

## Trout hamburgers: a sustainable pipeline from aquaculture to community catering

Marco L. Bianchini<sup>1\*</sup>, Valerio Muzzini<sup>1</sup>, Elena Pagliarino<sup>2</sup>

<sup>1</sup>*Inst. Agro-environmental Biology and Forestry, IBAF-CNR, Italian National Research Council  
Via Salaria km 29.300, 00015 Monterotondo Scalo (Rome), Italy*  
<sup>2</sup>*Villa Paolina, 05010 Porano (TR), Italy*

---

### Abstract

Public procurement is one the most influential means through which national and local governments can endeavor to modify behaviors and habits in the economy and the society. By assuring large, certain and lasting markets, public administrations can request sustainable changes from their suppliers, laying down the conditions for supervising the whole process and for empowering the consumers. Serving fresh, high-quality fish coming from sustainable aquaculture systems in school and other public canteens should have positive effects on people's present and future health and well-being, on the environment, on the local social and economic development. Still, such a simple idea turns out to be a surprisingly complex affair in practice, requiring inputs of research, innovation, information and training at every stage of the pipeline. This study describes a catering trial in the canteen of a public research institution of fresh hamburgers and sausages from farmed rainbow trouts, of which Italy is one of the most important producers. The difficulties encountered during the experiment, both objective and subjective (i.e., those perceived by the different actors along the supply chain, including the consumers) are examined, and solutions envisaged to overcome the barriers are proposed; finally, the results of a preliminary survey on fish consumption in community canteens are analyzed.

**keywords:** Trout, Public procurement, Aquaculture pipeline, Canteen catering, Final consumers

---

### Introduction

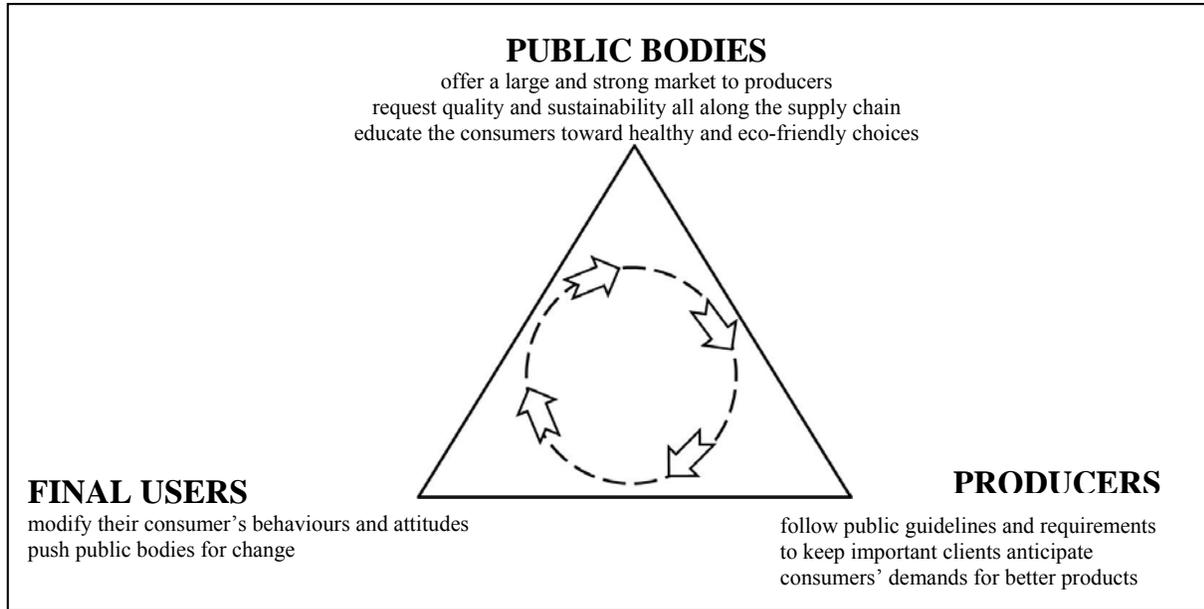
Public procurement is one of the most influential means through which national and local governments can endeavor to modify behaviours and habits in the economy and the society (Morgan and Sonnino 2008). During the last decade, an increasing focus has been emerged on public procurement as a fundamental contributor to pressuring for more environmental friendly products and processes all along the supply chain (Sips 2000; Erdmenger 2003; European Commission 2004; Michelsen et al. 2006; Carlsson and Waara 2007; Clement 2007).

