

Practical Knowledge and Institutional Mediation in a Controversial Case of Clam Farming in Italy

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Publicato in:

Bruckmeier K., Tovey H. (editors), *Rural Sustainable Development in the Knowledge Society*, Ashgate, Farnham, 2009

Introduction

The delta of the Po river in Italy shows a typical situation of rural areas: a higher presence of agriculture in the local economy, low density of population, lower income and education levels, high presence of not formally registered jobs. At the same time, the connection between land and sea has created a unique environment, made up of lagoons, small islands, and closed fresh water basins. Two regional parks exist in the delta. Beside beach tourism and sea fishing, various kinds of fish and shellfish farming emerged in late 1980s in the area, as a major case-history of diversification. One of these is the clam farming in the Goro Lagoon. That activity represents an exemplary case of how fragile are local institutions when they face a rapid change (North, 1990).

The introduction of a strong innovation, namely a new type of clam from Asia, brought sudden wealth to the inhabitants through the intensive cultivation, industrial transformation and exportation of the product. A local consortium was the pivot of all the operations. However, a rapid and unexpected environmental crisis, coming from a loss of oxygen in the lagoon, provoked a collapse of the clam farming with severe consequences for the social and political balance of the community, highlighting the weakness of a development path not based on sustainability. In every step of clam farming history an important role of mediation has been played by experts and scientific institutions. They introduced the different variety of clam, they taught how to farm, but they didn't deal with environmental problems, ignoring that in a sensitive ecosystem such as Po delta, salinity and oxygen conditions of water can change abruptly. Lacks in knowledge distribution and the missed adaptation of practical knowledge to innovation, almost brought to implosion of the whole system in a few years. But the crisis enabled new institutions to arise, keeping Goro economy alive, still using knowledge as a lever. In recent years a more limited cultivation and industry of clam has been re-established, which is based on a more shared knowledge among local people, development agencies and scientific institutions. Moreover, knowledge is again an important resource to control for environmental conditions and to permit alternatives to fish farming, allowing a new diversification in fields like rural tourism.

The case shows in a paradigmatic way the thick interdependency between experts, cooperative and public bodies and the ambivalent role of social capital. To treat a so complex, “constellational” subject in a coherent way, in Sections 1 and 2 we describe the territorial and institutional framework where all the story takes place, while Section 3 and 4 go deeper on the role played by different *knowledges* for local development and environmental sustainability in the Goro case. A final Section 5 sums up the main points of the case study, remarking the importance of the concept of practical knowledge and the role of institutions to hit a sustainable development path.

1. Territorial Framework and Fishery Filière in the Delta

The area of the Po river's Delta is divided in two administrations: the provinces of Rovigo, in the plane zone of the southern part of Veneto region, and Ferrara in the north-eastern Emilia-Romagna. Even if both regions are included among the top 25 European regions for labour productivity and rate of employment, Provinces of Rovigo and Ferrara have structural problems and show an unemployment rate higher than regional mean. It's worth noting that both sub-areas inside Rovigo and Ferrara provinces interested by Po river's Delta entered EU 2000-2006 Objective 2 zones.

The Po delta represents the biggest damp area in Italy and one of the most important in Europe. It

covers a surface of about 1.300 squared km, which extends along 130 km of low sedimentary shores, forming a crescent around the north-western Adriatic sea. The Po Delta territory is completely under the sea level, with the exception of banks, beaches and sandy dunes. The Volano-Mesola-Goro Station, representing the southern strip of the area, is the only territory of the Po Delta Park in the Emilia-Romagna region to be really interested by the Delta active branches. It includes a wide range of natural habitats of European interest.

Both Venetian and Emilia-Romagna delta show typical trends of rural areas, with a high percentage of unemployment, related to regional averages, and with an important quota of active population involved in primary activities (European Commission, 1988; Osti 1998). In this scenario Goro municipality is quite an exception if we look at the 20 years-period trend of unemployment rate: its unemployment rate falls from 6,6% to 4,5% in the first leg (1981-1991), to raise up again to 6,5% in the second one (1991-2001). The reason is the incredible boost in shellfish farming (namely clams, but even mussels in a lower size) in the Goro Lagoon, that carried on a great job creation in fishery, and the crisis of sector since 1993 until 1997, that fired many workers. Sorting active population by kind of work, we have a terrific percentage in the primary sector in Goro (57%) because of the highest relevance of fishery and fish farming¹.

