

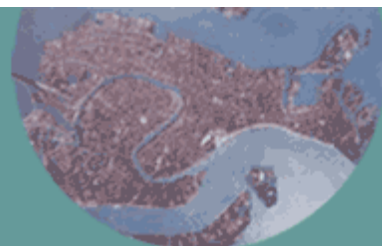
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## **A multi-object auction for selling fishing permits in the Venice Lagoon**

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# A Multi-object Auction for Selling Fishing Permits in the Venice Lagoon<sup>1</sup>

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## *Abstract*

The lack of well-defined property rights on renewable resources results, in many situations, in the overexploitation of the resources. In recent years, the lagoon of Venice has been subject to intense, and in many cases illegal clam harvesting. In order to regulate the fishery and to limit the clam harvesting, the local authorities have decided to assign property rights to fishermen. This paper investigates the advantages of adopting an auction for the selling of the permits for the clam harvesting in the Venice lagoon. An overview of the auction mechanisms reveals that the optimal mechanism for selling fishing permits has to reach the best outcome in terms of efficiency, equity, expected revenue, cost minimization, complexity of the rules, and avoidance of collusive behaviors. Finally, the paper suggests that an experiment would be the best method to choose which mechanism would best fit the Venice lagoon case.

Keywords : lagoon, fishery, auction theory, property rights

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<sup>1</sup> This paper has been prepared for the EAERE-FEEM-VIU Summer School on Political Economy of the Environment, Venice International University, September 16 2003. The present work discusses the optimal auction mechanism to allocate property rights for fishing permits in the Venice lagoon. The paper describes several auction mechanisms that could be used to allocate property rights among fishermen and suggests which mechanism would be the most appropriate for the lagoon of Venice fishery.

The next step would be to test with an experiment if the optimal mechanism suggested in the paper would be confirmed in an experiment where we test how the different auction mechanisms would perform in terms of equity, efficiency, and revenue maximization. During the Summer School I would like to discuss with professors and participants how to set up the experiment and try to generalize the experiment to test the outcome of different multi-unit objects auctions.

## 1. Introduction

The collective use of common pool resources has always been relevant for the socio-economic evolution of local communities. When demand exceeds supply, the exploitation of common pool resources such as fisheries, local forests, grazing areas, and irrigation systems typically poses problems of collective action, or governance (Ostrom, 1990). In many situations the lack of well-defined property rights is the main cause that generates the well-known tragedy of the commons.

Fishing activities in the Venice lagoon have been subject to strict rules for centuries in order to maintain a balance between the needs of the local population and the biological rhythms of the species in the lagoon environment. However, at the beginning of the 70s the fishing activity entered a period of crisis due to the pollution of lagoon waters which caused a significant reduction in the number of fish. In order to improve the situation, in 1983 the Consorzio per lo Sviluppo della Pesca e dell'Acquicoltura del Veneto<sup>2</sup> introduced a clam, the *Tapes philippinarum*, best known in the Venice area as “caparozzolo” (Provincia di Venezia, 2000). This mollusk adjusted perfectly to the environment, and the lagoon of Venice has become the first producer of *Tapes philippinarum* in Europe with 40.000 tons a year. As a consequence, more and more fishermen have left traditional fishing activities in order to harvest the *Tapes philippinarum* which also guarantees high incomes (it has been estimated that a clam fisherman earns about €500 a day). These clams are not particularly influenced by seasons and can therefore be fished all year long. The capital required to set about clam fishing is also very low; only a small two-three persons boat and a dump rake (called “rusca”) are necessary for the harvest. All these elements have fostered clam fishing, which has also become very popular among the young. The consequence of this blooming activity has been an

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<sup>2</sup> Consortium for the Development of Fishing and Farming in the Veneto Region.

overexploitation of the clams and a threat to the equilibrium of the lagoon ecosystem, since the clam fishing takes place with illegal dump rakes which have caused both an increase in the erosion process and a loss of biodiversity in the lagoon environment.<sup>3</sup>

In order to rationalize the exploitation of clams, local authorities have decided to allocate certain areas for clam farming and authorize special dump rakes for the harvesting. In this way, the size of the fishery will be reduced from the current 2,200 fishermen to 1,500. Outside the farming areas it will only be possible to harvest clams by hand. Figure 1 shows the lagoon of Venice and the main fishing centers.