By assuring large, certain and lasting markets, public administrations can request sustainable changes from their suppliers, laying down the conditions for supervising the whole process and for empowering the consumers (Bertino 2008; Pietinen et al. 2010).

---

\* Corresponding author. Email: bradipo50@yahoo.com. Tel: +39-0690672539, Fax: +39-069064492.  
© 2010, IAU, Tonekabon, IAR-10-1157.

The “green” and/or sustainable public procurement process effectively realizes the so-called “triangle of change” (UK Sustainable Consumption Roundtable 2006):



Serving fresh, high-quality fish coming from sustainable aquaculture systems in school and other public canteens should have positive effects on people's present and future health and well-being (Emmons et al. 1999; French et al. 2001), on the environment (Naylor et al. 2000), local social and economic development (Roos et al. 2004).

It must be taken into the consideration that seafood served in public canteens, especially in schools, shows often a high degree of uneaten leftovers (Pagliarini et al. 2005; Caporale et al. 2009); it is envisageable that mild-flavored, non-conventional fish presentations, resembling more “usual” foodstuffs, should overcome this problem.

Moreover, public institutions of research and education, e.g. the Italian National Research Council (CNR), besides their strategic research plans (Palmegiano and Bianchini 2004), have the mission to raise environmental awareness and to address people, and especially its own staff as producers of knowledge in the society, toward right alimentary choices (Bala et al. 2008). In fact, such a simple idea turns out to be a surprisingly complex affair in practice, requiring inputs of research, innovation, information and training at every stage of the pipeline (Cattaneo et al. 2007).

This study describes and discusses a catering trial in the canteen of a public research institution of fresh hamburgers and sausages from farmed rainbow trouts, of which Italy is one of the most important producers (FAO 2009).

## Materials and methods

The venue for the catering trials was the research campus of the Italian National Research Council in Montelibretti (30 km north of Rome). It comprises 17 research institutes, with domains as varied as agriculture, biotechnology, environment, chemistry; the working population varies daily, but it is around 500 persons, half of which is of post-doc researchers. The canteen serves an average of 300 lunches per day, offering a choice of 3 main courses, among which fish and other seafood such as cephalopods and shrimps are proposed twice a week, usually the fish which has been served in the canteen is frozen, of unknown origin (mainly extra-European, caught in the wild), presented whole or as fillet, breaded or not.

The catering trials were conducted twice, the first time (June 18<sup>th</sup> 2010) with innovative presentations of fish as a “surprise”, the second one (July 2<sup>nd</sup> 2010) after an informative campaign with e-mail messages, informal discussions, leaflets and posters.

The proposed fish dish was made of hamburgers and/or sausages, prepared with fresh grounded fillets of rainbow trout (*Oncorhynchus mykiss*) and other minor ingredients (potato flakes, spices, sunflower oil), produced in aquaculture farms of Northern Italy; it was preserved by refrigeration only, not freezing. To maintain the intrinsic taste and flavour, the preparations were simply grilled, without sauces. The pipeline was shortened to producer (transport included), catering, and final consumer.

A questionnaire, slightly different in the two trials, was handed out to every canteen user, and taken back at the end of the lunch, apart from personal information about sex, age, dependents, level of studies, it was asked to explain the actual meal choice and in case to measure the organoleptic quality of the fish dish, to assess the knowledge of fish quality in general and of the dish of the day, and to explicit the general behaviour toward fish servings. The Chi-square test was used for comparing the homogeneity of proportions at  $P < 0.05$ .

## Results

The first trial has been carried out to evaluate the demographic characteristics of the canteen users population, their perceived attitude toward the fish dishes usually served and the spontaneous reaction to non-conventional fish preparations.

During the first trial, the rate of return of the questionnaires was almost 100% (247/250). The sampled population (Table 1) was 151 men and 96 women, of which 54% were researchers of various level, 14% of the users were non-CNR personnel.

