health food) and away-from-home-consumption (mainly prestige food) (Boatto et.al, 1994; Dellenbarger et al., 1992; Trevisan, 1999).

On the other hand, over recent years demand for organic food has exponentially grown. In 2001 ISMEA-Nielsen estimated that the total household demand was 1174 mill Euro, equal to a 2.7% share of total food expenditure, with a target share of at least 5% in 2005 (ISMEA, 2001b). The 12.8% increase in demand for organic food since 2000 can be considered the best performance amongst food sub-sectors, despite the relatively low rate of households consuming organic products (medium-high income, relatively young families, mainly living in north-west (36,7%) or north-east Italy (26.6%)). This success is due to an increasing demand for food security and environmental-friendly farming but also to modern retail trader strategies aiming at increasing their market share with product differentiation. The increasing share large scale retailers have of the organic food market is currently 23%[4] (Yussefi et al., 2002) (94% in quantity and 86% in value[5] (ISMEA, 2001d), taking into account only packaged organic food).
Despite the statutory EU regulation on organic food there is also confusion amongst consumers over the meaning of organic and many ask for more information and guarantees concerning certification processes (Federalimentare, 2002).
On the supply side, Italy is a net importer of fishery and aquaculture products. Excluding molluscs (72.8%) and trout (17.8%), the most important aquaculture products are seabass (2.9% of total production for 1999) and seabream (2.3%) (ISMEA, 2001a). In 1998 there were 79 marine species intensive or extensive small to medium-size farms, 19 of which located off-shore (ISMEA, 1998 and 2000). Their production has increased over time, as demand for these species has increased (table 1), assuring a regular supply during the year[6].

Table 1. Seabream and seabass production, import export and consumption, Italy (metric tons)

	1995	1996	1997	1998	1999	2000	2001
SEABREAM							
Production	5379	5393	5759	7217	7454	7939	
-catch	2179	1743	1859	1717	1754	1939	
-aquaculture	3200	3650	3900	5500	5700	6000	
% EC production	26.8	21.2	18.6	19.8	14.7	13.3	
% world production	17.4	13.8	12.2	12.0	10.0	8.3	
Imports		2582	4681	5574	9158	10619	
Exports		605	334	434	984	1179	
At home consumption			11556	12171	18830	18472	17013
SEABASS							
Production	8233	6281	6630	7739	9081	10295	
-catch	4633	2481	2030	1889	1881	2195	
-aquaculture	3600	3800	4600	5850	7200	8100	
% EC production	32.3	24.2	22.5	22.2	21.1	21.5	
% world production	28.4	21.3	19.1	18.5	18.5	16.8	
Imports				7176	10277	11340	
Exports				156	337	537	
At home consumption			6122	6813	9843	10900	9741

Source: ISMEA Web-database. Data not fully balanced as different sources have been used: FAO (total production in fresh fish equivalent), ISTAT (imports, exports of fresh and processed products), ISMEA-Nielsen (only fresh fish at home consumption). Blanks represent unavailable data.

[4] Direct marketing 17%, specialized shops 60%.
[5] Several large scale retailers adopt an organic private labelling strategy (generally highly priced) and the others prefer a lower pricing policy compared to specialized organic food retailers.
[6] Usually a supply increase occurs in the last months of the year due to the extensive lagoon catch.

Over recent years the profitability of marine species (mainly seabream) has considerably dropped, showing operating losses in many semi-extensive farms. This is due to the strong price competition of imported products from foreign countries, namely Greece and, more recently, Turkey (ISMEA, 2000), where intensive off-shore farms have been established. On the other hand, the abovementioned lack of consumer information regarding product origin and the substantial price taker position of small-scale fish farms along the supply chain does not allow the adoption of product differentiation strategies able to assure a price premium to producers. An exception is origin labeling, introduced by some producers' associations located in traditional areas and well known to consumers. As a consequence, the price paid to producers has decreased over time to an average of 4.6-6.7 euro/kg for both species (small-medium size fish). Only fish over 800 g maintained a quite stable nominal price (over 10 euro/kg)[7]. The retail nominal price dropped by around 2 euro/kg (-20%) from 1997 to 2001.

In order to avoid this sector crisis, an unexplored product differentiation strategy for Italian sea-fish farmers could be certified organic marine fish, taking into account the increasing demand for organic food.

At present there is no supply of fresh organic fish in Italy, whether under independent certification schemes or national or EU legislation (with the exception of a few organic trout farms certified by an independent certification body). In other countries the situation is quickly changing. At the time of writing fish is not included in EU organic farming regulations (EC Reg. 2091/92 regards the certification of organic food labeling, amended by EC Reg. 1904/99 to cover organic terrestrial animal husbandry). IFOAM has recently begun work on international guidelines for organic aquaculture; however, several organic labeling bodies provide standard of production and labeling schemes for organic fish (mainly salmon) in several Northern-Central European countries, the USA, Canada, etc. (EU Commission, 2000; Crosetti, Uniprom, 2002).

