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SUPPLY CHAIN RELATIONSHIPS AND QUALITY CERTIFICATION SCHEMES: A CASE STUDY IN FISHERIES

JEL classification: L15, Q13, Q22

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Abstract. *The Italian fishery supply chain is highly fragmented and lacking in organization; consequently most firms experience high operating costs, low sale prices and limited profitability.*

The purpose of this paper is to contribute to the assessment of the effectiveness of policy intervention, in particular the creation of a collective label of origin, to promote local fishery products and increase their value. As a case study, we focus on the quality certification scheme named "PCAA - Prodotto Certificato dell'Alto Adriatico" (Certified Northern Adriatic Product), proposed by the Emilia-Romagna Regional Authority in order to promote the economic development of the regional supply chain and to facilitate private initiatives for coordination among supply chain participants.

By means of a direct survey on key regional economic agents, we investigate organisation of firms, relationships between them and their strategic behaviour at each stage of the supply chain - namely fishing and aquaculture firms, wholesale markets, wholesalers, processors and retailers.

As a result of the analysis, we provide an assessment of product flows along the supply chain for the main commercial species in Emilia-Romagna. We identify factors affecting the decision to participate in the PCAA certification scheme, and we discuss the expected effects of private agents' strategies on supply chain organization, as well as possible public intervention policies.

Key words: *supply chain coordination; collective strategy, free riding; quality certification schemes; fishery sector.*

1. Introduction

The dynamics of marketing and distribution of food products, and in particular fish products, indicate radical changes in recent years. The main trends include, on the one hand, the progressive development of modern distribution chains and, on the other, the growth in imports of large volumes of standardised products.

In Italy, approximately 60% of fresh products are sold by modern distribution channels and about 75% of the fish that comes on the tables of consumers is imported. At the same time, the general downward trend in food consumption, also affects fishery products, thus intensifying competitive pressure in the sector. A major drawback for Italian fisheries, moreover, is the very

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small size of firms that limits their ability to build relationships with other key economic agents in the supply chain, such as the processing industry and distribution chains.

Product differentiation and quality certification strategies may provide an effective solution for alleviating competitive pressure on firms and improve their profitability by boosting the consumption of domestic produce and increasing consumer satisfaction.

European Institutions have approved measures favourable to this line of action. The first time, more than ten years ago, in the Council Regulation 104/2000 on the Common Market Organisation in fishery and aquaculture products, supply concentration through producer organisations, was encouraged and interbranch organisations recognized, with the purpose of "*developing methods and instruments to improve product quality, exploiting the potential of, and protecting, designations of origin, quality seals and geographical designations; exploiting more fully the potential of fishery products and promoting fishery products*". More recently, in the final proposal for the Common Fishery Policy reform, the European Commission stresses its commitment to remedy the imperfections in the market, responding to the problem of high costs of information and transactions, as well as to solving organizational issues in order to improve the marketing of first-time sales and increase the competitiveness of EU production through the processes of integration and differentiation.

Quality signs, and among these, quality labels, provide a particularly interesting differentiation tool, as they emphasize the connection of a product to a specific territory or to specified quality characteristics. Moreover, quality marks are designed to ease market information transmission, so as to facilitate the recognition of quality attributes by consumers, and therefore, to increase their appreciation of the product.

In the light of this approach, the Emilia Romagna Regional Authority, in planning the use of EU Structural Funds, designed a path for the exploitation of regional fishery products, by means of a collective brand of certified quality, named "Prodotto Certificato dell'Alto Adriatico – PCAA" (Certified Northern Adriatic Product). The PCAA is intended to favour product differentiation based on its origin and specific production requirements, as well as to promote vertical coordination and to increase the profitability of the entire regional fishery supply chain.

The collective brand establishes a certification system for all the products fished, bred, gathered and packaged in the Northern Adriatic, conceived as a production system using resources and natural regulatory mechanisms to ensure that all its activities are sustainable. The brand name[1] is owned by the Emilia Romagna Regional Authority, while the beneficiaries are all economic agents, fishing and aquaculture firms, wholesale markets, processing industries and intermediaries, fishmongers and restaurants. Membership is voluntary and requires compliance with the production rules specified by the Regional Authority. Third-party certification and control procedures, as well as penalties designed to sanction opportunistic behaviours are enforced, to ensure the reliability and effectiveness of the certification scheme for both consumers and supply chain agents.

Given these premises, the objectives of this paper are to analyze the factors that incentivate economic agents to participate in voluntary quality certification schemes and to investigate the possible effects on the supply chain organization, considering the PCAA initiative as a case study. The study will also discuss the possible measures that could be implemented by the public

[1] Introduced by Regional Law n.1418, 15th September 2008.

authority in order to allow all the stakeholders involved to benefit from the participation in the certified supply chain.

2. Theoretical background

2.1. Supply chain relationships and product certification schemes

Various authors (Boon, 1999; Mighell and Jones, 1963) refer to the food system as a series of vertically inter-related stages and describe vertical coordination as "all the ways in which these stages are directed and fitted together". Linkages between stages in the food system require both quantitative and qualitative coordination: *quantitative* coordination is the balancing of quantities of inputs and outputs; *qualitative* coordination consists in the specification and development of certain processes and products and has become more and more important.

The coordination required may be provided not only by pure market transactions (led by price signals), or by full vertical integration (under managerial direction), but also by other intermediate forms of vertical coordination, relying on price signals as well as ex-ante non-price agreements. Recently, growing awareness of the importance of product quality amongst agribusiness managers and the increasing dissatisfaction with product quality amongst consumers may be interpreted as examples of failure of the existing market system (Boehljie et al., 1995); vertical coordination is often mentioned as a solution for such market failures (Johnston and Lawrence, 1988).

Additional motives for vertical coordination arise from specific market and production characteristics. Perishable produce is strongly affected by the direct relation between the intrinsic attributes of the final product and those of the primary product. Vertical coordination is also likely to occur to solve issues related to quality and quantity variability (e.g. due to biological variation, seasonality, weather conditions, etc.), stabilisation of consumption and increased consumer attention concerning both product attributes and characteristics of production methods.