The average age of the respondents was 44 years, about one third had dependents, 73% replied to be somehow involved in the home procurement of foodstuffs, 92% declared to eat fish, regularly (60%) or seldom (32%).

It appears that users were not aware of the commodity characteristics of the fish usually served at the canteen. In fact more than half (56%) did not know its geographical origin, almost nobody (92%) did know that it has been caught in the wild, but 84% rightly considered it frozen. The fish served at the canteen was considered of bad quality (58 “bad quality” judgments vs. 19 “good quality” responses), and in fact 84% declared that they don’t choose fish dishes at the canteen, even if they like it in general.

Speaking of the trout preparations actually served during the trial, it was a relative success, even having been proposed without previous information. In fact it was chosen by 88 persons (which was more or less the same number that usually takes fish as main course). Hamburgers and sausages received the same score, having been appreciated by more than 70% of the takers, still, 19% of the users population found that the non-conventional aspect was unacceptable. Notwithstanding that the perception of its national origin, of its aquaculture production and its freshness remained low, its better quality was recognized by many more people (30 “good quality” responses vs. 23 “bad quality” judgments).

As expected, the population for the second trial (Table 1) was similar to the previous one, average age 44 years, 41% of women, 56% of researchers, 12% of non-CNR personnel, 31% with dependents, 69% of people involved in food procurement, strangely enough, the rate of return of the questionnaires was lower (229/263).

Table 1. Demographic characteristic of the sampled population

	Trial I	Trial II		Trial I	Trial II
Men	151	135	post-grad	123	109
Women	96	92	technician	61	54
			other occupation	43	31
< 34 years	62	56	did take fish	88	134
35-44 years	63	48	did not take fish	154	95
45-54 years	55	58	willing to pay		
			premium		132
> 55 years	51	45	not willing to pay		
			premium		84

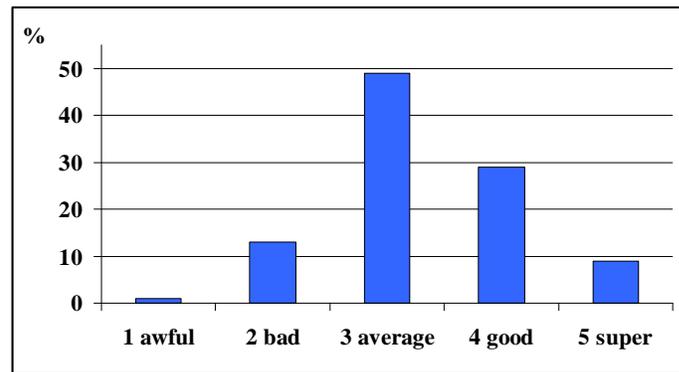


Fig. 1. Appreciation of the overall taste of the fish served during the second trial

The second trial, two weeks after the first one and preceded by “marketing” information, elicited curiosity: in fact, 59% of the canteen users decided to try the fish dishes, i.e. 23% more than average. The percentages of users that never take fish at the canteen (29%) and that dislike the non-conventional aspect (21%) were similar to the previous results. Among the fish takers, using a 5-step scale (Fig. 1), 38% expressed a completely positive evaluation (vote 4 or 5) of the product, 48% showed a middle attitude (vote 3), and only 14% disliked it (vote 2, with only 2 people voting 1), critics belonged to two typology, too mild taste and/or unacceptable shape (referred to sausages presentation only).

Table 2. Perceived characteristics of the fish served at the CNR canteen

	Usually	Trial I	Trial II
National (vs. foreign)	10 (58)	34 (22)	89 (9)
Fresh (vs. frozen)	2 (175)	23 (85)	38 (44)
Farmed (vs. wild)	72 (2)	60 (1)	110 (0)
Good quality (vs. bad)	19 (58)	30 (23)	44 (15)

The perception of the peculiarities of the fish served during the trial remained low (Table 2), notwithstanding the information campaign, 43% did not realize it was “made in Italy”, and only 31% considered it fresh but 80% were aware of its aquaculture origin. Its overall quality was recognized (Fig. 2) by a majority of respondents (44 “good quality” responses vs. 15 “bad quality” judgments, plus 43 “don’t know”).