Fishery and fish farming have a great economic, historical and cultural importance for coastal municipalities of Veneto and Emilia-Romagna. In the northern Delta, open sea fishery employs 350 workers, while the number of fish-boats in the province of Rovigo is of about 250 units (2001 census). Between Po di Maistra and Po di Goro (two branches of Po River Delta), workers in mussels farming are almost 1.500 units, while in the whole province generic fishery employs some 2.000 persons, associated in the 28 cooperatives that make the Consorzio delle Cooperative Pescatori del Polesine (Polesine Fishers' Cooperatives Consortium). Since 1999, the fish production and transformation system in Venetian Lagoon (Chioggia) and Delta, is recognized as an official district by the regional Government, according to the national laws on productive districts.

The shellfish filière in Delta, as for all Adriatic area, is articulated in few steps: at the first level, producers, mainly fishers' cooperatives or consortia, manage the stocks and harvest shellfish when they reach proper dimensions. Product, then, is sent to a gathering pound called Depuration Centre, where mussels are subjected to decantation or to depuration from pollutants. After this phase, product is managed by an Expedition Centre² officially appointed by European Commission, that addresses it to industries where it's transformed and canned, or directly to fish loan markets, to be sold as fresh product.

In northern Delta, revenues of these productions has been evaluated about 60 millions Euro in 2004. Quality level is very good; thus, that Consortium is ending the process of certification ISO 9001 (quality) and ISO 14001 (eco-efficiency), while products such as "true" clam of Polesine³, mussel of Scardovari, blue fish and eel of Po Delta, grey mullet of Polesine, are all granted with the "typical goods" seal by Italian Ministry of Agriculture Policies (De Pin, 2002).

In the southern part (Emilia-Romagna), fishery has historically concerned Goro Lagoon, Comacchio and the sea in front of these two municipalities, until the moment when modernization of

¹ In Italian Census statistics, fishery and agriculture belong jointly to the Primary sector.

² Usually, Depuration Centres play as Expedition Centres, too.

³ True clam is the translation of Italian trivial name of *Tapes Decussatus*, the only autochthon clam specie living in Italian waters.

fleets and boats permitted fishing in the open sea. Even in this way fishery has always meant a subsistence economy: it didn't ensure welfare of fishermen, who were forced to do other activities during the winter, such as harvesting reeds and renting hunting posts inside the lagoon. Therefore, fishery is an activity deeply rooted in the tradition's heritage of those places, evolving along the time toward professional forms.

Since the 1970s, fishery – linked to fish farming, topic of the case-study that we will develop in the next chapter – has become the main activity for revenues production in Goro: with 753 industrial units (Census, 2001), the sector covers a quota of 72% of total productive units at the municipality level (at the provincial one, fishery is just 2%); adding Comacchio's value, this quota raises to 96% of local units and 98% of employees of the Province of Ferrara as a whole. So, we can say that fishery leans almost completely on the units placed in this area.

A deeper analysis of fish boat fleet of Goro in last 10 years permits to underline some relevant aspects of fishery in southern Delta. While the number of boats is raising (+25% between 1992 and 2001), the gross tonnage remains unchanged; as a consequence, mean tonnage lowered of 20%, with a pivotal period in triennium 1995-1997, when units' number grew of 30% while mean tonnage fell down of 24%. The changing is due to explosion of clam culture inside the Goro Lagoon, an activity with a low entering threshold (both for financial capital and skill), that needs boats of a lower tonnage; many people – even from outside fishery sector – chose this activity, transforming Goro in the most important place for clam production of Europe in the 1990s.

Nowadays, the clam filière in the whole northern Adriatic sea, is under uncertain conditions both on supply and demand side. On one hand, production's main problem is linked to presence of abusive agents (outside the official cooperatives' system and inside it, as well) operating in the sector; this situation generate exceeding offer, with negative consequence on market equilibrium price, and on the hygienic conditions of the non-controlled product. On the commercial side, market segmentation and differentiation policies are implemented, based on certification and tracking tools such as ecological voluntary applied standards and quality-origin seals. At the moment, demand side's willingness to pay for a certified product isn't high enough to justify investments in reputation; main producers of the Delta area, anyway, has already started the certification process.

2 Diversification and Innovation: Shellfish Farming in Goro Lagoon

Fishery in the open sea and lagoons, as mentioned, has always been an important sustenance source for Po Delta communities. Since almost 40 years, however, fishery left room to another activity linked to it, but at the same time similar in work organization to agricultural practice: this new activity is fish farming, in particular mussel and clam farming. Mussel farming started in Venetian Delta lagoons, but it became famous in the world due to impulse of Goro production in 1980s and 1990s. It is a paradigmatic example of the way local skills, scientific knowledge and practical experience can join together to generate development in a rural area.