Product certification schemes provide a useful tool to ensure a certain quality standard, to communicate effectively product differentiation to consumers, and to create higher value for all economic agents participating in the supply chain. Collective brands are certification schemes that can be requested by a group of actors, designed to guarantee the nature, quality or origin of certain goods or services. Product quality is attained either by compliance with a predefined production method, or to a common local heritage in the area considered, due to natural or cultural conditions. Both elements, i.e. production method and product origin, contribute to the creation of a collective reputation and strengthen consumer appreciation and confidence. In this way firms are able to create a new market segment, where consumers are willing to pay a premium price for the branded product (Shapiro, 1982, 1983). Other benefits induced by participation in a collective brand concern the relationships with the other actors along the supply chain, particularly in terms of certainty and standardisation of procurements, more transparent information, a limited number of intermediaries and ease of access to final consumers.

According to Fisher et al. (2008), in order to maintain high quality standards, formal relationships (written bilateral contracts and financial participation agreements) are usually preferred to informal ones (spot markets or repeated market transactions with the same buyer/supplier). On the contrary, non-formal relationships are preferred by firms that strive for independence.

Actually, collective brands are effective as long as product quality and characteristics of produc-

tion methods are pre-emptively and explicitly defined by the collective organisation (Pilati, Flaim, 1994) and single firms cannot lower product quality below the level imposed by the collective brand. This implies that each actor along the supply chain has to comply with specific organisational and production requirements that limit their flexibility, for both qualitative and quantitative strategies. Therefore they are not free to take arbitrary decisions concerning the selection of procurement, the choice of suppliers, the type and distance of final markets, etc.

A major threat for the success of a collective brand is due to the opportunistic conduct of single actors, who attempt to take advantage from information asymmetries on the demand side. In fact, in case of combined production by many agents, without adequate incentives and monitoring systems, *free riding behaviour* will arise (Holmström, 1982). As pointed out by Klein and Leffler (1981), in the short run the quality reduction induced by free riders will lower production costs, but in the long run it will negatively affect the collective reputation. Hence, individual opportunistic strategies may imply negative effects on the whole supply chain as well as on consumers, hampering the effectiveness of quality signals and increasing price and income instability. Since adequate profitability is necessary for undertaking investments for quality in the long run, the collective brand supply chain may no longer be sustainable.

In conclusion, the strategic choice of participating in the collective brand implies a trade off between short-run and long-run payoffs and individual decisions influence the structure and organisation of the whole supply chain.

2.2. Quality differentiation strategies in the agri-food sector

"Quality" may be interpreted as the extent to which (agri-food) products meet consumer expectations. The agri-food product being described as a basket of characteristics or attributes, consumer preferences refer to a set of attributes rather than to the "product" itself as a whole; some of these attributes are not observable by consumers before (or even after) purchase/consumption, so that "quality" is not verifiable (Darby and Karni, 1973; Nelson, 1970)[2]. In addition, consumers are "imperfect problem solvers", who collect limited information upon which to base their choices (Henson and Traill, 1993). Further, the set of information available to consumers is itself imperfect[3]. Finally, food manufacturers and retailers are better informed about the nature of the products they sell than individual consumers. In this context, the main approach taken by consumers to reduce the risk associated with purchase/consumption consists in the use of "risk relievers"; consumers thus rely upon "external risk indicators" (McCarthy and Henson, 2005), i.e. "extrinsic quality cues" (e.g. brands, geographical indications, label information, the nature of food packaging, the nature of the food store, etc.) and are willing to pay for a "quality sign" that increases the probability of product success in meeting their expectations (Loureiro and Umberger, 2007; Grunert, 2005)[4].

These information asymmetries have crucial effects on the behaviour of economic agents. Whilst discovering the actual level of quality is costly for consumers (and, in some cases prohibi-

[2] Some attributes, the so-called "experience" attributes, are only verifiable after purchase (e.g. taste or organoleptic characteristics), whilst others are not observable, even after purchase/consumption (the so-called "credence" attributes, such as safety, or the effects of the production process on animal welfare, environment or ethical issues, or product origin).

[3] As regards food safety, for example, all food-borne risks factors fall either into the experience categories (e.g. acute food risk factors, *salmonellosis* and other food poisoning) or into credence ones (e.g. chronic food risk factors, such as nutritional imbalance in the diet, food additives or pesticide residues).

[4] It is worth noting that the higher the *perceived* risk the more frequent is the use of risk relievers and the willingness to pay for a risk reduction (Angulo and Gil, 2007; Brown et al., 2005).

tively so), producing a "quality good" is costly for firms. Such a market has specific economic properties: anticipating the risk that quality efforts may be inadequately perceived (and thus remunerated) by the market, firms may under-invest in quality in the long term. Hence, an adequate "premium price" is a necessary condition for maintaining quality in the long term, when this latter is not directly observable (Shapiro, 1982, 1983; Klein and Leffler, 1981). In the absence of adequate quality signals and control systems, the risk is that of a reduction of the average quality supplied to the market (Akerlof, 1970) and, more in general, of an under-provision of quality (or safety) with respect to the socially optimal quality level.

The necessity of assuring the provision of the socially optimal quality level justifies public regulation of quality. The public authority may intervene, for example, by imposing minimum quality standards (MQS) or ex-post liability rules (e.g. in the domain of food safety) or by designing voluntary certification schemes. Indeed, as underlined by Henson and Humphrey (2009) public standards may be mandatory or voluntary. Notably, voluntary certification schemes make it possible to reduce information asymmetries by communicating to consumers the compliance with specific quality (process or performance) standards, through a logo or a brand, while giving firms access to a quality-based competitive advantage relying on the collective reputation and to the related "premium price" (to the extent to which consumers "react" to the quality improvement). In this context, the design of adequate certification procedures and control systems aims at guaranteeing the transparency of product requirements and the reliability of firms' claims about the quality/safety of goods, at avoiding opportunistic behaviours arising when collective initiatives are concerned (notably, the free riding phenomenon) thus "protecting" firms' quality investments and ensuring the maintenance of quality level in the long term.

In this context, the PCAA brand can be classified into the category of collective voluntary "certification schemes" (European Commission, 2010). It can, in particular, be classified as a "differentiation scheme", following the definition given by EU Commission "differentiation schemes aim to distinguish certified products from others by highlighting certain product or process attributes (e.g., observance of strict animal welfare or environmental requirements; organic farming; social standards; high organoleptic product quality; origin; etc.) and communicating this fact to the consumer by means of a logo or label. Farmers and producers can use such schemes to improve their marketing position and obtain higher prices for their products.