The second questionnaire was aimed also at determining the perceived nutritional values and the factual knowledge about fish properties, 85% considered important the presence of fish dishes in the canteen, with 49% of the respondents considered the choice “very important” (Fig. 3), moreover, 61% declared to be ready to pay a premium (set at 45 eurocents) for fish of greater quality, being freshness the most sought parameter. A whopping 99% recognized fish as a healthy food, being the presence of omega-3 fatty acids the most indicated reason, a great majority recognized also that farmed fish costs less than the wild product of comparable quality.

It is worth noting that men’s and women’s responses did not show statistically significant differences at the 10% level in any comparison, in particular, not on the today choice ( $\chi^2$  probability=0.83), nor in the preparation taste ( $\chi^2$  probability=0.39, slightly better for women), nor in the importance of fish in the canteen ( $\chi^2$  probability=0.83) or in the willingness to pay a premium for better fish products ( $\chi^2$  probability=0.79).

The level of instruction did not significantly discriminate a group behaviour, still, having a University degree suggested a propensity toward trying un-conventional preparations ( $\chi^2$  probability=0.17) and a willingness to pay for better quality ( $\chi^2$  probability=0.24).

Having dependents, and therefore a family, probably means a tendency toward healthier alimentary habits. In fact, this section of the users considered the choice of fish dishes highly important ( $\chi^2$  probability=0.04), did like the proposed preparations ( $\chi^2$  probability=0.08) and was more prone to pay a premium than the general population (although only with a  $\chi^2$  probability=0.19).

Another significant result was obtained splitting the population on the mean age, “seniors” did like today servings more ( $\chi^2$  probability= 0.07), and almost gave greater importance to the fish choice in the canteen (although only with a  $\chi^2$  probability= 0.15).



Fig. 2. Perception of the fish quality served at the CNR canteen

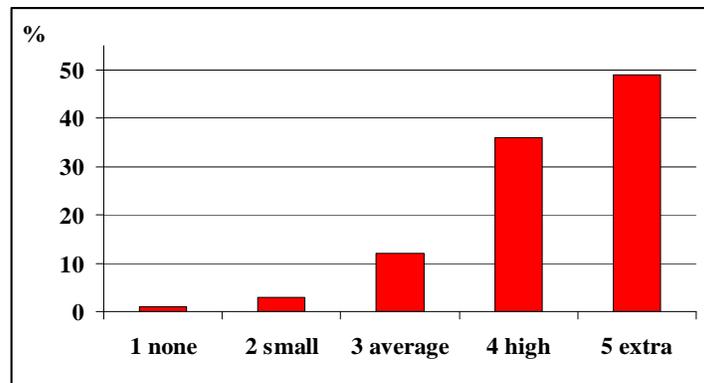


Fig. 3. Perceived importance of the serving in the menu at the CNR canteen

## Conclusion

The study was aimed at tentatively replacing the fish usually served in the canteen of the largest CNR campus (frozen, caught in the wild, of extra-European) with a fresh, farmed Italian products, in non-conventional preparation, assessing its acceptance by the final consumers.

The population sampled was composed of keen people (working in a stimulant environment, and half of which were post-docs), involved in the family food procurement, with a positive attitude toward edible fish, used to assume an active role in spreading innovation; it seems to be an ideal community in which exerting actions for multi-focused alimentary changes.

At the beginning, the sample was not well informed about the characteristics of the seafood usually served at the CNR canteen, still, a short informative campaign resulted in greater awareness, showing that consumers, given the possibility, care for the food eaten at the canteen. The “marketing” effort before the second trial elicited interest and curiosity, with more than half of the canteen users willing to test the innovative trout servings, a substantial increase above the average of one third of takers. The judgment of the quality of the seafood usually served at the canteen was strongly negative, with a majority of respondents never taking fish at the canteen for that reason, among the commodity parameters, freshness resulted the most sought characteristic.

On the contrary, the fish served during the trials was appreciated for its qualities. Critics were concentrated on the mildness of taste of both trout preparations, and on the shape of the fish sausage, therefore in the future,

notwithstanding the many industrial and catering advantages of using hamburgers and sausages, the utilization of non-conventional shapes should be reconsidered, at least for the adult target.