Figure 1 – Fishing centers in the Venice lagoon



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<sup>3</sup> Currently there are 83 boats using legal rakes, while all other boats use illegal dump rakes. Pranovi and Giovanardi (1994), Fontolan et al. (1995), Pranovi et al. (1998) found that the clams fishing causes a loss of 106m<sup>3</sup> of sediments from the lagoon each year. Moreover, they claim that the dump rakes used to gather the clams cause a general loss to the total biomass of other species present in the lagoon.

The aim of this paper is to study the allocation of fishing permits for clams harvesting through an auction. After a survey of different auction mechanisms, an auction that best fits this specific clam fishery will be suggested.

In designing an auction it is necessary to establish the goals. For the Venice lagoon, an important goal might be the revenue maximization from the sale of the areas. Another goal, strictly linked with the first one, might be an incentive for the highest possible number of fishermen to participate in the auction, in order to guarantee a fair assignment of areas.<sup>4</sup> A third goal might be an efficient allocation: with an auction, the areas for clam farming should go to those who value them the most.<sup>5</sup> It is important to note that some of these options are conflicting, and in choosing the mechanism, the decision maker has to consider what priorities are more important.

Considering that local authorities initially wanted to assign the areas free of charge, it is reasonable to assume that the revenue maximization is a secondary aim, while regarding more important the purposes of equity and efficiency in the allocation of the areas.

A problem that must be considered in designing an auction – in order not only to maximize revenues, but also to assure efficiency and equity – is strategic behavior and the collusion among bidders. Another aspect to be considered is the necessity of simple rules, so that bidders quickly understand the mechanism.

Moreover, it will be necessary to consider how to redistribute the auction revenues. These might be used to restore the damages caused to the lagoon environment by the illegal clams

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<sup>4</sup> If a particular auction mechanism encourages the participation of the highest number of bidders, this mechanism would guarantee a fairer allocation of resources compared to a mechanism that would not encourage as many bidders to take part to the auction. If a participant takes part to the auction this means that he feels he has some chances to win a good. Therefore, one of the goals of the allocating mechanism might be to maximize the number of fishermen that would feel potentially able to win a good.

<sup>5</sup> In auction theory, efficiency refers to the fact that at the end of an auction the object is sold to the buyer who values it the most.

harvesting that has occurred in the latest 10-15 years. I would not suggest to use the auction revenues for subsidize the clams farming, because this might create distortionary issues. Moreover, distortionary effects might originate if the auction revenues be used to subsidize the other fishing activities.

Finally, it is important to stress that the optimal auction alone cannot guarantee an efficient market. The auction must be complemented by other elements that guarantee the success of the market, such as the creation of rules and exclusive rights concerning the owning of the areas, or the commitment of local authorities to establish a seal of quality for the *Tapes philippinarum* which will foster the marketing of the product.

The paper is organized as follows: section two describes the advantages of the auction compared to “grandfathering”; section three illustrates the object sold at auction. Section four summarizes the main results of auction theory for the sale of several similar objects and section five applies these results to the clam fishery of the Venice lagoon. Finally, section six concludes the paper.

## **2. Why sell areas at auction?**

Instead of using an auction, local authorities might allocate the areas to particular groups of fishermen. This alternative, known as “grandfathering” (Cramton and Kerr, 1999; Goeree and Holt, 1999), would assign areas to those who have long fished in the areas, or those who have already begun clam harvesting, or those who are older members of the fishing community, or those with a strong political influence. The traditional view is that grandfathering, while inefficient,<sup>6</sup> is chosen because it provides greater political control over the distributive effects of the regulation (Stavins, 1997).

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<sup>6</sup>The inefficiency of grandfathering could be offset if fishermen would be allowed to trade fishing permits.

Compared to grandfathering, an auction would be not only more efficient, but would also allow a more equitable distribution of goods. Through an auction there would be no need to find a political agreement to share the goods among interested people. Considering the lagoon of Venice situation, where there are more than 2,000 clam fishermen, it would be politically challenging to exclude 600-700 persons from the fishery. Through an auction, those who have higher marginal costs would remain outside the market and would not receive any area.

The auction of the clam farming areas would generate a rent for local authorities that might be used to restore the lagoon environment destroyed by years of illegal clams harvesting. With grandfathering, such a rent would instead go to a group of favored fishermen.