Quality differentiation is here mainly based on product origin and on specific quality standards, in some cases more restrictive than public regulations. Looking in more detail at the features of this initiative, participation in the certification scheme requires economic agents to comply with specific production requirements (or quality standards) that regulate both production and commercialization practices and characteristics of the final product (e.g. product size, packaging, etc.).

The voluntary nature of this initiative carries at least three main implications. First, firms' strategic incentive to adhere to such a voluntary scheme results from both costs (e.g. costs of compliance with the standard, certification and control procedures, additional production costs, etc.) and benefits (e.g. quality-based competitive advantage, reputation, reduction of market risk in the long term, etc.). The decisional process of firms regarding participation takes into account the expected costs and benefits associated with the initiative (see for example Loader and Hobbs, 1999, for a conceptual model of the strategic process of compliance to food safety legislation). Second, given the voluntary nature of the initiative, the resulting market structure is endogenously determined by the number and the nature of economic agents adhering at each stage in the supply chain (see for example Giraud-Héraud et al. 2012 for an analysis of Joint Private

Standards in agri-food chains). Third, the long term "sustainability" of the initiative depends on the mechanisms designed to ensure participants' compliance with the standard, thus protecting quality investment (and the collective reputation of the brand) in the long term.

3. Methods and data

Research into vertically co-ordinated supply chains poses particular challenges for researchers, especially when assessing the relationships among different stages (Hornibork and Fearne, 2006). In this view, the case study research strategy is identified as being the most appropriate when examining 'how' or 'why' research questions (Yin, 1989; Eisenhardt, 1989). Moreover we recall that the Italian fishery supply chain includes a set of heterogeneous and fragmented firms, that cannot be adequately assessed using only conventional sector statistics.

Therefore, after collecting all the relevant secondary data from official national statistical bodies (Irepa, Ismea, Istat), we carried out an empirical investigation in the Emilia-Romagna fishery supply chain.

The survey was conducted by means of a questionnaire on a non-probabilistic, non-random sample. Twenty key actors, along the supply chain were interviewed, both participating and not participating in the PCAA initiative, including four main categories: *i)* fishing and aquaculture firms, *ii)* wholesale markets, *iii)* wholesalers and processors *iv)* retailers (fishmongers and restaurants).

The questionnaire was divided in two parts. The first part was specific for each of the supply chain stages addressed and it was intended to quantify the product flows of the main species, with questions concerning the size and structure of the firm, the quantity and type of produce and the relationships with suppliers and purchasers, in terms of volumes marketed and distribution agreements contracts. The information gathered in this way was elaborated for each species of interest[5] and complemented with secondary production and import-export data previously collected to estimate the corresponding supply balance and product flows at each stage of the supply chain (see *Figure 1*).

The second part of the questionnaire aimed specifically at investigating firms' attitudes towards product differentiation, their perception of the PCAA collective brand and its possible implications on the regional supply chain. In particular, the second part of the questionnaire was divided in three sub-sections: the first was intended to register the opinion of the agents on current market conditions and on the relevance of product attributes and to discover their strategies concerning quality and brands; the second focussed on the benefits and the compliance efforts anticipated by the agents for participating in the PCAA initiative, on the basis of the specific requirements of the production method imposed by the Regional Authority; the third was designed to collect interviewees' opinions on the development of relationships among stakeholders and the need for further public intervention policies to support the certified supply chain.

[5] The main species considered are small pelagics (anchovies, sardines, mackerel and sprats), bivalves (mussels and clams), crustaceans and cephalopods (mainly mantis shrimps - *Squilla mantis*, caramote prawns - *Penaeus kerathurus*, other squids and small cuttlefish).

4. Results

In this section, we illustrate the results of the empirical analysis. First, we provide an illustration of the supply chain organization based on official data on fisheries and wholesale markets. We then illustrate the results of the direct survey aimed at assessing the expected benefits and compliance efforts perceived as associated with the voluntary certification scheme and thus the factors influencing the strategic incentive of economic agents to participate in the collective initiative. Finally, we illustrate the possible effects of the voluntary certification scheme on the supply chain organization.

4.1. Fishery supply chain organization in Emilia-Romagna

The fishery supply chain in Emilia-Romagna is characterized by a high degree of heterogeneity between the economic actors, with respect to firm structure, supply chain relationships and strategic behaviour.

Aquaculture, especially production of mussels and clams, is a very important economic activity in Emilia Romagna. The production of the region plays a fundamental role in the Italian aquaculture sector as a whole: with approximately 32,000 tons of bivalves produced in 2007/08, Emilia Romagna contributes, in fact, 27% to national production and approximately 29% of the total catches in sea fisheries. On the other hand, fishery is characterized by a high degree of fragmentation, as firms are usually very small. In fact, industrial fishing is conducted by only 4% of boats, but accounts for about 30% of the total Gross Tonnage of the regional fleet. Analogously, there is a large number of harbours, but each one is too small to meet market demand in terms of species, catch and size.

Located near the main harbours, the wholesale markets play an institutional role in the marketing process of fresh and frozen fishery products, as they provide the necessary sanitary certification for the products sold and prices are determined by auctions. However, in spite of their crucial role, only a minority quota of regional catches (less than one third) are exchanged through wholesale markets; quite often, especially for small pelagics and mussels, firms choose to deal separately, directly with wholesalers and traders or processors.

Wholesalers and processors exchange the larger proportion of volumes in the supply chain, as they purchase both from wholesale markets and directly from producers, on a very wide geographical scale (either national or international). We estimate that about 50% of these firms are pure traders, 43% of them also offer preserved products (salted, smoked, dried, etc.) and only 7% are pure processors, selling food preparations.