The catering trials proved that a short-chain pipeline, producer to canteen to consumer, of fresh, local, farmed fish is feasible, and that the product is appreciated by the users of a large, public canteen. More research is still necessary to assess the various requirements of different final recipients (schools, hospitals, etc.) in species, preparation, biological production, sustainability of the pipeline, etc.

## Acknowledgements

The fish preparations were kindly provided by the national category chamber, the "Associazione Italiana Piscicoltori" (API). Sincere thanks to the whole personnel of the CNR's canteen in Montelibretti.

## References

- Bala A, Muñoz P, Rieradevall J, Ysern P. 2008. Experiences with greening suppliers: the Universitat Autònoma de Barcelona. *J Cleaner Product* 16: 1610-1619.
- Bertino RM. 2006. Scuole e aziende, avanti con bio. *Ristorazione collettiva* 4: 36-41.
- Caporale G, Policastro S, Tuorila H, Monteleone E. 2009. Hedonic ratings and consumption of school lunch among preschool children. *Food Qual Prefer* 20: 482-489.
- Carlsson L, Waara F. 2007. Environmental concerns in Swedish local government procurement. K.V. Thai, G. Piga (Eds.) *Advancing public procurement: practices, innovation and knowledge-sharing*, Academic Press (Boca Raton FL, USA) 239-256.
- Clement S. 2007. *The Procura and manual: a guide to cost-effective sustainable public procurement*, ICLEI European Secretariat, Freiburg, Germany (2nd ed.).
- Cattaneo P, Balzaretto C, Bernardi C, Colombo F, Marzano AM. 2007. Principali problematiche legate ai prodotti della pesca nella ristorazione collettiva. *Industrie alimentari* 46(470): 625-632.
- Emmons KM, Linnan A, Shadel WG, Marcus B, Abrams DB. 1999. The Working Healthy Project, a worksite health-promotion trial targeting physical activity, diet, and smoking. *J Occupat Environm Med* 41(7): 545-555.
- Erdmenger C. 2003. Public purchasing: a new, old policy tool. C. Erdmenger [ed.] *Buying into the environment: experiences, opportunities and potential for eco-procurement*, Greenleaf, Sheffield, UK: 1-9.
- European Commission 2004. *Buying greent: a handbook on environmental public procurement*. Official Publications of European Communities, Luxembourg: 1-39.
- FAO 2009. *The state of world fisheries and aquaculture*, Rome, Italy.
- French SA, Story M, Jeffery RW. 2001. Environmental influences on eating and physical activity. *Ann Rev Pub Heal* 22: 309-335.
- Michelsen O, Fet AM, Dahlsrud A. 2006. Eco-efficiency in extended supply chains: a case study of furniture production. *J Environm Manag* 79: 290-297.
- Morgan K, Sonnino R. 2008. *The school food revolution*. Earthscan Publications, London, UK: 231 p.
- Naylor RL, Goldburg RJ, Primavera JH, Kautsky N, Beveridge MCM, Clay J, Folke C, Lubchenco J, Mooney H, Troell M. 2000. Effects of aquaculture in world fish supplies. *Nature* 405: 1017-1024.
- Pagliarini E, Gabbiadini N, Ratti S. 2005. Consumer testing with children on food combinations for school lunch. *Food Qual Prefer* 16: 131-138.
- Palmegiano GB, Bianchini ML. 2004. The role of public research in the strategic development of aquaculture in Italy. *Aqua Europe* 35(2): 7-9.
- Pietinen P, Männistö S, Valsta LM, Sarlio-Lähteenkorva S. 2010. Nutrition policy in Finland. *Pub Heal Nutr* 13: 901-906.
- Roos E, Sarlio-Lahteenkorva S, Lallukka T. 2004. Having lunch at a staff canteen is associated with recommended food habits. *Pub Heal Nutr* 7(1): 53-61.
- Sips H. 2000. Combining economic growth with reducing pressure on the environment. E.F.M. Wubben (ed.) *The dynamics of the eco-efficient economy - environmental regulation and competitive advantage*, Edward Elgar, Cheltenham, UK: 77-93.
- UK Sustainable Consumption Roundtable, 2006. *I will if you will: towards sustainable consumption*. Sustainable development commission & National consumer council. London (UK). [www.sd-commission.org.uk/publications/downloads](http://www.sd-commission.org.uk/publications/downloads).