### **3. The object sold at auction**

In every auction it is essential to define the object to sell. In this case, the auction would regard 500 permits for the exclusive exploitation of 500 areas of the lagoon destined for clam farming. As the average crew for clam fishing is composed of three persons, the 500 concessions would allow 1,500 persons to work in the fishery.

A relevant consideration is the homogeneity of the goods: are the areas all the same, or is it possible that a fisherman would be willing to pay more for an area rather than another? In the first case we would face a multi-object auction with identical goods, while in the latter we would face a multi-object auction with similar goods. Besides the physical characteristics of the areas, it is necessary to consider their localization. In fact, the Venice lagoon is the largest wetland in the Mediterranean Sea (550 km<sup>2</sup>) and the fishermen operate in different areas of the lagoon. Local authorities have decided to allocate 10,000 hectares for clam farming. It is likely that the areas will

be quite similar for quality and quantity of clams.<sup>7</sup> The only difference is the localization of areas, as every fisherman would be more interested in winning an area near his localization. Therefore, in this situation the appropriate mechanism would be an auction to sell several heterogeneous goods.

Regarding the length of permits, it seems reasonable that they should last for five years with the possibility of renewal, so that fishermen can consider a long period strategy for clams farming.

The efficiency of the market could be further enhanced if fishermen would be allowed to trade the permits after the auction.

#### **4. An overview of some popular auction mechanisms for selling several similar objects**

Much of the existing literature on competitive bidding focuses on the sale of a single object. In this case, the most used mechanisms are the first price sealed bid auction, the second price sealed bid auction, the English auction and the Dutch auction. In the first price sealed bid auction, each bidder writes his offer in a sealed bid; who bids the highest price wins the object and pays the amount offered. In the second price sealed bid auction, each bidder writes his offer in a sealed bid, as in the first price sealed bid auction; who bids the highest price wins the object and pays the second highest price that was offered. The English auction is perhaps the best known among all the auctions: it is an oral auction where whoever makes the highest bid wins the object and pays the price offered. The Dutch auction is an oral auction with a falling price: at the beginning the price is set at a very high level and the auctioneer lowers the price until the first bidder stops it. The person who stops the price wins the auction and pays the price at which he stopped the auction.

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<sup>7</sup> Provincia di Venezia (2000) has estimated that there are no significant differences in depth, sediment structure, temperature, and currents in the areas for clams farming.

In reality it is rare to observe sales involving only one object. Either a number of similar objects, such as books, stamps, paintings, antiques, mineral rights, or the like, are put on the block in the course of a sale, or multiple units of essentially identical objects, such as the Treasury bills, are offered for sale (Milgrom and Weber, 2000).

In this section I describe some of the most popular mechanisms that can be used to allocate several similar objects. Four auction mechanisms have already been described: a sequence of English auctions, or Dutch auctions, or first price sealed bid auctions, or second price sealed bid auctions can be used to sell in sequence several similar objects. For example, in the Netherlands, sequential Dutch auctions are very popular, especially for selling lots of homogeneous flowers. In this case, the winner may decide how many lots to buy for the price bid.

Auction theory has recently studied other alternatives to the basic four auction mechanisms. In this paper, I analyze two mechanisms that might be interesting for the Venice lagoon fishery: the Simultaneous Ascending Auction (Milgrom, 2000), and the Menezes–Monteiro Auction (1998).

Table 1 – An example of simultaneous multi-unit ascending auction.

	<b>G1</b>	<b>G2</b>
<i>Round 1</i>		
<b>Bidder A</b>	10	10
<b>Bidder B</b>	20	20
<b>Bidder C</b>	20	15
<i>Round 2</i>		
<b>Bidder A</b>	25	-
<b>Bidder B</b>	30	-
<b>Bidder C</b>	-	25
<i>Round 3</i>		
<b>Bidder A</b>	35	-
<b>Bidder B</b>	-	30
<b>Bidder C</b>	-	-
<i>Round 4</i>		
<b>Bidder A</b>	-	-
<b>Bidder B</b>	-	-
<b>Bidder C</b>	-	-

In a Simultaneous Ascending Auction, the items are auctioned simultaneously in multiple rounds of bidding. In each round, bidders may submit new bids. A bid is a pair comprising an item and an associated price (higher than the standing high bid). Bids can continue to be submitted for any item until the auction ends for all items; the auction ends only when a round elapses with no new bids submitted for any of the items. For example, suppose there are three bidders A, B, and C, and two goods, G1, and G2. Suppose the bids are as presented in Table 1.

