

## Improving food quality for the organic poultry meat sector: a Quality Function Deployment approach

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**Key words:** House of Quality, QFD, organic poultry meat, quality determinants.

### Abstract

*The paper presents results from an Italian study on the development of the food quality for poultry meat into the organic sector, using the Quality Function Deployment (QFD) technique. Results show that among the visual characteristics of poultry meat consumers assign greater importance to attributes strictly related to the animal welfare issue. Price and product appearance (colour and fat presence) come as second. To meet these needs, producers can effectively operate along the supply chain by acting on: housing type, genotype lines and stocking density (animal concentration/mq). Information about these issues (labelling) should also be provided to the consumers.*

### Introduction

Exploiting dynamic and heterogeneous consumers demand often involves different supply chain categories with their different viewpoints. In the case of meat, consumers just ask for a tasty and tender meat (Parasuraman et al., 1985), and only recently for differentiation in quality levels, while producers seem more interested in limiting biological variation (Grunert, 2003). Sensorial aspects, but also health and the place of origin are also important when selecting animal food products. In the case of poultry meat, parameters that affect quality are complex and can be controlled through all supply chain (production stages, slaughter and meat processing). This study analyses some of the quality determinants of organic poultry meat as viewed by different points of view. Food quality, beyond being rooted in the consumers value system, is a matter of the supply chain members, but only when they all share a common or at least similar view of the pathway to build it. This study applies the Quality Function Deployment (QFD) approach in order to translate consumer needs into appropriate products and processing characteristics for poultry meat. Consumer attitudes towards the quality of poultry meat as well as expert assessment opinions about the interaction between product quality characteristics and the determinants of the production process were collected.

### Material and methods

The QFD method, by focusing on the interactions among the different phases of the production process, encourages communication along the supply chain and between the chain members (Benner et al., 2003). It helps exploiting dynamic and heterogeneous consumers demand for food quality. In our study, we apply the QFD method for the development of poultry meat quality, from a supply chain perspective. The construction process started with the House of Quality (HoQ) or Product Planning Matrix. The methodology approach consists of defining the house dimensions: the consumer needs (the *whats*) and the ranking of the consumer needs on the left side, the processing characteristics requirements (the *hows*) on the top, and the relationship matrix where the importance ratings for each how (the *how much*) are to be defined (Benner et al., 2003). The consumer needs were obtained by using our own expertise of consumer research, while the relative ranking were determined through a choice experiment, asking the consumer when the poultry meat was selected at the point of purchase.<sup>3</sup> Respondents were asked to choose between two hypothetical cuts of chicken breast with a different combination of the six product attributes. Then, the preference data (elicitation of attribute attendance) were investigated (Zanoli et al., 2013) by asking the consumers to self declare the frequency of the selection of each quality cue during their choice experiment. Respondents were asked to indicate on a 9-point Likert scale (never = 1 to always = 9) how much they felt they attended to each attribute in their sequence of responses. The normalised average value of each attribute is reported in the Product Weight (*PW*) column of the HoQ (Fig. 1, left side) (Vatthanakul et al., 2010). The attribute characteristics and the relative levels for the six attributes included in the voice of consumer are: *Colour*: the colour of the chicken breast as sold on the supermarket shelves (Pink-red/Pink-yellow); *Fat*: the yellow fat presence on

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<sup>3</sup> A sample of 150 organic and poultry meat consumers were interviewed in autumn 2008, in Italy. See Napolitano et al. (2013) for more details on the results of the choice experiment.