These general considerations on the role of the various actors along the supply chain can be further detailed for the main species of interest (*Figure 1*). The analysis conducted shows that small pelagics (and particularly anchovies) are the most important species exchanged on wholesale markets, where volumes sold account for a large share of both catches (18%) and total internal availability (33%)[6]. The quantity marketed directly by producers' associations is also relevant, with more than 10% of catches and about 20% market availability. However, wholesalers are the actors who concentrate the largest share of product flows, with purchases straight from producers and from wholesale markets. As far as anchovies and sardines are concerned, wholesalers deal with more than 90% of market volumes. Other species show more balanced product

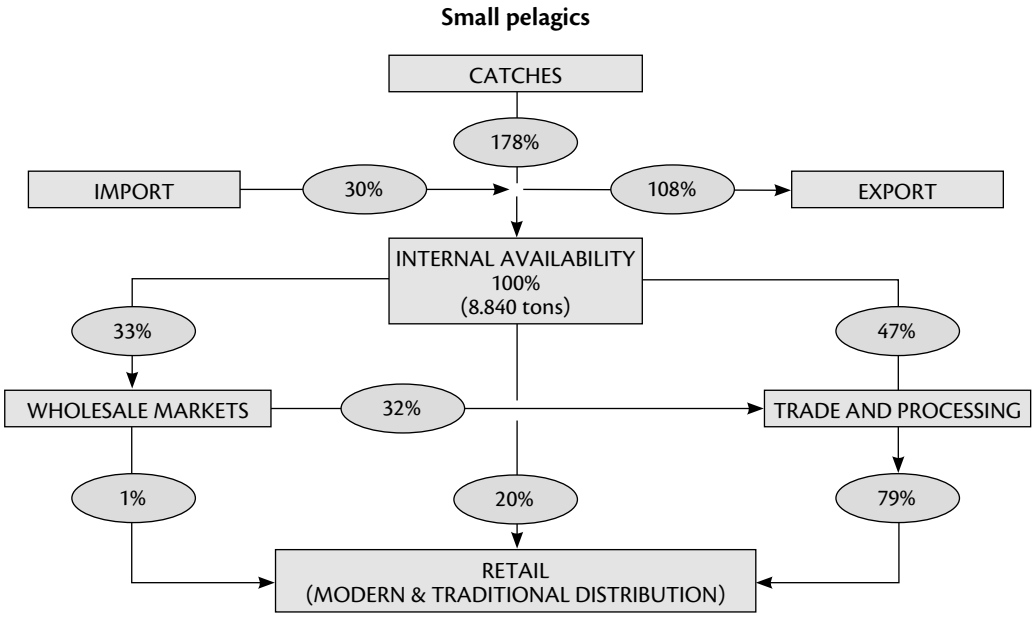
[6] Internal availability is calculated as the sum of catches and imports, minus exports.

flows: sprats are almost equally demanded by wholesalers and retailers, while mackerel is bought mostly by local traditional retailers, i.e. fishmongers and restaurants. Wholesalers purchase about 40% of small pelagics from wholesale markets, 40% directly from producers' consortia and the remaining 20% is equally divided between other wholesalers and importers. Producers' consortia are particularly important with respect to anchovies, sardines and sprats, providing about 50% of wholesalers' procurements; on the contrary, almost 2/3 of mackerel volumes are imported. On the supply side, wholesalers' sales are equally distributed among processors (50% of sardines and 20% of anchovies and sprats), exports to foreign markets and other wholesalers (1/3 each).

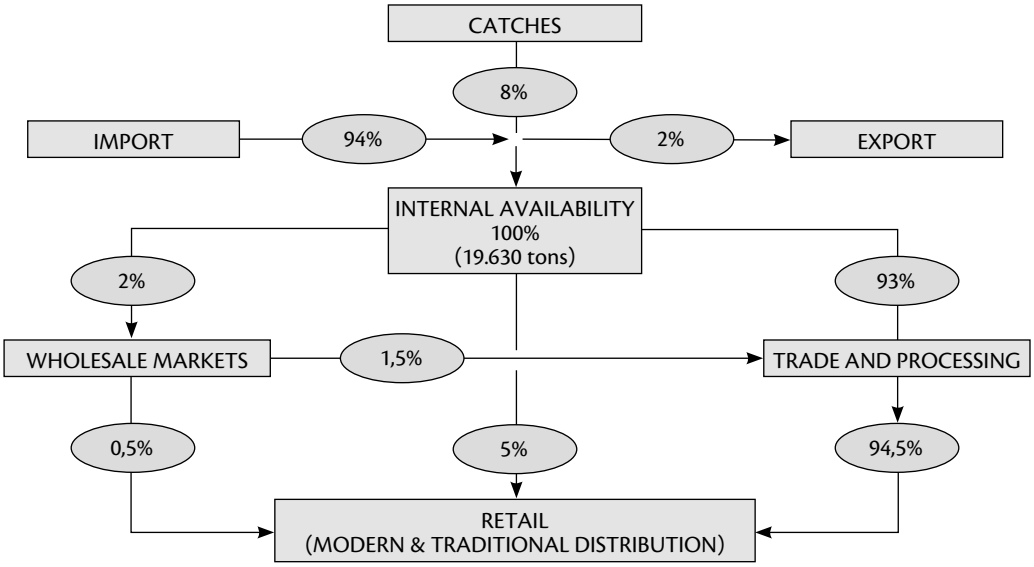
Crustacean and cephalopod supply chains have some common features, i.e. given the rather scarce catches, domestic demand is highly dependent on imports. This is why the largest share of product flows is exchanged by traders (importers), up to 90% of internal market availability. As a consequence, wholesale markets play a secondary role in the supply chain. Nevertheless, the quantity of crustaceans and cephalopods exchanged in the wholesale market is still relevant, when compared to regional catches (90%), mostly because of the large amount of mantis shrimps. Products exchanged on wholesale markets are bought by wholesalers (about 65%), fishmongers and Ho.Re.Ca. for the residual part.

The supply chain of bivalves has quite a different structure as compared to those of small pelagics and crustaceans and cephalopods, as product flows are much more concentrated. In fact, primary production is organised around producers' associations (cooperatives and consortia) that often control downstream trade and processing stages, with vertical integration strategies. Producer cooperatives and consortia, moreover, engage in positive and intense relationships with the regional socio-economic system, including other firms in the supply chain, such as traders and retailers. As a result, there is a limited number of intermediaries from production to final consumption and the value created at the retail level is fairly distributed among the actors of the supply chain.