The paper shows the results of an experimental multi-disciplinary research program (2000-01) aimed at testing the technical and economical feasibility of an organic farming certification standard with particular reference to seabream and seabass. It should be considered as a baseline hypothesis for an EC regulation proposal, to be further checked in the future (Uniprom, 2002). In particular, the paper highlights a) on the supply side, the estimated unit production cost differential of organically farmed fish compared to conventional products harvested in four commercial intensive or semi-extensive commercial farms; b) on the demand side, both the estimated potential demand for fresh organic marine fish and consumer willingness to pay a price premium, based on a survey carried out during the promotion sale of the experimental organic fish (around 40 t) in 40 large-scale supermarket retailers.

2. Methodology and data

2.1 Production costs

To estimate the technical and economical feasibility of organic fish farming in Italian aquaculture, the organic fish farming process has been experimented in four intensive or semi-extensive commercial farms located in central-southern Italy. Farmers agreed to convert part of their ponds or open-sea cages to the organic farming experimental standard under researchers' supervision and monitoring

[7] For this reason, some farms, able to sustain the financial cost due to a longer production cycle, differentiated their production to large-size fish.

production processes in order to fine tune the standard. Obviously, the organic production processes were fully separated from the conventional ones. Highly intensive fish farms were excluded, taking into account the low fish stock density imposed by the organic farming scheme in order to improve animal welfare and to reduce health risks and the impact of farming on the environment. The farms can be considered as representative of the different Italian semi-extensive farming systems (table 2).

Table 2. Experimental organic fish farming units

Farm	**A**	**B**	**C**	**D**
Production System	Open-sea cages	Earth ponds	Concrete ponds	PVC ponds
N. of units	1	2	2	2
Water capacity (m^3)	1200	1400	200	675
Species	Seabream	Seabream	Seabass	Seabream
Final organic fish density (kg m^{-3})	10.6	3.6	15.0	13.5
Final conventional fish density (kg m^{-3})	18.8	4.1	29.0	22.0

Taking into account that conversion to organic fish farming involves the whole farm's structure and management (Petit, 1999), the cost estimates have been based on a full operating costing approach (Banker et al., 1994). Both the production and at firm sales costs have been considered, taking into account organic certification and labeling costs, based on a national independent body's charges (AIAB). Direct costs have been analytically monitored daily on an activity based costing system (Hilton, 1997): a) rearing units' preparation and juveniles input, b) feeding (GMO free organic feed), c) monitoring, control, water changes, etc., d) harvesting and post harvest fish processing. Direct activity cost has been based on real quantities and standard average prices[8] (Selleri,1990). Indirect costs, equipment depreciation included, have been charged to rearing units using specific cost drivers (Atkinson et al., 1998), in order to take into account the influence of low density farming on fish unit cost. The cost of organic fish has been compared with that of conventional fish by parallel-monitoring costs sustained in dimensionally comparable farm units devoted to conventional fish farming. Fish unit cost estimates have been carried out in the following stages:

1) Experiment costs evaluation. Only the grow out phase up to the commercial size of the production process has been analytically monitored, excluding larvae and fry phases. The main differences from conventional fish husbandry are due to: a) direct input farming costs, b) lower farming density, c) high monitoring and control costs, partly due to experimental farming and to reduce health risks, d) organic labeling and certification, e) lack of farm scale-economies due to the small scale experiment, imposing high labour input.

2) Normal medium-run costs estimate. In order to better compare organic fish farming costs with those of conventional farming, normal medium-run production costs have been estimated during focus groups among researchers and farmers involved in the experimental phase. In particular, the scale-economies involved by extending the organic process to the whole farm (Monden et al. 1991) have been taken into account, i.e. using the feeding and monitoring systems already adopted for

[8] Ad hoc organic feed has been prepared by a commercial company and supplied at a contracted price (on average 15% higher than the cost of conventional feed).

conventional farming, if allowed by the organic guidelines, managing, where possible, the maximum final density per cubic meter of water graduating the harvest over time, rationalizing the over-monitoring process due to experimental phase. The cost estimate has been extended to the whole rearing process[9].

3) Opportunity-cost. In order to evaluate the feasibility of converting existing farms to organic farming it is necessary to consider the operating results loss due to the relevant reduction of total production imposed by lower fish density. Given the actual structure and production capacity of the fish farms and assuming the actual utilized capacity as optimal both in conventional and in organic fish farming, the opportunity cost for organic fish can be estimated. That is the differential assuring equal total operating income for the farm both from organic fish and from conventional fish. The estimated opportunity cost has been so expressed as operating results loss from conventional farming per kg of organically farmed fish. A sensitivity analysis of unit full production cost (including opportunity cost) to small increases in final organic fish density and to conventional fish price variation has been carried out. The variable and fixed structure of medium run costs and more optimistic market scenarios compared to those observed in recent years have been taken into account.