the chicken breast sold (Visible/Invisible); *Farming system*: the set of farming techniques adopted to raise the chickens (Organic/Conventional); *Animal welfare*: chance for the chickens to have outdoor access (outdoor access/no-outdoor access); *Origin*: the country of origin for the poultry (Italy/Extra Italy and UE); *Price*: selling price in Euro/kg (€8/€16/€24/€32). The processing characteristics requirements, obtained by using experts' opinions, are classified into three main phases. The Production phase includes: *Genotype lines*: chickens selected for a better growth; *Gender*: females, having different growth rates, respect to males; *Age*: slaughter age is at least 81 in organic farming, in conventional farming the age is lower (avg. 55); *Final weight*: the weight of the chickens at slaughter differs for different selling purposes; *Feed composition*: feed with a high concentration of nutritional value; *Presence of GMO*: presence of genetically modified (GM) ingredients in feed composition. Organic feed allow at maximum 0.9% GM ingredients; *Free range housing type*: poultry have access to the outside; *Natural ventilation system*: natural ventilation when chickens are indoor; *High stocking density*: more than 10 chickens per ms in the poultry house; *Vaccination*: chickens are vaccinated for diseases and infections. In the Pre-slaughter phase are: *Bad handling conditions before transport*: low expertise and/or bad handling behaviour and/or lack of handling equipment; *Bad transport conditions*: low level of ventilation, lack of floor space, lack of watering facilities; *Journey duration*: high time length of the journey from farm to slaughter house; *Pre-slaughter time*: high waiting time before slaughter. Finally, in the Slaughter and meat processing phase are: *Electrical stunning methods*: stunning by an electrical equipment; *Cut-up*: chickens sold in dismembered pieces (wings, legs and front halves); *Packaged in MA*: poultry meat packaged in modified atmosphere packs (increases shelf life); *Mixture of gas*: gas mixture (CO<sub>2</sub> O<sub>2</sub> N<sub>2</sub>) in modified atmosphere packs; *Low transport temperature*: temperature level during transport (close to 0° C); *Shelves illumination*: light sources employed for shelves illumination; *Additional labelling*: extra labelling information exceeding the current general labelling legislation. The correlation matrix was established in autumn 2009, during a focus group with an expert team. Seven experts, recruited among producers, technicians, and researchers were asked to assess the relationships between the consumer needs and the processing requirement and to rank these relationships in three levels (9: strong, 3: medium or 1: weak). In figure 1, the relationships are expressed through symbols (e.g.: the relation between 'animal welfare' and 'genotype lines' is moderate).

## Results and Discussion

Results are shown in the HoQ planning matrix (Figure 1). The most important quality attributes consumers ask are predominantly related to the characteristics of the production process. The most important quality cues that the consumer checks when selecting the poultry meat from the shelves are: the animal welfare (AW = 8.37), the Italian origin (AW = 8.36) and the organic farming system (AW = 8.07). The visual characteristics of the poultry meat (fat presence and meat colour) as well as the price level are quite occasionally inspected. The main findings also show that consumer preferences are more affected by the chicken production phase rather than the following processing phases. The attributes related to the free range housing type (Relative Weight (RW) = 7.8), the chicken final weight (RW = 7.3) and the high stoking density (RW = 6.1) – strictly related to the animal welfare issue – significantly affect the perceived quality for poultry, hence the consumer willingness to pay.

Castellini et al., (2002) shows how the growing rates and the feed efficiencies significantly decrease if the chickens are reared outside and with a low stocking density. Producers are often prone to reduce animal welfare, by cutting the housing equipment and the labour cost (Napolitano et al., 2013). Hence, they should take into account that free range, low stocking density and low final weight, particularly in organic production system, are synonymous of adequate welfare and favourable environment. These results confirm previous findings (Napolitano et al., 2013 and Sundrum, 2001) showing that information about animal welfare issues – such as the housing type and the stocking density – influences the consumer willingness to pay for animal products. The genotype lines (RW = 7.4) is another important attribute affecting the perceived meat quality. Modern genotype lines, intensively selected for their fast growth rate and the feed conversion, can produce anxieties about welfare and carcass quality, especially if the animals are reared outside.