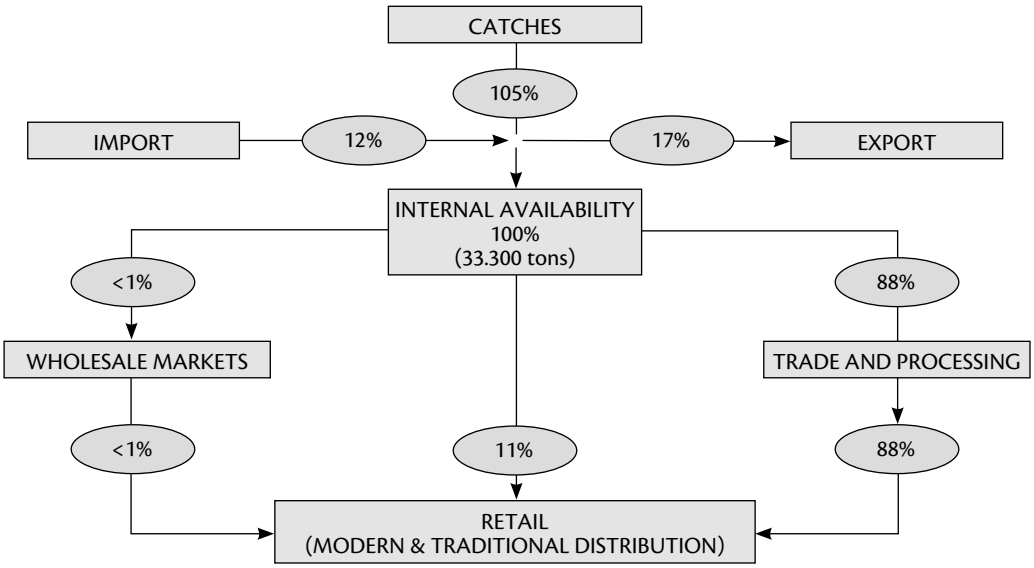
Fig. 1 - Supply chain flows of the main species of interest in Emilia-Romagna

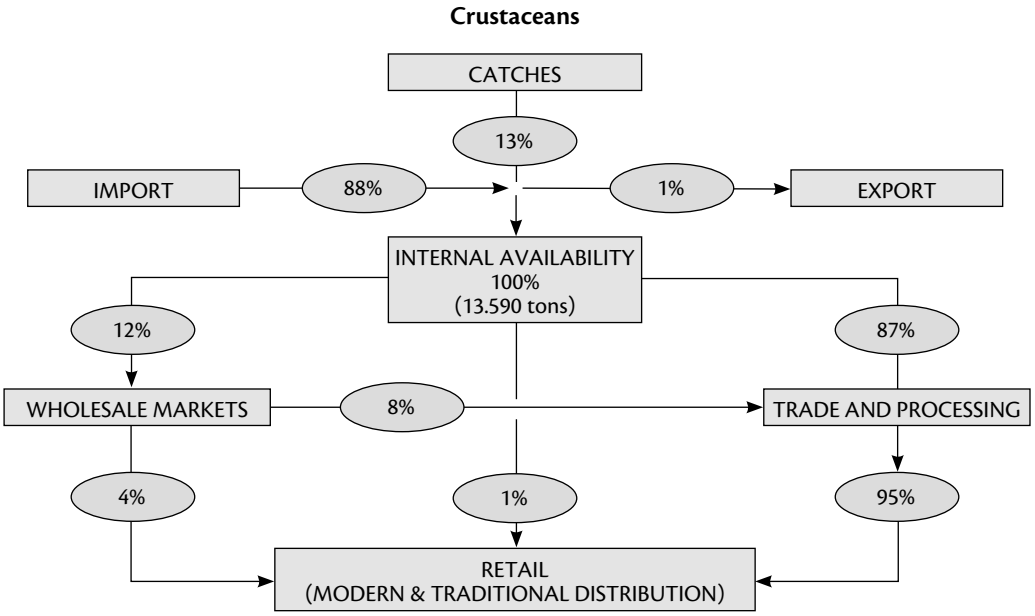


Cephalopods



Bivalves





Source: direct survey, Irepa, Ismea, Istat

4.2. Market and product perception by supply chain actors

In this section, we analyse actors' perceptions about market conditions and product attributes. A strong competitive pressure is perceived as one of the most important difficulties in building a competitive advantage. Actors experience high price variability, mainly due to supply uncertainty; price (and income) variability may induce under-investment in process and product quality, thus an under-provision of quality in the long term. In addition, price variability is exacerbated by under-supply (with respect to demand), mainly due to limited product availability; under-supply may also contribute to an increase of price on the final market.

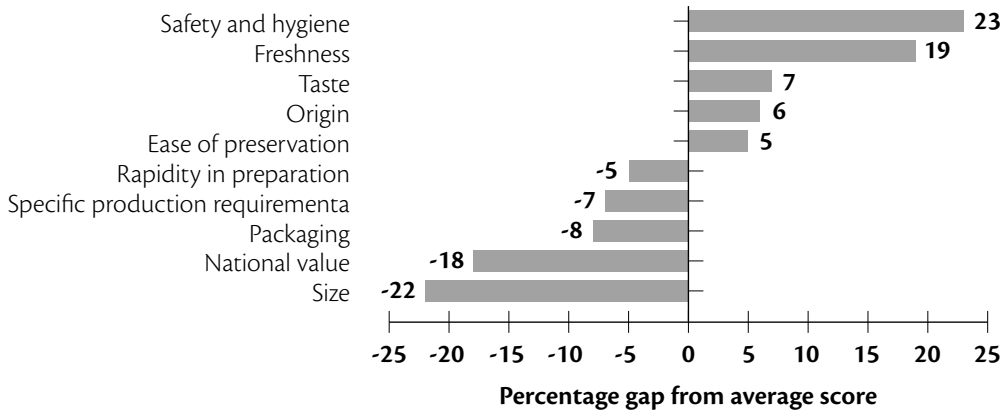
Figure 2 illustrates the relative importance of product attributes[7]: product hygiene is perceived as the most important attribute (with the highest deviation from the average score). This is followed by freshness, taste (especially for fish shops and restaurants), origin, and shelf life (the latter notably for traders, and especially for export supply chains). Conversely, packaging, nutritional characteristics, and "size" are perceived as relatively less important. It is worth noting that compliance with safety and hygiene and traceability requirements is considered a necessary condition for accessing the market and reducing market risk in the long term (loss of reputation and drop in demand in the case of shortcomings in product safety), rather than as a factor for differentiation.