2.2 Consumer survey and data

As has been previously highlighted, a consumer survey has been carried out by a market research company during the promotion sale of the experimental organic marine fish harvest. The promotion was held in 40 large-scale retail supermarkets, located all over Italy, the north-west excluded, during the last two weeks of November 2001 (Thursday, Friday and Saturday). The survey-scenario is as follows: a) a detailed description of an organic marine fish experimental production system was presented to consumers by the interviewer; b) the organic fish was sold at the same price as the conventional fish sold by the retailer on the same day; c) it was made clear to the consumer that the organic fish sold could be considered a potential organically-labeled new product, obtained at a higher cost of production than the existing conventional fish, and therefore to be eventually supplied in the future only at a higher price.

A questionnaire-based personal interview was conducted on a sample of people interested in the promotion sale whether they bought the fish or not (6877 questionnaires were collected). Because of the survey design, the results only represent the increasing quota of both fresh fish and organic food buyers in large-scale supermarkets and not Italian households in general. In other words, the goal of this research is to describe the behavior of the potential 'innovator-consumer' of organic fresh fish entering the new niche market, this being the more interesting target-consumer for farms potentially converting to organic fish. From a statistical point of view, a two stage sampling technique was carried out: in the first-stage a non-random sample of supermarkets was selected in order to be spatially representative, under the promotion contracts constraints; in the second stage, household samples were based on an intercept-sampling technique (Brasini et al., 1996). The questionnaire was previously fine-tuned by focus groups and its core-part was extensively pretested during a survey on household conventional fresh fish

[9] Extending the analysis to the whole rearing process, organic fish production costs estimates are better in farms A and B, producing small commercial-size organic fish, and in farm D, organically rearing wild caught lagoon fish. In farm C estimated costs can be referred to the conversion phase and only with cautions to the organic farming process.

consumption carried out by Uniprom in spring-summer 2001 (Uniprom, 2001). In particular, pretesting helped better define the range of price-increases to be randomly proposed to consumers. The 15-question interview aimed at: a) defining household consumption patterns with regard both to fresh fish (frequency and level of seabream and seabass consumption, percentage of large-scale retail demand for fresh fish) and to organic food; b) eliciting consumer willingness to pay a price premium for organic fish (WTP), expressed as a percentage increase on the promotional price[10]. Given the survey's protocol, the premium price can be considered a household's subjective valuation of the perceived or expected difference in quality of labeled organic marine fish compared to conventional fish (Romani, 2000). %WTP was first asked on the basis of a single-bounded dichotomous choice contingent valuation approach[11] (SB-CVM) (Mitchell and Carson, 1989). The take-or-leave-it percentage proposed to each respondent was randomly selected in the 0-100% range of the promotion price. The first question was followed by a continuous follow-up question (OE-CVM), whether the respondent answered 'yes' or 'not' to the first one[12]; c) estimating a household's potential demand for organic marine fish (willingness to buy WTB). An open-ended question directly asked consumers what percentage of actual fresh seabream-seabass consumption would be potentially moved to organically farmed fish if EU-labeled organic fish were to be supplied in the future at the previously declared %WTP price increase[13]; d) better understanding zero-WTPs, in order to separate (and exclude from the analysis[14]) protest answers from zero-WTPs expressed by potentially-in-the-market households; e) describing organic marine fish innovator-households from a socio-economical point of view (sex, age, number of components, income level, region of residence, etc.).

Under Hanemann's (1984, 1989) well known linkage between random utility maximization and the functional form of econometric models with a binary dependent variable, a logit model has been estimated on SB-CVM data, explaining the log-odds ratio as a linear function of several household attributes (including income level as a covariate) and of the percentage premium price proposed (Franses et. al., 2001; Gourieroux, 2000). Median WTP and truncated mean WTPs (both only at zero and between zero and 100%) have been calculated according to Hanemann (1996)[15].

Because of the appreciable number of zero answers both on continuous WTP follow up and on open-ended WTB a censored Tobit model has been estimated in both cases (Greene, 2000). The first one explains the declared percentage premium price as a linear function of a vector of household attributes, including the income co-variate; the second explains the potential household's monthly demand, i.e. the actual marine fresh fish consumption shift to organically farmed fish, as a linear

[10] It was preferred to express a percentage price premium instead of an absolute value, taking into account the different promotion prices among supermarkets, being set equal to prices fixed for same-size conventional fish.

[11] CV approach is been largely applied both in valuing non-market goods and in estimating premium price for new or differentiated market goods.