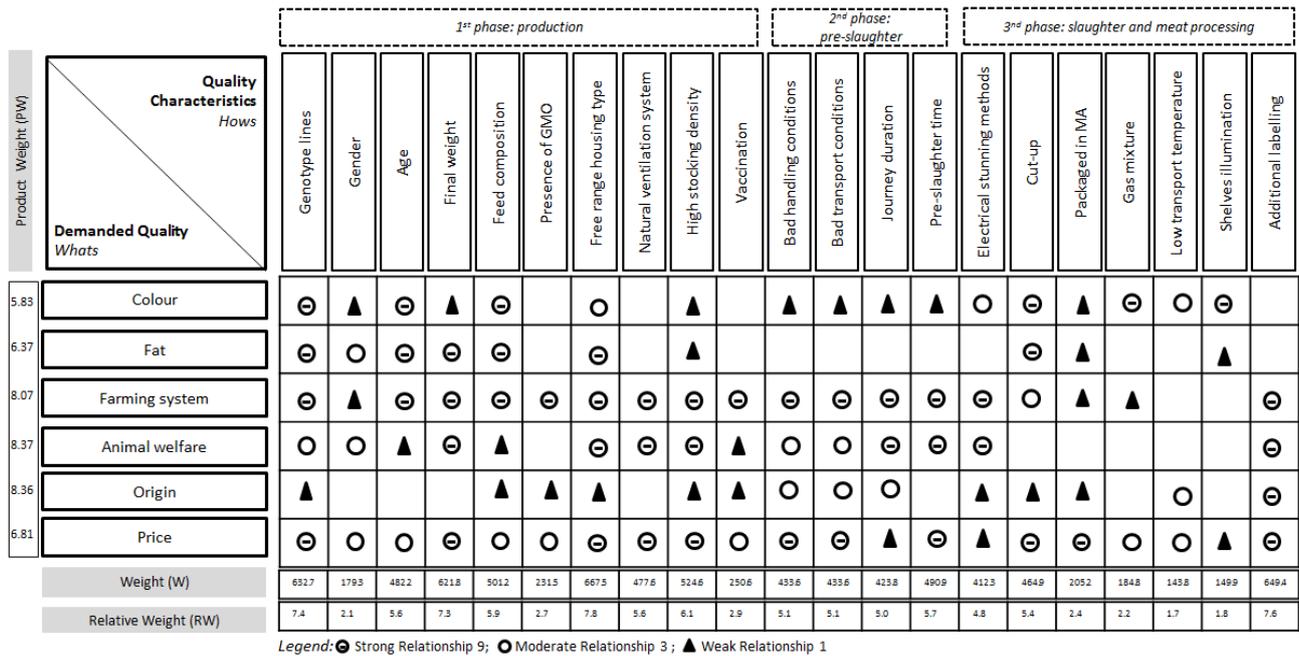


Figure 1. House of Quality for poultry meat

Nevertheless, Reiter and Bessei (1998) and Castellini (2005) confirm that slow-growing genotype lines can fully benefit of organic rearing systems (outdoor access, pasture availability, older age), whereas the fast-growing are characterized by a very low degree of adaptation (manifesting feed inefficiencies and physical problems). As a consequence, the fast growing genotype lines should not be recommended in free range systems nor under organic conditions. In the meat processing phase, additional labelling is the most relevant characteristic (RW = 7.6). In order to let the consumers better identify the quality features, is important that the relevant products characteristic are well described in the label. Additional claim about the above mentioned processing characteristics can give consumers an important tool to make informed choice.

### Suggestions to tackle with the future challenges of organic animal husbandry

Determinants that affect poultry meat quality are complex. By applying the house of quality method the poultry industry could learn how to produce products that better meet consumers' expectations. Further work is needed, in particular, for what concerns the analysis of interdependency between the producer parameters (correlation roof). It is reasonable to suppose that some products and/or processing characteristic could have some interaction: supporting or conflicting each other's they could influence the producer strategy. Also, the integration of other sensorial aspect into the product quality attributes could be considered as an interesting option to deeply investigate the role of processing requirements on perceived poultry quality.

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