Fishery has always been the main economic activity in Goro, and for this reason in 1962 this little fisher's centre obtained the status of municipality, parting from Mesola, a typical agriculture area. In Goro in 1931 is founded the first local association, a guild of fascist period of fishers from which after WWII it will come the Fishermen Consortium (COPEGO, *Consorzio Pescatori di Goro*), a crucial institution for later events. In Goro, moreover, at the time a highly specialized occupation is well developed: it's the early fish (fries) fishery, that pushed people from Goro

looking for fries even in Mediterranean waters near France and Spain. Like many traditional specializations, this kind of fishing needs skills in treating fries before selling it to fish farms in Veneto. Nevertheless, after some years the diffusion of labs made it simpler and cheaper to provide fries, so that local practical culture linked to this kind of fishing activity disappeared.

In a period that extended until early 1970s, COPEGO is the Goro community point of reference, influencing all the aspects of the local society life. COPEGO carried out not only the typical activity of a professional association, but also social activities and mutual aid. In the last mid-century COPEGO was so present that helped the sons of the fishermen attending the school, it supported the poor families, organized holidays, so that COPEGO could be identified *de facto* with the local civil society.

In 1968, an event happened that would change forever the history of Goro: local fishermen found a natural stock of “true” clams (*Tapes Decussatus*) in the bottom of the lagoon. Skills to develop this new activity are simple and easy to learn. COPEGO tried to give some cultivation and selling guidelines to its members, but even in this way exploitation didn’t follow any rational rule. In a few months, in Goro happened actually what Garret Hardin defined in a famous and frequently quoted paper “the tragedy of the commons” (Hardin 1968): absence of property rights made it possible that the clam’s stock was exploited with no attention for physiological growth of the resource. In 1974 the natural bank got almost completely exhausted.

Even if Consortium tried to establish some rule, inadequacy to enjoy a common good (felt as something to exploit before some other else would do the same), mutual mistrust among operators and the lack of managerial knowledge carried to a rapid stock consumption. Even so, something of that transitory experience remained inside the local community. The importance of not depending totally on open sea fishing, with its high level of uncertainty, the importance of programming oneself own work and to make it all the year long, pushed in the idea of diversifying fishery’s activities. In the lagoon was found not only clams, but also mussels stocks, whose exploitation followed some sustainability principles, such as harvesting just a quota of the total resource. Then, in 1973 COPEGO invested in the building of a decanting pound, for depuration of mussels before commercialisation. Anyway, these were not lucky days for the fishing sector: a cholera fever epidemic in southern Italy depressed the consume of sea food, shellfish in particular; nevertheless mussel culture developed in Goro and fish-farming skills improved.

It’s quite difficult to make it clear why the same virtuous behaviour in managing a shellfish species (mussel) wasn’t applied in the same area and at the same time for another kind of shellfish (clam). As a matter of fact, mussel management needs lesser attention: it develops at a higher rate and in a shorter time than clam; furthermore, traditions in dealing with it were more rooted in every lagoon, where fishermen used to drive stakes into the ground and to live mussels “colonize” them (while clams grow in the sea ground, needing more specific conditions for water temperature); finally, local markets were accustomed to mussels consumption, while there was a lack of culinary tradition for clams. For all these reasons, a kind of tacit, not codified knowledge⁴ in dealing with mussels was more developed in comparison with clams situation, so that managerial knowledge at first, and scientific one in a second time could root on it (see *infra*).

Even because of the blossom of studies and experiments, in the same years became quite popular the idea of transforming fishermen in a kind of “sea farmer”, buying seeds in specialized centres, planting them in sea fields and harvesting products when they get ready. Research areas are

⁴ For the concept of tacit knowledge see Polanyi (1974), Nonaka and Takeuchi (1995) and Conti (1997).

linked mostly to fish and fries, but somebody begins to apply these techniques to shellfish. Easiest to be treated, as we said, are mussels, whose traditional “farming” in wooden stakes have recently been joined by more sophisticated technologies, like *long line* pipes in the open sea. When they decided to start mussel farming in Goro Lagoon, the former lesson coming from the clam stock exploitation seemed to be learned: in order to rule harvesting, coordinate the commodity supply and assume a favourable position in front of dealers, in 1976 five cooperatives decided to join COPEGO and not to exceed production quotas assigned by it. Managed with economic rationality principles, mussel farming shows good results and someone supposes to repeat the experience with clams.

In 1982 first experiments are made with *Tapes Philippinarum*; just three years later the harvest is of about 10 tons of clams, raised to 22.000 in 1991, that represented 80% of national production and 70% of European one (Carrieri *et alii*, 1992). A so terrific and unexpected growth causes experience management problems, that spill over local community: the low expertise needed to become a clams producer, pushes everybody to join the new business, mostly young people, who leave school career as soon as the law allows them to do it.