[12] SB-CV method suffers 'yes-saying' bias, generally avoided using a multiple-bounded CV approach (Hanemann et al. 1996; Bishop et al., 1998). In this specific case a continuous follow up was preferred a) to evaluate WTP for a potential market good, b) in order to simplify the interviewers' work, being members of a promotion sales agency without experience in CVM.

[13] Given the substantially stable household demand for fresh marine fish, it was assumed that the demand for organic fish will substitute a similar quantity of conventional fish.

[14] Respondents showing a low attention level during the interview (subjectively valuated by interviewer) have also been excluded. It has to be pointed out that the refusal to answer rate decreases as the attention level increases. More generally, the number of observations varies among the different analyses carried out, cases with missing data in the considered variables being excluded.

[15] Parameters have been estimated by LIMDEP likelihood function maximizing routine (Greene, 2000).

function of income, price (premium price included), and other significant household attributes (Blend et al., 1999)[16].

3 Findings and comments

3.1 Production costs

The analysis of the estimated medium-run normal unit cost of production can be summarized as follows (table 3)[17]:

a) Comparing the full unit operating cost of conventionally farmed fish with the average price received by producers, the operating loss incurred by the more extensive farms (A and B) because of the high price competition from imported products[18] can be highlighted. Relatively better results can be found in the more intensive farm (C) and in D, adopting a fish-size differentiation and a producers' association geographical origin labeling strategy.

b) The normal production costs of organic fish are 20-30% higher than for conventional fish. The main differences are directly related to the reduction in farming density and more marginally to the higher feed and monitoring costs. Feeding cost differentials are due to organic feed and to not allowing fully automated feeding equipment. Higher costs both in absolute terms and as differentials compared to those for the conventional product are sustained by more capital-intensive farms. Actually, the latter have incurred higher pond/cage-related fixed costs and indirect equipment costs (Jolly et al., 1993). In other words, the maximum final organic stocking density, tentatively fixed by the pilot standard at 15 kg m^{-3}, can be considered the highest drawback to converting existing fish farms to organic farming. However, this fixed limit could be managed in a more flexible way being more strictly related to farming conditions and to using equipment that assures animal welfare.

c) The normal costs increase compared to experimental ones, due to extending the organic standard to the whole rearing process, is highly compensated by the technical and organizational scale-economies incurred by extending the organic husbandry at the farm level, mainly in the more capital-intensive farms.

d) Taking also into account the estimated opportunity-cost of organic fish farming, the estimated price premium for organic fish, guaranteeing the firm the same total operating income as for the conventional product, varies on average from 2.07 euro per kg in extensive farms to 2.5 in the more intensive ones. Obviously these average premium prices have to be considered as minimal values assuring only the current low profitability to farms, not sustainable in the long run. As has been previously highlighted for production costs, the minimal price premium is sensitive to the final density of organic fish stock. For example, in farm A, reaching an organic final density of 15 kg the break-even price would be 6.5 €/kg (15% less than at experimental density). A -0.42 average elasticity of break-even price to density has been estimated. For farm B, representative of traditional Italian fish farming plants, at present out of market, organic fish farming could be a good new chance to operate: at the usual 4 kg m^{-3} density the break-even price would be 7 €. In the more intensive farms, increasing the maximal density to 18 kg m^{-3} will cause a lesser decrease (8-10%) in the break-even price because of the higher impact of fixed and semi-fixed costs (respectively -0.55 and –0.48 average elasticity to density

[16] Only the selected models on the basis of the maximized value of the log-likelihood function will be later discussed.

[17] A more detailed analysis of costs can be found in Uniprom, 2002.

[18] As a result, both unaccounted family labour and accounted non monetary costs, i.e. depreciation, are generally undervalued. At present the more extensive fish farm (B) does not operate.

increase). On the other hand, if EC Reg. 2065/01 on informing consumers about fishery and aquaculture products successfully works, increasing the prices of Italian fresh sea-fish, the minimal price premium for organically farmed fish will linearly increase. On average, a 60% marginal effect can be observed in the more extensive farms as opposed to 70% in the semi-intensive ones.

Table 3. Medium-run normal unit costs of organic fish and at farm price premium assuring equal operating results to conventional fish farming (€ /kg)