The analysis reveals some crucial points concerning consumer information. The compliance with specific production requirements is perceived as "very important" by 33% of interviewees. Nevertheless, interviewees perceive difficulties in obtaining an adequate remuneration from the market for this particular attribute unless consumers are better informed about the process and product quality standards required and thus able adequately to perceive the efforts for achieving

[7] The importance of each attribute has been measured on a 5-point Likert scale. Percentages indicate the percentage gap of attribute *i* average score with respect to the average score of the whole set of attributes.

quality made by firms. Hence, if consumers are not adequately informed, they may underestimate product quality, with a negative effect on willingness to pay. This may explain why economic agents (especially fishers) tend to be "pessimistic" with regard to the possibility of obtaining a premium price on the final market based on the product's compliance with specific production requirements. The only "optimistic" category of agents is that of the points of sale (fish shops, restaurants, etc.) that are likely to benefit from a "proximity" to consumers and the consequent "direct" relationship and possibility of transmitting information about non-verifiable attributes.

Fig. 2 - Perceived importance of product's attributes



Source: authors' calculations on direct survey data

4.3. Participation in the certification scheme: expected costs and benefits

According to our survey, 83% of interviewees would participate in the certification system and associate the NASC logo with their individual brand, whilst the rest would not. Agents' strategic decision to adhere to the collective voluntary certification scheme results from a benefit-cost analysis. In this section, we analyse the main expected benefits and costs associated with the NASC, distinguishing by type of agent.

4.3.1. Expected benefits

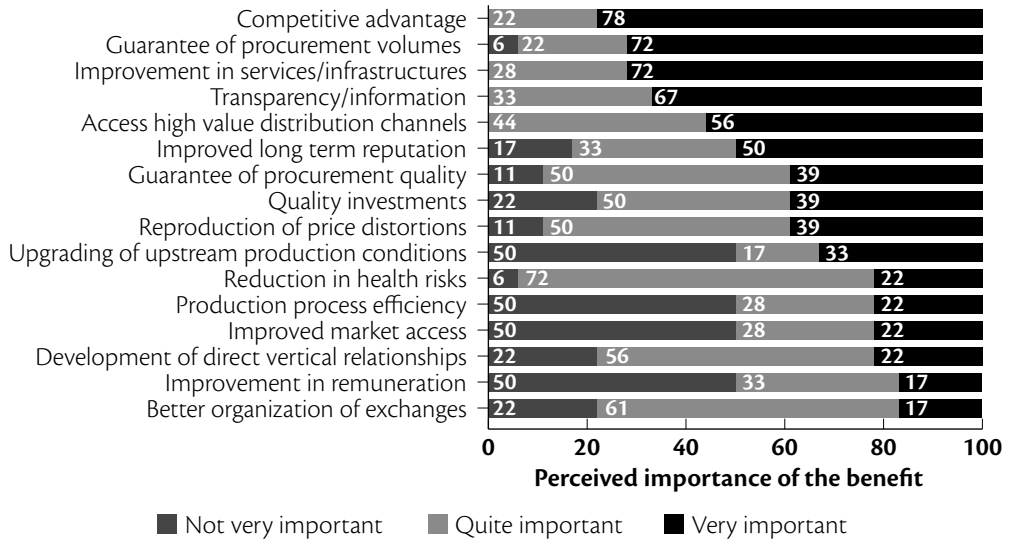
Figure 3 illustrates interviewees' perceptions of expected benefits associated with participation in the certification system[8]. Interviewees agree on the potential role of the certification system both as a quality differentiation tool and as a procurement management and control system. The importance of its role thus emerges, both as regards the final market and in the framework of buyer-supplier relationships. Indeed, 78% of interviewees consider the certification system a "very important" source of quality-based competitive advantage on the final market, with respect to the non-certified product. Hence, the quality (and food safety) improvement (raw material, production process, final product and services) may give access to more lucrative markets, increase market share and contribute to building and maintaining the collective

[8] The perceived importance of the expected benefits is measured on a three-level scale ("not very-", "quite-", "very-" important); the percentages indicate the frequency of modalities for each expected benefit.

reputation; it is worth noting that downstream agents, in particular, expect a "premium price" on the final market.

The perceived effects expected on supply chain organisation are, however, ambiguous. On the one hand, interviewees expect the certification system to facilitate the management and the control of procurement, assure procurement volumes and quality, increase transparency and thus reduce information asymmetries (and price distortions), notably in the framework of buyer-suppliers relationships; e.g. economic agents expect the certification system to improve processes of supplier selection by downstream agents (processing and retailing firms). "Standardization" and increased transparency may thus potentially favour a reduction in transaction costs and improve buyer-supplier relationships (e.g. Fulponi et al., 2006). Nevertheless, only 17% of interviewees expect a benefit in terms of a better organization of market transactions and 22% expect the creation of direct vertical relationships between upstream and downstream agents (e.g. restaurants and points of sale) indicating the role of wholesale markets in avoiding imbalances in bargaining power among supply chain participants to the detriment of upstream fishers.

Fig. 3 - Perceived importance of expected benefits



Source: authors' calculations on direct survey data

About 50% of interviewees do not really expect an improvement of upstream production conditions or an increase in the efficiency of production processes. Hence, the organisational and management constraints (and the related costs) associated with traceability and certification procedures are expected to reduce efficiency at firm-level; the potential productivity improvements associated with the normalisation procedures are not adequately perceived by the economic agents.

In addition, interviewees do not expect an increase in the remuneration of upstream agents. Indeed, the effects on the intermediary price (and notably the "transfer" of a potential premium price on the final market to upstream agents) are likely to depend on the nature of vertical relationships between downstream and upstream firms participating, as well as on the possible public

support policies aimed at facilitating the compliance process (notably of upstream producers).

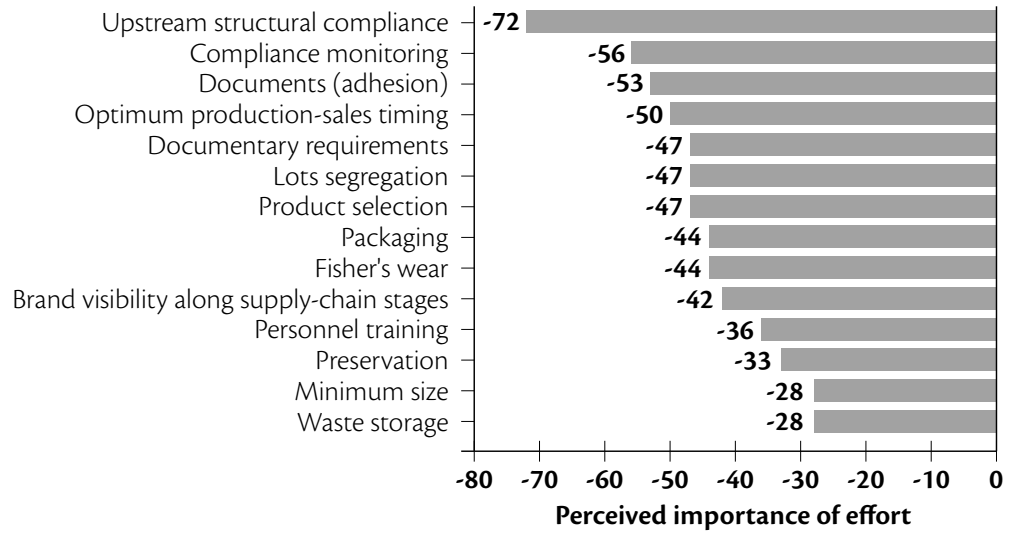
Perception of expected benefits may differ between upstream and downstream economic agents. Whilst downstream agents perceive positive effects in terms of increased transparency, reduced information asymmetries and the possibility of better management and control of procurements (thus reducing uncertainty in quantity and quality of supplies); upstream economic agents perceive the possibility of improving access to more lucrative market segments.