In a few years, COPEGO changed his nature: it became the national leader on the clam market and was also able to succeed in the international market. In this way, it played the role of supply side monopolist, becoming an important stakeholder in this area, able to affect the local government choices. Changing in business dimension and society’s income, grew from 10 up to 40 millions of Euro, wasn’t followed up by an improvement of professional and managerial skills, so that COPEGO was responsible for many mistakes in selecting clients (with problematic insolvencies), out of budget expenditures, unjustified hiring that lead manpower to 150 units, heavy but almost useless investments, and so on. Deficit raised rapidly and consortium management revealed soon to be inadequate to drive a so complex machine.

When in 1992 a ruinous environmental crisis cut down 60% of production, being repeated the year after and in 1996-’97, the whole system implodes. COPEGO, in the eye of the hurricane even because of some court’s enquires, lost its authority and more than a half of its members (640 out of 1.200) quits. Nowadays, COPEGO has been reorganized, returning to the original economic vocation. It is still influent at local level, the only one owner of a decanting-pound, but it is not a pervading structure anymore. New consortia have raised (*FederCoPesca*, *AGCI Pesca*) as a demonstration that COPEGO’s monopoly on the market and on local civil society was over.

In spite of these dramatic events, fish farming keeps on being the main economic sector in Goro, the one that still generates employment and welfare for inhabitants. Nowadays Goro lagoon is parted in a plantation and weaning zone for *Tapes Philippinarum* seeds – called *nursery* – and in field plots given in a four years long license. Because plots request number is raising year by year, the 1990s crisis seems to be over-passed. Harvested production is growing: after minimum touched in 1998 (1.834 tons), in 2002 production reached 4.521 tons and 6.222 in 2003, a year in which recovered environmental equilibrium conditions joined with favourable weather and climate. Furthermore, we must point out that during last years comes out the habit to follow markets demand, with peaks in the summer season, in December and, in a lower way, for Easter holidays.

As a consequence of the crisis, in last years Goro has lost its supremacy on shellfish market: a lower coordination among suppliers, the raise of traditional competitors – first of all Chioggia, that covers now almost 65% of national market, relegating Goro at 11% – and of Mediterranean new comers (Tunisia, Egypt), has facilitated the passage of market power in dealers’ hands. This situation makes it possible that international price depends on demand’s volume, floating in a year even about 400% according to the season (from 1,65 to 7 Euro per kg). In addition, de-

mand's side prominence on supply's one stimulates habit of single producers not to comply with assigned quotas, and to sell products on the black market, evaluated by some observers in 30% of the whole exchanges.

Trusting in official data, most likely underestimated, the revenue of clam sector in Goro is relevant, quantified in 40 millions euros per year. The future of this activity requires a production line based on quality, an aspect strongly linked with environmental conservation of local habitats. Willingness to get out from a situation of chaos in management and to fit a more qualitative segment, is proved by two initiatives: EMAS certification of Goro lagoon and assignment of EU Protected Geographic Indication seal to Goro clam, both next to be approved by European Commission. The latter is truly important, since it introduces mechanisms either for commercial signaling against the related risk of market failure (Akerlof, 1970; Milgrom and Roberts, 1986) as for guarantee and tracking of a product usually associated with risks of bad quality and health danger.

Chronology of Shellfish Farming in Goro Lagoon

- 1968: True clams (*Tapes Decussatus*) are discovered in the Lagoon
- 1973: building of the decanting pound for mussels depuration
- 1982: introduction of a foreign very productive clam (*Tapes Philippinarum*)
- 1992: first anoxic crisis of the Lagoon
- 1996: managerial and financial crisis of Fishermen Consortium (COPEGO)
- 2004: the procedure for Goro's Lagoon EMAS II certification started

3 Knowledge Contribution to Fish Farming

Shellfish farming in Goro is a good model of knowledge and local development relationship: its origin, exogenous to local geographical system, is deeply rooted in high scientific knowledge which spread to Goro because of the action of some "knowledge mediators" (Piore 2001).

In the early '80es, when in Goro the "clam-fever" begins, advanced competence in fish-farming in Italy are placed in the Venetian Lagoon, particularly in Chioggia, where both the Ichthyology Centre of Venetian Lagoons (*Centro Ittiologico Valli Venete, CIVV*) and the Italian Society for Artificial Fish Reproduction (*Società Italiana Riproduzione Artificiale Pesce, SIRAP*) were established. In the same years, in Chioggia a group of researchers of Consortium for Development of Fishery and Fish Farming in Veneto (*Consorzio per lo Sviluppo della Pesca e dell'Acquacoltura del Veneto, CoSPAV*), began to study farming perspectives of bivalve shellfish.

The director of CoSPAV was an American scientist of Italian origins, who - knowing some experience of clam farming in USA, Spain and Portugal – decided to experiment the plantation of clam's seed acquired abroad in two Venetian delta's lagoons; if in the first water shield the results were unsatisfactory, in Caleri's lagoon seeds took roots and clam population grew up.