Farm:	A	B	C	D
Organic fish full cost (experimental)	**6.37**	**7.37**	**10.10**	**9.08**
Organic fish full cost (normal)	**6.52**	**7.38**	**7.77**	**7.54**
Direct rearing costs	3.63	4.98	5.91	5.78
Rearing units' preparation and juveniles	1.68	1.50	3.25	2.11
Feeding	1.56	1.87	1.23	1.76
Monitoring and control	0.39	1.61	1.43	1.91
Harvesting and post-harvesting fish processing direct costs	0.78	0.69	0.55	0.71
Direct depreciation costs	0.95	0.85	0.93	0.51
Indirect costs	1.08	0.82	0.35	0.48
Certification and labeling	0.07	0.04	0.03	0.07
Conventional fish full cost	**5.02**	**6.16**	**5.96**	**6.05**
Cost difference (%)	29.7	19.8	30.5	24.6
Cost difference	**1.49**	**1.22**	**1.82**	**1.49**
Of which: direct rearing	0.71	0.67	1.02	0.91
Direct harvest and post harvest	0.42	0.39	0.39	0.31
Depreciation and indirect costs	0.29	0.12	0.38	0.20
Certification and labeling	0.07	0.04	0.03	0.07
Average price of conventional fish	**5.62**	**5.22**	**7.75**	**8.29**
Organic fish price assuring total operating results equal to conventional fish farming	**7.59**	**7.38**	**10.40**	**10.10**
Of which: normal full cost	6.52	7.38	7.77	7.54
Unit opportunity cost	1.07	0.00(*)	2.63	2.56
Minimal price premium	**1.97**	**2.16**	**2.66**	**1.80 (**)**
Price differential (%)	**34.95**	**41.38**	**34.27**	**21.72**

(*) In this farm, showing an accounting operating loss, the analysis has been carried out with reference to break-even organic price.
(**) In this case, the minimal price premium has been reduced because of the higher average weight increase (appreciable in terms of commercial size) of organically farmed fish compared to conventional fish.

3.2 Respondents' profile

Table 4 shows some summary statistics of the respondents. Households interested in the experimental organic fish promotion sale are mainly: a) resident in north-east Italy (50.6%), b) women (60.3%), c) usually fresh fish buyers for the family (80.5%), d) 35-54 years old[19]. Both income-level distribution and family size are comparable with ISMEA-Nielsen fish-consumer surveys.

The respondents' consumption patterns have also been investigated with particular regard to organic food and to fresh marine fish. They show the expected spatial differences (table 5). 34% of the interviewees do not buy organic food at all, but 16%

[19] ISMEA-Nielsen household surveys account for a higher fresh fish consumption in higher age-classes. Our findings show greater interest for organic fish consumption in relatively younger people, and confirm the general low penetration of fresh fish consumption among young families.

of them are regular organic food consumers, mainly living in north-east Italy. As expected, both the market penetration and consumption level of organic food decline from north to south Italy. However this survey confirms the above mentioned (EU Commission, 2000; ISMEA, 2000) need to better inform consumers on organic food production processes and on certification systems in order to increase its penetration level[20].

The sample of respondents shows: a) an above national average marine fresh fish consumption (5.6 kg per capita year), increasing from north to south Italy because of traditional eating habits, b) a higher household rate of consumption, c) a relevant consumption frequency (at least weekly in over 70% of cases, as opposed to the 53% reported by ISTAT (2000), d) an above average demand for fresh fish to large-scale-retailers (67.6%). 39.3% of respondents buy fresh marine fish exclusively at large-scale supermarkets (51% North-east Italy). The declining share from north to south is mainly related to differences in the rate of diffusion of the modern-retail-trade.

The respondents' profile confirms the hypothesis that the potential labeled organic fresh fish buyers could be, at first, both organic food and intensive marine fresh fish consumers. Caution in extending the survey results to all Italian consumers has also been confirmed.

Table 4. Respondents' summary statistics

		Percentage of respondents
Place of living	North-east	50.6
	Centre	18.5
	South	14.6
	Islands	16.3
Gender	women	60.3
	men	39.7
Age group	18-24	3.4
	25-34	13.8
	35-44	25.2
	45-54	25.3
	55-64	19.9
	>64	12.4
Income level	low	47.8
	low-medium	26.9
	medium-high	10
	high	15.3
Family size	Mean value	2.9
Respondents' attention level	low	9.5
	sufficient	35.4
	good	55.1

[20] Only 22% of respondents do not demand organic food because of its higher price.

Table 5. Respondents' consumption patterns: organic food and fresh fish

	North-east	Centre	South	Islands	Italy
Organic food demand (%): never	27.9	35.9	48.4	40.2	34.3
occasionally	51.3	49.3	45.1	49.8	49.8
regularly	20.9	14.8	6.5	10.0	15.9
Why zero organic food demand (%)					
lack of product awareness	23.9	22.3	24.2	44.1	27.3
lack of trust over certification systems	23.3	24.1	16.6	15.7	20.7
not interested	28.2	31.3	38.7	22.9	30.0
higher prices	24.6	22.3	20.6	17.3	22.0
Marine fresh fish average consumption (kg/per household /monthly)	1.06	1.31	1.57	2.08	1.39
Percentage of households not consuming fresh marine fish	25.8	22.5	9.9	9.7	20.3
Percentage of low fresh fish consumers (monthly or less)	13.4	6.4	5.7	7.8	10.0
Average large-scale-retailers share of marine fresh fish demand (%)	77.4	68.4	51.2	55.9	67.6
Average promotional price (€/kg)	9.05	6.33	6.52	6.55	7.60