4.3.2. Expected compliance efforts

Participation in the certification system requires firms to comply with specific production requirements that constitute the Minimum Quality Standard (MQS) and imply both fixed and variable costs. Hence, compliance implies long term investment in the quality of production practices, labour skills, organisational and management constraints associated with the certification procedures.

Of course, compliance costs depend on the level (and the nature) of the MQS and on the "initial position" (status quo) of economic agents, with respect to the required MQS, i.e. the initial level of quality of production practices[9]. The gap between the latter and the MQS measures the extent of the compliance effort and thus influences firms' strategic incentives to participate in the system. The analysis of the perceived compliance efforts illustrated in *Figure 4* shows the current weaknesses in the compliance process and the supply chain stages involved, as well as to enabling possible areas of public support measures to be identified[10].

Fig. 4 - Perceived importance of expected compliance efforts



Source: authors' calculations on direct survey data

[9] Firms may be thus characterized by the initial level of quality of production practices and by the gap between this latter and the MQS required by the certification system; this representation points out the heterogeneity of economic agents with respect to their initial quality level. Compliance costs thus increase in the distance between the initial quality level and the MQS.

[10] The perceived importance of the compliance effort has been measured by the *ratio* between the percentage gap between the average perceived level of effort (where "high-effort=2", "low-effort=1.5" or "no-effort=1" i.e. compliant) and the situation of "no-effort=1" i.e. compliance.

First, the direct survey has made it possible to describe the initial conditions (status quo) and the most important difficulties perceived in complying with the MQS. The most crucial difficulties are identified as follows: investments in cooling equipment, difficulties in differentiating fish size (selection costs), particularly for upstream operators. Wholesale markets expect difficulties in respecting the required timing between fishing and consignment of the product. Downstream agents (processing and retailing economic agents) perceive problems in "selecting" compliant suppliers (or selecting against non-compliant ones). Hence, difficulties for downstream economic agents to "disclose" the actual quality effort undertaken by upstream agents indicates the issue of asymmetric information in buyer-supplier relationships, as well as the difficulties in implementing an adequate traceability system. In addition to these difficulties, downstream points of sale (fish-shops, restaurants, etc.) expect difficulties in respecting the standards related to product preservation (e.g. freezing).

The most important compliance effort perceived is the structural improvement of upstream production conditions. Indeed, the average level of effort is 1.72. The status quo at fishery stage is perceived as relatively inadequate, with respect to the requirements. The high compliance effort at the upstream stage may thus generate scarce participation of upstream economic agents and, consequently, a relatively scarce supply of certified product (with consequences on the structure of the "certified supply chain", on final prices and territorial extension of sales).

Finally, support policies aiming at facilitating the upstream compliance process have to be focused not only on financial support mechanisms but on information and education activities, public-private debates and partnerships. In addition to difficulties in the compliance process for the upstream production stage, important difficulties perceived concern documentary requirements, compliance control and monitoring activities, lot segregation, and product selection, at each stage in the supply chain followed by storage of waste, the compliance with a minimum size, product preservation and staff training.

Perception of efforts for compliance also depend on the type of agent. Upstream fishers perceive structural investments, product selection and the minimum size as the most important efforts, whilst wholesale markets perceive structural investment, lot segregation, documentary requirements, and compliance monitoring as the most important efforts. Documentary requirements, lot segregation, and the fishery-to-sales timing are perceived as particularly important by downstream agents.

5. Possible effects on supply chain organization

After the description of the supply chain organisation in section 4.1, and the main results of the direct survey, some considerations about the possible effects in terms of supply chain structure and organisation can be presented. In fact, the voluntary participation of upstream and downstream agents in the PCAA certification scheme may modify the existing supply chain structure either through the creation of an intermediate market for the certified product or by the development of individual contractual relations between upstream and downstream agents. Hence, we argue that the two following main forms of vertical coordination may emerge:

(i) Vertical coordination is achieved through intermediate (spot) markets.

In this case, vertical relations between upstream and downstream agents are "managed" through the wholesale market, where the third-party certification guarantees a "higher qual-

ity" with respect to the "traditional" spot market. It appears that, when collective standards are concerned, vertical coordination is realized through spot markets, rather than individual relations between upstream and downstream firms (see for example Giraud-Héraud et al. 2012). A "high-quality" (or certified) spot market may thus emerge beside the traditional (or generic) spot market; in order to guarantee the coexistence (and segregation) of the "standard"- and "certified-product", the traditional wholesale markets should develop logistic platforms and service centres. Of course, this "certified-spot market" is attained (or endogenously determined) through the voluntary adhesion of upstream and downstream agents. Producers have incentive to participate in this initiative if the expected remuneration on the intermediary market is higher than the expected compliance effort (section 4.3), otherwise they continue to supply the generic spot market. Survey results showed that the expected premium price anticipated is relatively low, whilst high compliance costs are expected for structural upgrading of upstream production conditions.