Among interested observers of the experiment, there was a neo-biologist, graduated at Ferrara University and employed in COPEGO's decanting pound. Thinking Caleri's experiment can be replicated in Goro lagoon, he asked scientific support to his former thesis advisor and used his own contacts inside COPEGO to establish a new and experimental clams' plantation in Goro. Ready to buy the first stock of seeds, they discovered that no factory treated any more *Tapes Decussatus*, the true clam typical of Italian waters; rather than quit the experiment, they decided to

shift to a similar but Asian species, *Tapes Philippinarum* (a.k.a. *Tapes Semidecussatus*), without considering potential environmental problems carried in by the introduction of an external species.

After an unlucky start, the Goro experiment reveals to be a great success, unexpected in that dimensions: after a year, new seeds generated by the same population planted in 1985 is everywhere inside the lagoon; clams from Philippines show a stronger tolerance against anoxicity, salinity variations, parasites. They produce much more spats per female and record a higher growth-rate, almost double respect *Decussatus*; it means the possibility to fit the commercial dimensions into two years, while the autochthon species would need at least three or four years.

Since that moment on, relationships between producers and scientific units and Universities (mostly Universities of Ferrara and Padua), will be continuous, regarding experiments on seeds and fries, but neglecting, the impact that ecological crisis could have on such a massive monocultural activity.. Moreover, comprehension of the importance of knowledge in clams farming, makes it possible that even the local scholar attendance, still dramatically low, goes improving. In front of these undeniable social progress, there is more than a problem for the sector: management skills are insufficient to direct this important economic activity and it is still difficult to convince local producers about the importance of ecological balance for sector's sustainability.

Albeit its visible labour intensive character, what really distinguishes clam farming and determines its productivity is the nature of knowledge based activity: spread out due to an intuition, adjusted through R&D, lab experiments and field tests, it imposed a sharp discontinuity with the past and developed a mechanism easily replicable in other places (David, 1998).

To transfer innovations from the place where they were originally fashioned to other sites where to reproduce and use them, can impose high adaptation costs, mostly if scientific knowledge that favoured the innovation has not a complement in local lay knowledge. In this case, it is fundamental the role played by "cognitive mediators", i.e. agents belonging to expert knowledge world, capable to managed complexity and to implement theory in practice, so that innovation can be reproduced at a low cost even in a context far from its origin.

In our case-history, cognitive mediators between innovators (CoSPAV researchers) and users of the innovation in the Goro Lagoon were the experts of University of Ferrara, in particular the young biologist employed at COPEGO. He was able to understand the potentiality of clam farming in Goro, to convince a local community where entrepreneurship and trust were very scarce resources to join a common project, and to help the local producers to see the profitability of it.

Besides the important activity of cognitive mediators, effective diffusion of a knowledge based innovation is prone to interaction of three drivers (Foray and Mairesse, 1999): the existence of a *value* to be extracted by the innovation, a regulatory institution allocating the value among the different actors of the filière according to a *vector*, and finally a *mechanism to multiply* many times the innovation in a profitable way. The last driver can be augmented by new investments in knowledge at a local level and by endogenous features that transform a decreasing returns factor such as value in an increasing one winning the constraints of path-dependency (David, 1985).

The three drivers are naturally conflicting: value that each agent wants to extract from innovation can unfit the distribution vector proposed by regulatory institution, while multiplying effects assured by the strength of social networks can conflict with individual maximization of value extracted from innovation (Rullani, 2004). Like for sustainable development, equilibrium for knowledge economy is a compromise between three pure objectives: the private one of value

maximization, the social one of best allocation among the different agents, and a third one of maximization of the times innovation can be efficiently multiplied.

Apart from cognitive mediators' contribution, to consolidate the innovation at a local level needs a "practical knowledge" contribution. It's a different concept from the just mentioned tacit knowledge one (see *supra*), because of strong ethic element it incorporates. Stemming out by Gadamer's reprise of the aristothelic concept of praxis (Gadamer, 1975), practical knowledge

" (...) is somehow related to awareness of what it's 'right' to do, before of what it's 'useful'. (...) it's deeply rooted in a territory, it can change, it can evolve, it can renew even through imitation, but it can't be imported"⁵.

It's the kind of knowledge to be used in understanding, rather than in changing reality, capable to evaluate the same effects produced by the action. Despite of technical knowledge, practical one doesn't generate artefacts and tools, but it creates the conditions to succeed, interpreting situations, dissipating ambiguity and anticipating problems that could arise. It's a relational kind of knowledge, embedded in the relational network of local agents.