3.3 Respondents' willingness to pay

43% of interviewed households accept the SB-CVM randomly proposed premium price. The percentage accepting to pay declines according to the increase in proposed amounts (ranging from 71.6% for a premium less than 10% to 16.6% for a price increase of over 80%). The maximum likelihood SB-logit model estimates are reported in table 6 and have the expected sign. In particular, respondents behave according to economic theory: as the percentage price premium increases, their likelihood to accept the proposed amount decreases and the latter is positively related to income level. The coefficients on the considered consumption patterns are all positive, as expected: frequency of marine fish consumption, consumption level of both fresh fish and organic food, demand share to large-scale-retail, and traditional fish consumption habits (spatially differentiated and increasing from north to south Italy). Negative coefficients of family size and household age are generally found in the case of eco-labeled food (Wessels et al., 1999; Blend et al., 1996; Fu et al., 1999; Jaffry et al, 2000; Asche et. Al., 1999) and they are coherent with Italian organic food consumption patterns. The median percentage premium price is 37.8% higher than the promotional price. The zero- truncated mean is 43.3% and the double-truncated mean 41%.

Continuous follow up WTP shows 17.7% of respondent declaring a WTP=0. A debriefing question (table 7) highlights that only 12% of zero-WTPs can be accounted for protest answers. On the other hand, 46.4% of the unwilling to pay respondents can be considered in-the-organic-fish-market, i.e. potential organic fish buyers willing to pay the same price paid for conventional fish.

Taking into account only the in-the-market households, the censored Tobit model estimates confirm the previous model coefficient signs of main factors affecting a WTP price premium. In particular, the role played by organic food and fresh fish direct knowledge is confirmed[21], as a consequence of an expected improvement in

[21] In another model specification, including the promotion price, the coefficient was not significantly different from zero, being income-related.

the perceived fish quality. As expected, the censored conditional mean household percentage premium price (29.46%) is lower than the SB-CVM mean, because of the ‘yes-saying’ bias affecting the latter.

Table 6. Estimated coefficients of SB-CVM logit model

Variable	Coefficient	t-value	Variable description
Constant	-1.468	-6.558	
INCOME	0.084	2.704	Income level, categorical (4 levels)
SUPER	0.005	4.494	Large scale retailers fresh marine fish demand share
FAM	-0.047*	-1.715	Family size
AGE	-0.051*	-1.898	Household age
QUA	0.095	2.935	Frequency of fresh fish consumption, categorical (5 levels)
MARINE	0.073	2.238	Monthly household fresh marine fish consumption
BID	-0.039	-26.023	Percentage premium price proposed
BIO	0.973	18.507	Household consumption of organic food, categorical (3 levels)
REGION	0.233	7.290	Place of living, categorical (4 levels)

* Significant at the 10% level; otherwise significant at least at the 5% level.
N=5141
Percentage of correct predictions= 71.2
McFadden’s R^2=0.18
Model chi-square=1257.4 (9df)