The auction ends on round 4 when there are no more bids. Bidder A gets G1 and pays 35, bidder B gets G2 and pays 30. Ascending bid, multi-unit auctions formats have become dominant in recent years for government sales of telecommunications spectrum.

Menezes and Monteiro (1998) proposed a sealed bid auction for the sale of several similar commodities where bidders are allowed to purchase only one object. Suppose there are  $k$  goods, and  $n$  players, with  $n > k$ . Bidders submit a sealed bid for one object. In this auction, the individual with the highest bid chooses an object first; the individual with the second highest bid chooses the next object; and this process continues until the individual with the  $k^{\text{th}}$  highest bid receives the last object. Each individual pays the equivalent to his/her bid. For the Venice lagoon fishery, it might be possible to use a sequence of 4-6 Menezes-Monteiro auctions, in order to sell in each round a group of areas with similar characteristics. For example, in one round it might be possible to sell 50 permits related to areas of the southern part of the lagoon.

##### **5. A comparison of the most popular auction mechanisms for selling several similar goods Which auction to choose for the sale of the fishing permits in the Venice lagoon?**

As I showed in the previous section, there are different ways to sell several objects at auction. Choosing a mechanism depends not only on the result the seller wants to obtain, but also on the characteristics of the environment (Klemperer, 1999). In fact, in order to choose the auction

for the selling of the fishing permits in the Venice lagoon, it is necessary to consider the characteristics of the areas being sold, of the market and how strategically bidders will act. Moreover, in the sale of a high number of objects it is necessary to consider the costs involved with the adoption of each mechanism.

### Expected revenues

In the sale of a single object, the literature affirms that the expected revenue for the seller is the same for the four basic auctions (English, Dutch, first price sealed bid, second price sealed bid), with private values<sup>8</sup> and under the hypothesis that bidders are identical and adopt symmetric strategies. Moreover, auction theory states that the revenue equivalence theorem is true not only for the four basic auctions, but for every auction mechanism, provided the seller does not know the different valuations that bidders have over the object. This strong result is still true in the sale of several identical objects, provided each possible individual wants only one object (Maskin and Riley, 1989).

Dealing with common values and with several similar but not identical objects, the revenue equivalence theorem is no longer true and it is necessary to analyze, in each situation, which auction gives the highest expected revenue to the seller. Recently, several auctions have been run using the simultaneous multi-unit format. However, this format does not guarantee the best outcome in terms of revenue maximization, while it does guarantee an efficient outcome, as is explained below.

### Efficiency

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<sup>8</sup> In a **private value** auction each individual values the object independently of the valuation of other individuals and independently of the information that other individuals have. The valuation of the object depends only on personal factors. In a **common value** auction each individual has the same valuation of the good, but every individual has different information on the uncertain value of the object. If an individual knew the information of another individual, he would modify his own valuation of the object. In most auctions there are both private values and common values elements. The auction for the selling of the permits for the *Tapes philippinarum* farming involves both private values and common values.

When the objects are not identical, simultaneous auctions are generally preferred over sequential auctions because they are more efficient (Cramton, 1997). In a sequential auction the information released is lower than in a simultaneous auction. Moreover, with sequential auctions for similar objects, bidders have to infer the future selling prices of successive auctions. A wrong estimate may make for an inefficient allocation of goods when the objects are interdependent. With a sequential auction, an individual is limited in his strategy: he will regret having paid a high price at the beginning of the sequence of auctions, or not having taken advantage of a lower price in a certain moment of the sequence. With simultaneous auctions, when several similar objects are sold simultaneously, each bidder gets the information about other bidders' valuations of the objects during the rounds of the auction. Therefore, there is no need to infer which will be the final prices of the objects. Given that the objects sold at auction are similar, also the sale prices should be similar. With a sequential auction it is possible that prices will be very different, while in a simultaneous auction sale prices are usually very similar to each other.

While a simultaneous multi-object English auction provides more or less constant selling prices, a sequence of Dutch auctions does not provide the uniformity in prices. Ashenfelter (1989) noticed, however, that even though in a sequence of Dutch auctions the price falls over different rounds, it does not move much from the average price, guaranteeing, in this way, a rather efficient outcome.