While evolution of technical knowledge is mostly an intellectual effort, changing the practical one is a social issue: it means reconsidering cultural heritage and local identity, modifying interactions within the network and reallocating power in the social system: new actors and groups arise, new relationships among formerly isolated agents strengthen and a social change process takes place (Botta and Vino, 1999).

In Goro, the whole system imploded because innovation was abrupt, and it hadn't enough time to induce the needed change in practical knowledge and in the local values structure. As a consequence, compromise balance among drivers couldn't resist to the centrifuge force of opportunistic behaviour by different maximizing agents. The regulatory institution (COPEGO) was neither accomplishing nor authoritative enough to impose a common objective. As a typical oligopolistic cartel with not aligned interests⁶, the Goro system crumbled down for the action of who operated to grab defection gains.

To self-impose cooperation, agreement pay-off must be higher than competition and defection one. It happens when the value coming from innovation raises, forcing the boundaries of nil-sum games. This is the result of markets where the goal-function of agents considers not only monetary, but also immaterial items (von Wangenheim, 2004). Such a situation is more frequent in communities where social capital is thick, where social networks are strong and trust is a shared value (Cersosimo and Wolleb, 2006). In Goro, on contrast, social capital doesn't play any relevant role: COPEGO's pervasive presence blocked up the blossom of any other social multiplier, as witnessed by the almost total absence of voluntary associations and social cooperatives. Without a thick social capital to use as a factor for development, another possibility to enforce cooperation is the prestige of the regulatory institution, but when the ecological crisis breaks on, COPEGO has already lost its credibility, trying to get consensus through "favours" to the political sector, and ignoring the systematic elusion of rules by its members.

Furthermore, the clam farming case in Goro shows another important issue related to knowledge based activities: the huge difference between production and replication costs, that usually in-

⁵ Botta and Vino (1999), p. 52. (our translation).

⁶ For a complete review of oligopoly and strategic behaviour in economics, see Tirole 1988.

duces the advantage of being a second mover, increases the probability of losing importance in favour of new comers. This is what happened in the middle of 1990s, when other sites in the Northern Adriatic Sea replaced Goro as leaders of the European clam market (Boatto *et alii*, 2005).

4 Knowledge contribution to environmental sustainability

After early times and the years of consolidation, the scientific knowledge contribution to fish farming in the Delta area was directed to environmental monitoring and improving ecological conditions which were required for steadying the economic activities.

The right quantity of oxygen necessary to shellfish farming in the lagoon depends mostly on water exchange between Po di Goro fresh water and the open sea one. While sea waters are of good quality, fresh waters bring on nutritive substances, worsening hydro-equilibrium inside the lagoon. In fact, a too low level in salinity and a too high concentration in nutrients characterizes most part of the lagoon. Moreover, alluvial materials brought on with Po di Goro waters are the main responsible of sand covering of the lagoon, reduction of water flows and, consequently, raise of temperatures and seaweeds blossom.

Anoxic crisis in the 1990s, and authority fragmentation in many public bodies on a so complex subject (Po River Magistrate, Province of Ferrara, Municipality of Goro, Land-Reclamation Consortium, Italian Military Navy, National Ministries), with a restricted dialogue in-between, suggested to create in 1995 a new special authority to govern scientific and technical problems of Goro Lagoon. As Chairman and scientific responsible of this authority, named “Consortium for Goro Lagoon management”, gathering Municipality of Goro and Province of Ferrara, is nominated a professor of the Ferrara University.

Consortium is able to raise funds to make important actions of cleaning, periodical upkeep and hydro-dynamic recovering inside the lagoon, but – because of contrasts between Goro Municipality and Province of Ferrara – in 1997 it’s dismantled. The same year, a new anoxic phenomenon puts Goro case in the middle of national attention, and Italian Government decides to appoint a Commissar with extra-ordinary powers to solve main environmental problems. Investments made possible by the new Officer and his special funds, rapidly give their results and since those days no anoxic crisis has came out, while clams’ production has grown continuously⁷.

In 2003, at the end of the season of “extraordinary intervention”, a new *Committee for Environmental Management of Goro Lagoon* is settled down, a body inclusive of local authorities delegates (Municipality, Province of Ferrara and Emilia-Romagna Region), of representatives of main Fishery Association, and a technical body constituted inside Environmental Assessorship of

⁷ This event is a further deny of the relationship between environmental conservation and local income, according to the framework of Environmental Kuznets Curve (EKC) proposed by Selden and Song (1994). Clam stocking in Goro outlines the importance of environmental investments for spreading successful economic activities; but strong investments for lagoon preservation and water monitoring are not driven by an increase in local welfare and revenues. Apart of rhetoric of EKC, toughly criticized by many experts in last years (Tisdell, 2001; Zaim and Taskin, 2000), in our case-study we could see the reverse mechanism: it was the risk of irreversible environmental catastrophe, anticipated by a series of anoxic crisis, to claim for new public investments in environmental quality, after sector’s revenues fell down.

the Province of Ferrara (*Goro Lagoon Board*). In the later three years, the Committee facilitated annual works of keeping, land management, lagoon channels resection, and hydraulic functions restoring. This set of acts is coupled by the settlement of a sophisticated monitoring satellite controlled system, managed by Goro Lagoon Board; such system gives real time information about hydrometric levels, chemical and physical characters of waters in lagoon different places⁸.