Table 7. Debriefing question on zero-WTP

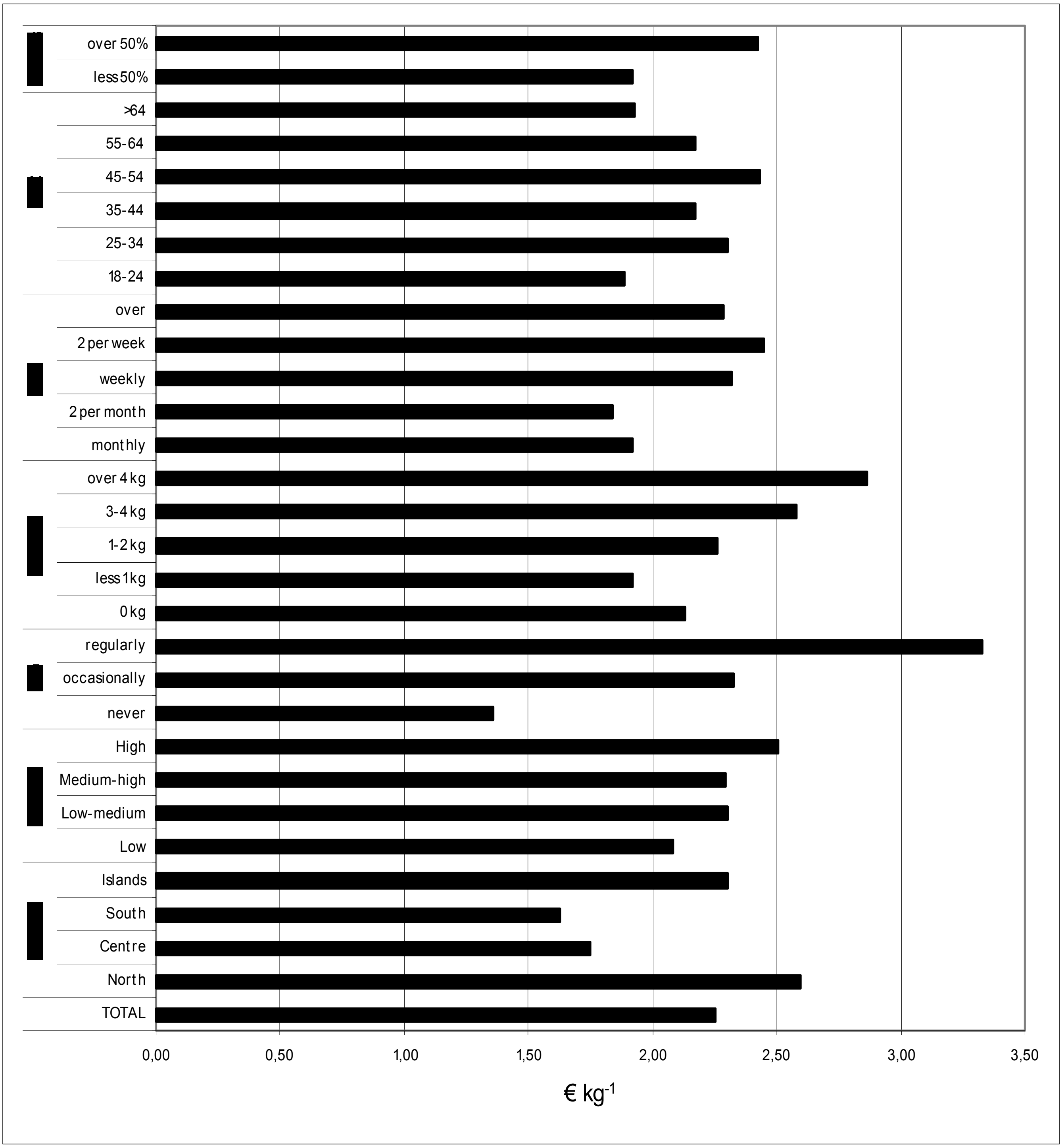
	Percentage
Protest answer	11.9
In-the-market-zero (premium=0)	46.4
Out-of-market (no concern in organic fish)	25.7
Out-of-market (lack of trust over certification)	16.0
Total	100.0

Table 8. Continuous follow-up Tobit model estimated coefficients

Variable	Coefficient	t-value
Constant	-17.67	-5.36
INCOME	0.86*	1.72
SUPER	0.12	6.80
AGE	-0.72*	-1.65
QUA	1.13	2.16
MARINE	0.94*	1.77
BIO	13.22	15.77
REGION	3.04	6.01
σ	27.66	67.64

* Significant at the 10% level; otherwise significant at least at the 5% level.
N=2937, 17.7% of which corresponds to zero-WTP
Max log-likelihood value -8465.48

Figure 1. Average household premium price (€/kg)



Expressing the household premium price for organic-labeled fish in euro/kg (figure 1), it can be highlighted that:

a) innovator-potential-consumers of organically farmed fresh marine fish are willing to pay 2.25 €/kg as a mean premium price (σ=1.98). If fully transferred along the *filiere* to organic fish farmers, the mean premium is over the minimal premium at the farm level only in the case of more extensive fish-farms. On the other hand, the result seems too low, in general and particularly for the more intensive fish farms, taking into account the respondent's tendency to overestimate their real WTP in simulated markets (Romani, 2000; Dalli et. al., 2000). For the last fish farm considered, mainly producing origin-labeled large-sized fish, the effect of a double-labeling system seems questionable, in terms of price premium, and further investigations are needed[22].

b) Mean premium price significantly differs among respondent subgroups. In particular, it is higher and more adequate for organic fish farms' needs, in the case of regular organic food consumers, expressing a high level of marine fish demand and mainly living in north Italy. It seems a relatively easy and 'expert' market segment for organic fish farm penetration strategies, because of relatively low investment costs are needed in order to inform consumers on organic fish farming standards.

3.4 Respondents' potential demand

Taking into account only the potentially in-the-market households, a tentative[23] censored Tobit linear demand model has been estimated (table 9), expressing the dependent variable as potential at-home organic marine fish demand as a household's monthly consumption (kg). It has been obtained on the basis of declared %WTB and actual conventional marine fish at-home consumption. As expected, both the decision to buy and the quantity purchased (Tobit model imposing that the same variables affect the two decisions) are positively related to a household's income level, and negatively to price. Mean price elasticity of demand equals -0.22, showing a scarce price-sensitivity of innovator-potential-buyers. On the other hand, both organic food and marine fish consumption levels show a significant positive effect on demand. However, the organic fish demand is more relevant in northern Italy, probably as a consequence of: a) higher trust in the organic labeling system, b) expected reduction in imperfect and asymmetric information of marine fish consumers due to organic certification. The need to be better informed on marine fish origin and quality is actually higher in northern regions, where at-home marine fish consumption has recently become more widely spread.