Since the remuneration on the spot market is given by the balancing of supply and demand, it partially results from the proportion of upstream and downstream agents adhering to the certification scheme. The higher is the proportion of downstream agent participating, the higher is the intermediary price (in the certified market), and thus the higher the incentive for upstream agents to participate. Hence, a "large commitment" of downstream agents to participate may provide an incentive for upstream adhesion. Nevertheless, the adhesion of downstream agents depends, in turn, on several factors. First, as in the case where a signalled initiative is concerned, the extent of the premium price obtained on the final market will be taken into account. The empirical analysis shows that the premium price expected by downstream agents is relatively low. Second, since the quality differentiation initiative has a collective nature, the free riding phenomenon may arise with negative repercussions on retailers' individual reputation. Anticipation of such opportunistic behaviour may discourage firms from participating and may prompt them to prefer individual quality differentiation strategies. Hence, it appears from the empirical analysis that downstream agents perceive the risk of reputation loss due to the free riding phenomenon and the necessity to of developing adequate control tools that monitor agents' behaviour and protect quality (and reputation) in the long term.

(ii) Vertical coordination is achieved through individual contracts (or more informal relations) between upstream and downstream firms.

As a collective initiative is concerned, vertical coordination is likely to be realized through intermediary markets rather than individual contracts between upstream economic agents (fisheries) and downstream agents. Nevertheless, if an "individual" vertical relationship exists, economic agents may have an incentive to take part in the collective initiative. It appears that the participation may occur in at least two different cases:

a) when a direct relationship exists between a fish shop (or a restaurant) and one or a few "boats", addressed mainly to a "local" market, or a niche market (low-quantity / high-price strategies), the participation in the collective brand may provide access to the collective reputation and associate the individual economic agents with particular geographical origin, and related cultural and human values. However, the risk of opportunistic behaviour may discourage individual agents from participating, especially when the individual firm has a strong individual reputation;
b) when a direct relationship already exists between a downstream processing and/or retailing firm and individual (or associated) fishers, where the downstream firm develops individual differentiation strategies (based on its own brand) and decides to participate in the collective

initiative, e.g. to improve the organisation of procurement (e.g. reduce the costs of supplier selection or contract setting, as well as control and certification costs).

In this sense, participation in the collective initiative and individual quality differentiation strategies may be complementary. In this case, again, the risk of opportunistic behaviour may discourage individual agents from participating, especially when the individual firm has a strong individual reputation.

However, economic agents might have incentives to develop individual contracts in order to organise procurement of the certified product and thus coordinate on volumes, transport, and logistic conditions, production specifications being regulated and certified by third parties; individual contracts (and the related control and monitoring procedures) may also be stipulated to preserve individual reputation from the consequences of opportunistic behaviour related to the collective initiative and, more in general, to reduce the market risk in the long term. Indeed, it appears that 56% of interviewees would develop contractual agreements for the procurement of the certified product, in order to specify volumes, and transport/logistic specifications.

6. Concluding remarks and recommendations

The research focussed on the factors that may provide incentives to economic agents to participate in voluntary quality certification schemes and the possible consequences for the organisation of the supply chain. The PCAA case study was investigated by means of a direct survey that focussed on supply agents' perceptions of the main problems associated with the implementation of the collective initiative and the perceived intervention (support) mechanisms that would guarantee the effectiveness of the certification scheme.

As a first result, we observe that production specifications required by the certification scheme are not always perceived as consistent with consumers' expectations, whilst they are considered a relevant limit for firms' strategic flexibility. In addition, agents perceive a relatively low degree of effectiveness in communication of brand names. These factors, however, may affect the possibility of achieving a premium price on the final market.

Interviewees suggest the public-private definition of a *strategic plan* clarifying marketing strategies of the certified product, as well as a public-private co-regulation where production specifications are jointly defined by the public authorities and the private supply chain actors, taking into account the actual market expectations. Inadequate perception by consumers of the distinctive attributes of the product (i.e. quality underestimation) may have negative consequences on their willingness to pay and ultimately affect the size of the premium price. Firms' anticipation of an inadequate remuneration on the final market may, in turn, discourage the firm from participating in the collective initiative or, more in general, reduce the quality effort.

Secondly, the survey pointed out difficulties in the structural adaptation of upstream production conditions. As illustrated in section 4.3, upstream agents' incentive to participate depends on the expected remuneration relative to compliance costs. However, expected benefits might be inadequately perceived by upstream agents, since atomisation of upstream supply exacerbates information asymmetries along the supply chain. In this context, cooperatives or producers' organisations may play a crucial role. First, they may favour horizontal coordination among suppliers and improve their bargaining power vis-à-vis downstream actors. Second, they may favour the exchange of information and provide technical assistance and support to the producers' compliance process.

A third group of results concerns the expected benefits and compliance costs from participation in the certification scheme. The interviews pointed out that the strategic incentive to adhere to the voluntary certification system differs between upstream and downstream agents. More precisely, while upstream agents' incentive to participate will essentially depend on the possibility of obtaining an adequate remuneration on the "certified market", the incentive for downstream agents to participate will depend on the amount of the premium price on the final market.

Overall, the participation in the certification scheme of both upstream and downstream agents depends crucially on the effectiveness of mechanisms preventing the emergence of opportunistic behaviour and thus reducing market risk in the long term. In fact, supply chain agents perceive the risk of opportunistic behaviour (notably, the *free riding* phenomenon) that could menace the level of quality (and the collective reputation) in the long term. If certification and control procedures designed to sanction opportunistic behaviour are inadequate they may cause inefficiencies: this may either discourage investments in quality upstream (and thus reduce the average quality in the long term) or increase selection and monitoring costs for downstream agents (that, in the end, increase consumer price). Hence, quality control (and sanction) mechanisms must be designed in order to prevent opportunistic behaviour.

The results of the study suggest that, in order to implement the collective certification scheme effectively, policy makers should undertake complementary initiatives and private agents should adjust their organisation and strategies accordingly. A critical aspect to be improved is communication to final consumers and information transmission along the supply chain; this can be attained by means of joint promotional campaigns on the media and special events involving all the stakeholders. Moreover, new marketing systems, involving a restricted number of actors and exploiting the potential of local fishery products in the region of origin are recommended. Another important issue is horizontal coordination, notably at the production stage. The internal cohesion of cooperatives and producer associations needs to be strengthened and the process of structural and organisational adaptation to the requirements of the certification scheme should be supported with technical assistance and professional training initiatives. Furthermore, technological adaptation and process and product innovation should be encouraged at all stages of the supply chain, by means of incentives and initiatives for transfer of technology. Finally, policy makers must enforce objective certification procedures and an effective control system, with severe penalties against opportunistic behaviour, in order to ensure benefits of the collective brand for both consumers and supply chain agents in the long run.

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