Nowadays, a raising environmental question is connected with clams' cultivation and harvesting. The leaving of the manual rakes system for practices based on the use of mechanical rakes, such as hydraulic dredger and vibrating rakes, has brought unavoidable negative environmental impacts on the morphology processes and marine life functions of the lagoon. Similar problems are faced in Venetian Delta, both for mechanical harvesting and maintaining of internal hydrodynamics (Onofri, 2005).

5 Practical Knowledge and Institutional Mediation

In this paper we concentrate on shellfish farming activity to understand how a different kind of knowledge mix was capable to impose in a short time a non-agricultural activity in a rural area such as Po River Delta. At the present time, producers know they must pay greater attention to environmental conditions inside the lagoons: past anoxic calamities seem to have educated people of the sector about the importance of a strong control of water qualities, hydro-dynamism and morphological evolution of coasts; otherwise, the whole system could collapse in any moment. We can see a practical demonstration of this new awareness in the institution of a permanent technical body to monitor ecological balances, with the support of Province and Universities, and in the diffusion inside the system of some voluntary instruments of environmental certification.

The selfish farming is outward-oriented, since clam production is sold in national and international markets, and it incorporates great innovative items, with a tangible modernisation of local fishery filière. Thus, it is not surprising that shellfish farming needed a strong injection of expert and managerial knowledge to spread out. Just the lack of managerial expertise represented the dreadful bottleneck that risked tumbling down the whole sector in the 1990s.

Goro fishery and fish-farming case showed how awareness about ecological conditions' importance gradually entered local stakeholders and public bodies; environmental problems in Goro lagoon moved from a top down perspective – with a governmental Commissar granted with special powers of intervention – to a more local one, even if not exactly bottom up: since 2003 a new committee, constituted by local public bodies and fishery associations, replaced the Commissar in monitoring the lagoon and in deciding the protection initiatives.

Thus, shellfish farming has brought a new awareness in local community, linked both with governance and capacity building on one hand, and with sustainability on the other one. Obviously, the process is still in progress and it's quite far from a definitive and satisfactory result.

⁸ Monitoring system is based upon a series of bathymetric plummets, connected via GPS to a data processor, and competed with acquiring of satellite's photos (Quick Bird); all data are transformed in GIS coordinates and laid down in maps. Information is used to verify morphological evolution of beaches and sand-banks, marine life and hydrodynamics, but it is even shared via web with local stakeholders, like fishery associations and operators.

Goro story, in addition, allows to test the importance of knowledge for start up, rooting and development, or – on the contrary – implosion of an economic activity. Lay knowledge in the area is represented by many things: traditional fishery techniques; habit of living in the sea and of sea resources; specialization in fry fishing; practice to treat with the fish farming filière; and learning on the field what means a correct management of common goods. On the body of tacit knowledge, a robust dose of scientific knowledge at the top level has been injected: great experimental centres on ichthyology established in Veneto and with linkages with international scientific world; Universities of Padua and Ferrara; technical knowledge of environmental institutes and internal high level competency of public authorities.

It's worth noting that transfer from “higher” forms of knowledge to trivial ones was mostly due to interests and constancy of someone who belongs to both worlds, the scientific world of Universities and experimental centres, and the local world: a biologist specialized at Ferrara University, involved in Chioggia labs activities, but even son of a local fisherman's family and employed at COPEGO. Another “main character”, probably the one who more than others represents the concept of “expert knowledge” is the chief researcher of Institute of Marine Zoology at Ferrara University, who didn't act simply as a consultant or as a scientific tutor, but played directly managing roles, becoming the President of the first Consortium for Goro Lagoon.

What really missed in clams farming experience in the Delta, in particular in Goro lagoon, was the mentioned practical capacity (or knowledge), able to assemble different sources of knowledge with the changing conditions of local economic actors. The main mediator – COPEGO - suffered inadequacy of its management, inappropriate pressures from political parties and a paternalist attitude toward local people.

Moreover, areas with only “bonding” social capital (Helliwell and Putnam, 1995; Putnam 2000), institutional weakness, and isolation are really prone to shocks caused by innovations; these ones induce inside the territorial system a perturbation, that claims for an upgrading of practical knowledge. During all the time the transformation occurs, the system is exposed to great hazards.