The household's estimated monthly mean potential demand is 511g, around 37% of the respondents' actual marine fish consumption. It is an interesting level (2.1 kg on a per capita year base), from the producers' point of view, also taking it carefully, because of the particular innovator-consumers considered. The mean potential demand for organic marine fish consumers is above average in several homogeneous subgroups: high organic food consumers (728 g), high income level (673 g), 45-55 year old households (605 g), high marine fresh fish consumers (1.281 kg) and families living in northern Italy (543g), the latter expresses a relevant %WTB (43.6%) which is comparable with that of frequent organic food consumers (44.4%).

[22] In all cases, the experimental organic fish was unlabelled during the promotion sale.

[23] A further data cleaning was needed at this stage of the analysis, in order to exclude both WTB missing data and the few cases expressing an inconsistent behaviour (WTP>0 but WTB=0). There are 1710 remaining valid cases.

Table 9. Tobit demand model estimated coefficients

Variable	Coefficient	t-value
Constant	-0.698	-6.174
INCOME	0.045	2.591
ORGANIC PRICE	-0.012*	-1.657
MARINE	0.459	23.359
BIO	0.060	1.980
REGION	-0.125	-6.899
σ	0.759	49.523

* Significant at the 10% level; otherwise significant at least at the 5% level.
N=1710, 21.2% of which correspond to zero-WTB
Max log-likelihood value -1805.89

4. Concluding remarks

Analysis has shown the potential interest in organic farming labeling as a means of generating market-driven incentives to support Italian marine-fish aquaculture. On the demand side, the consumer survey carried out during the promotion sale of experimental organically farmed marine fish has shown:

a) the potential innovator-consumer is willing to pay an average premium price, able to cover the increased production costs for organic standards, at least, of more extensive marine fish farms. On the other hand, a well defined household subgroup (high-income level, regular organic food consumer, above average fresh marine fish buyer, mainly living in northern Italy) provides for an intentional WTP a premium fully compatible with the estimated costs at the farm level;

b) the potential demand, cautiously estimated as a percentage shift from conventional consumption levels to organically labeled consumption is interesting in volume, if compared to Italian aquaculture marine fish supply.

At the marine fish farm managerial level, the following are of note:

a) a product differentiation strategy based on organic fish labeling seems possible in the short run. It aims to reduce the loss of profitability recently incurred by Italian marine fish farmers because of the strong price-competition of imports. The previously described target sub-population of consumers seems a relatively-easy market segment for organic fish farm penetration strategies, because of relatively low investment costs needed to inform consumers on organic fish farming standards. At present this target is the best informed on organic food certification systems. In the meantime, organic labeling seems to play the role of improving the perceived fish quality, reducing the consumers' lack of information on fish origin (Roth et al., 2000);

b) since fish farmers operate as price taker, the full transferability of the consumers' price premium to them seems questionable. Adequate supply concentration at the farm level as well as price agreements with large-scale retailers are strongly recommended.

At the institutional level, the following are of note:

a) if the niche market seems to adequately assure profitability to organic marine fish farms in the medium run, temporary institutional financial support is needed to cover the higher investment and organizational costs sustained by fish farms during the conversion period, when unlabelled fish is produced. A temporary and partially decoupled support system could be arranged on the rearing capacity, such as the EU agriculture organic farming support system under the Agenda 2000 Regulation. On the other hand, the lower environmental impact of organic aquaculture could justify the support (Cahill, 2001);

b) in order to assure an increase in demand for organically labeled marine fish and organic food in general, consumers have to be better informed on organic farming guidelines, improving their trust in certification systems (Mariette et al., 1999);

c) the imperfect and asymmetric information characterizing the fresh fish market could also be reduced. Under EC Reg. 2065/2001 on informing consumers about fishery and aquaculture products, an EU member country can autonomously define both the different production/catch processes and the farming/catch areas. In Italy, a proper fine-tuning strategy could increase both fresh fish demand and consumer willingness to pay for origin-labeled or organic-labeled fish.

Finally, further research needs have emerged. From the supply side, the pilot organic standard has to be improved, both from a technical and economical point of view, giving greater attention to the whole production process costs and the distribution costs. The *interfiliere* price transfer mechanism also has to be explored. On the demand side the following should be investigated: a) the double labeling system effect (geographical origin label and organic label) on the price premium, under a full operating EC Reg. 2065/2001; b) the price premium effect for different species and different fish commercial sizes; c) potential away-from-home demand for certified organic marine fish, because of the expected higher consumer WTP affecting it.

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