The Menezes-Monteiro Auction could be inefficient. Suppose area A is fisherman's  $i$  preferred area. Suppose he decides to bid  $\text{€}X$ , which this is the maximum value he attaches to this area. It is possible that, even if he is one of the winners of the auction, he cannot choose area A because someone else who bid more than he did chose the same area. A way to limit this inefficiency problem is to sell simultaneously areas that have similar characteristics. For example, the local government could sell in the same auction areas located in a well delimited zone.

### Equity

One of the aims of the auction is to give to all fishermen the same chance to buy a permit. In auction theory, equity refers to the number of potential bidders the auction may attract: the highest the number of bidders, the more equitable an auction is.

The issue of equity may be quite serious in the case of an English auction. With an ascending auction, individuals who know they have a low value for the object might decide not to take part in the auction, because they might feel that they are going to lose against someone who they think should attach a higher value to the good. In general, those fishermen that know that they will be defeated in an ascending auction may decide not to take part in the auction. A sealed bid auction, or a Dutch auction, may reduce this problem. Each bidder must submit a unique optimal bid and the weakest bidders also have some chances to win (Wolfstetter, 1994).

### Collusion

The aim of revenue maximization might not be reached if bidders are able to find an agreement on how to behave during the auction. It is very difficult to prove unfair behaviors which, on the contrary, are often legal: sometimes individuals are able to co-ordinate their actions without any previous agreement. Ascending auctions are very affected by this aspect (Klemperer, 2000). For example, with simultaneous ascending auctions bidders may, in the first rounds, signal which is the good that they are interested in by only bidding for that particular object. On the contrary, with simultaneous first price sealed bid auctions, no bidder has any credible way either to signal his interest for a particular object, or to say which maximum price he is willing to pay for that object. In the Dutch auction and in the first price sealed bid auction it is difficult for bidders to maintain collusive behavior. Let us consider collusion in the Dutch auction, which is based in such an agreement among bidders: the participants, before the beginning of the auction choose a winner designated to stop the price as soon as it arrives at a prearranged level. It is easy to understand that

any bidder who, within the agreement, should not take part in the auction may deviate from the collusive strategy by deciding to stop the falling price as soon as it arrives at a slightly higher level than the prearranged level.

The auction for clam farming permits in the lagoon of Venice is not likely to suffer collusion troubles because, as we have seen, there are more than 2,000 potential bidders and only 500 permits to sell.

### Costs

The influence of costs may have a substantial weight over the choice of the auction mechanism. A mechanism may be more expensive than another if it needs a particular expensive organizational structure, such as a large room to gather all the bidders, or if it takes a long time to run the auctioning process. In fact, if the sale lasts for several weeks, this will cause an increase in the costs.

Suppose a sequence of sealed bid auctions is implemented. Each bidder must write the price at which he is willing to buy a specific permit. Afterwards, the seller checks the bids and assigns the permit to the winner bidder. If it were to repeat this procedure 500 times, the auction would be very long. It is therefore clear that it would be very expensive to assign the permits through a sequence of sealed bid auction. The Menezes-Monteiro Auction would be an exception. In fact, this sealed bid auction would run quite fast, and would need no particular organizational facilities to gather a high number of bidders, given that it is a sealed bid auction.

Among oral auctions, a sequence of English auctions would provide a slightly faster sale compared to a sequence of sealed bid auctions, but it would still be quite long. Moreover, its costs would be influenced by the need to have a place to gather several hundreds of bidders. A sequence of Dutch auctions, even if presents the same drawback of a sequence of English auctions in terms of the structure to gather the bidders, it will run much faster than all the previous ones we just

considered. For example, in The Netherlands, each Dutch auction for the selling of flowers lasts only few seconds.

A simultaneous ascending auction would have both the drawbacks of the need of a facility to gather many bidders, and might also last for a rather long period, even though it should be faster than a sequence of English auctions.

### Mechanism comprehension

A final relevant aspect in the choice of a mechanism is the easiness of comprehension. As it has been shown, different auctions have different rules. Bidders might have more problems in understanding one mechanism rather than another. Of course, if the bidders are companies bidding for goods worth several million dollars, then whatever mechanism would be chosen, the aspect of the mechanism comprehension should be irrelevant. In such a situation, bidders would be very well informed by economic advisors and auction experts about the optimal strategy they should play. But when the goods to be sold are only worth a few thousands dollars, and no auction specialist is hired by bidders, then the comprehension of the mechanism might play an important role. In this situation, the seller should choose a mechanism that is not too complicated.