In Goro, the hazard took the form of the anoxia, and it revealed the failure of the regulatory institution and of the local social network. The local system showed its own inability to manage the growing level of complexity, and – as in many other situation such that – just an intervention from outside could re-address it (Lane and Maxfield, 1997). New agents arose to avoid the system from “bankruptcy”: consortia and “middle level institutions” (Arrighetti and Seravalli 1997; 1999) just existing in some case, but quite marginal until that time for the area, such as the Regional Park Consortium of Po River Delta, the Leader II and then Leader+ LAG Delta 2000.

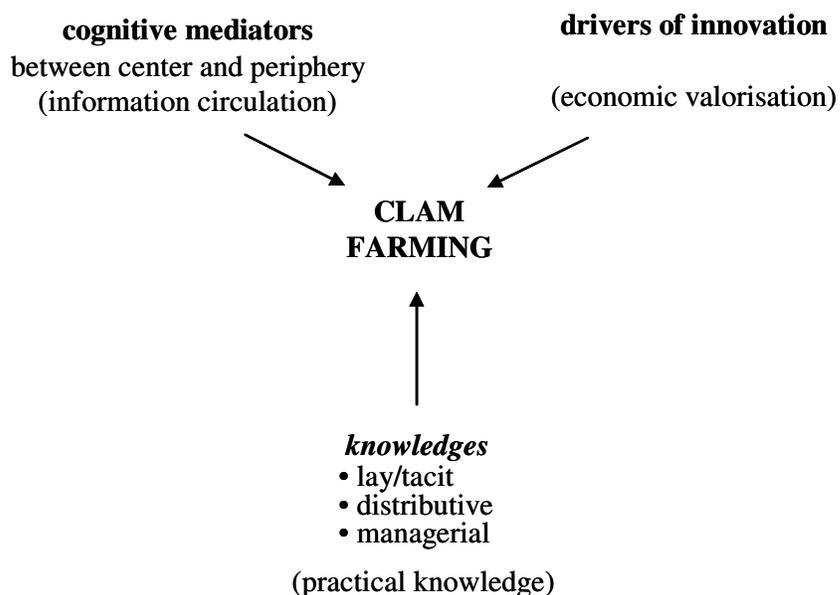


Fig. 1 – The representation of clam farming main factors

Using the knowledge as a main resource, both the Regional Park and the LAG Delta 2000 tried successfully to enlarge development opportunities to activities different from the clam filière and the fishery sector, mostly correlated with sustainable tourism and environmental valorisation. Even though these activities did not produce the same revenues of main activity (shellfish farming), they were very important, being based on a network and cooperation approach (Silvestri and Bono, 2005). Such new intermediate institutions broke the single-item development path for Goro, keeping variety alive and strengthening system’s ability both to generate innovations and to escape from lock-in (Arthur, 1988, 1989; Saxenian, 1996).

Nowadays, the crisis seems to be partially over-passed, even because of redistribution of functions, formerly monopolized by COPEGO, among different agents. What’s more, generic knowledge and education level are remarkably improved in local community. Strengthening of human capital in Delta, certified by the higher frequency of university and higher number of secondary school graduates in local population, is translated in the new attention for environmental problems. On the other hand, a weak point of the system deeply rooted in past lack of competence and low confidence in institutions, is the incidence of black market (Consorzio Parco regionale Delta del Po and eco&eco, 2006).

As a conclusive remark, we must consider the crucial role played by the so called practical knowledge. It is a hybrid form including the codified as well the context-tacit knowledge; but it is not only a good mix of traditionally polar forms of cognition; it embodies a social dimension too, particularly evident in the (weak) capacity of Goro’s institutions to redistribute the wealth, not strictly monetary, coming from clam farming. At stake there was a redistribution inside the fishing sector (with the great problem of free rider), and across other less rewarding activities, like eco-tourism and education. The monolithic presence of COPEGO affected all the redistribution process in a negative way. Even if established in a mutual base (consortium), its capacity to ensure a social balance was widely insufficient. That means two things for rural development: first,

the local *knowledges*, even when mixed with external ones, are not able to ensure a good management of the entire innovation process; secondly, egalitarian ideology that inspired COPEGO, are not well equipped to face complex situations due to ecological crisis and economic differentiation.

Thus, we wonder which are the mechanisms that allow rural areas to develop through knowledge: surely practical knowledge is a key factor; it has two components: one is ethical, the other is linked to the practice; the former concerns the commitment for public goods, particularly in our story the environment protection and the young people education, the latter deals with the adoption of sequences of managerial acts (scripts) sufficiently flexible to admit the insertion of new bodies. When in Goro Lagoon such scripts became less rigidly linked to “productivistic” goals and hegemonic political designs, a new and more sustainable development path arose.

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