The English auction is by far the easiest mechanism. Also the rules of the other three basic auctions are quite easy to understand. Maybe the rules of the second price sealed bid auction are a little more difficult than the three others. The rules of the Menezes-Monteiro Auction are also quite simple, while maybe simultaneous ascending auction might be the most complicated mechanism.

Table 2 summarizes the characteristics of the auctions just described.

Table 2 – Multi-unit auctions for selling similar objects

	<b>Revenue maximization</b>	<b>Efficiency</b>	<b>Equity</b>	<b>Collusion</b>	<b>Cost</b>	<b>Mechanism comprehension</b>
Sequence of English Auctions	?	-	-	-	-	+
Sequence of Dutch Auctions	?	-	+	+	-/+	+
Sequence of first price sealed bid auctions	?	-	+	+	-	+
Sequence of second price sealed bid auctions	?	-	+	+	-	+/-
Simultaneous Ascending Auction	?	+	-	-	-/+	-
Menezes -Monteiro Auction	?	-	+	+	+	+

**6. Which auction to choose for the sale of the fishing permits in the Venice lagoon?**

The auctioning of permits for the *Tapes philippinarum* farming should find the best mix among equity, efficiency, expected revenue, easiness of comprehension for the buyers and costs involved with the auction mechanism.

In choosing the mechanism, the regulator should consider the priorities of the sale. A good way to decide which auction mechanism would be to test with an experiment the performance of the different auctions on the elements described in Table 1 under the specific circumstances of the clams fishery. In fact, Auction design is a matter of “horses for courses”, not “one size fits all” as Klemperer (2000) states.

Anyway, if the principal goal of the auction is efficiency, then the simultaneous ascending auction should be used. However, the regulator should consider the difficulties bidders might have in understanding this mechanism and the possible collusive strategies. If the regulator puts more importance to the speed of the sale and to the easiness of comprehension of the mechanism rules, then the Dutch auction might be the most favorite one. A sequence of sealed bid auctions does not

seem to be a good choice, given the extremely time consuming process the sale of 500 objects would take. If a Menezes–Monteiro Auction would be chosen, it might last too long and give an inefficient result.

An alternative might be to consider the sale of areas by groups: first the auctioneer might sell the areas related to the north lagoon, then the area of the south lagoon, then the areas of the central lagoon. In this way, if a Menezes–Monteiro Auction would be chosen, the inefficient result should be minimized. If a simultaneous ascending auction would be chosen, there would be fewer players in each auction and the organizational problems would be less important.

## **7. Conclusions**

When it is not governed by strict rules, the exploitation of a natural resource may lead to the overexploitation of the goods and cause the depletion of the resource. The lack of property rights is the main reason behind the overexploitation of many natural resources. The necessity to regulate the *Tapes Philippinarum* fishery in the Venice lagoon has driven local authorities to decide to allocate property rights of some areas of the lagoon in order to harvest the clams with dump rakes only within these areas.

Since the allocation of the permits through an auction gives advantages in terms of efficiency and equity compared to an arbitrary allocation to a particular group of fishermen, several auction mechanisms have been analyzed in this paper for the lagoon of Venice case.

In the choice of the auction for the permits to farm the *Tapes philippinarum*, the revenue maximization might not be a priority; while the aspects linked to the efficiency and the equity of the allocation of the permits might be more important. Moreover, other relevant aspects might be the costs associated with one mechanism rather than another and the complexities of rules that define the different mechanisms.

A simultaneous multi-object English auction, in the case of similar goods, guarantees the efficient allocation of the objects. However, since this mechanism might be quite complicated for fishermen and since this type of auction suits situations where bidders may buy more than one object, our attention has moved towards a sequence of oral auctions.

An alternative might be a sequence of Dutch auctions, since this mechanism is the fastest way to allocate 500 permits avoiding collusive behavior. With this mechanism, bidders have few chances to find any collusive agreement and each bidder may concentrate his efforts on the permit he is more interested in. Besides, the analysis of empirical data shows that in a sequence of Dutch auctions the selling price does not move much from the average price, guaranteeing an efficient outcome.

The next step would be to analyze through an experiment the performance of the different mechanisms with respect to revenue maximization, cost minimization, equity, efficiency, collusion, and comprehension of the rules.

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