

**PROJECT ANALYSIS AND MARKET ANALYSIS,  
TWO COMPLEMENTARY TOOLS TO HELP AQUACULTURE FIT DEMAND :  
THE CASES OF SCALLOP AND SEA-BASS**

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**EAFE VIth Annual Conference  
Heraklion, Crete, March 1994**

**ABSTRACT**

Despite its youth, aquaculture is faced with market difficulties which make profitability of the activity more and more difficult to reach. Time is long gone when the price of some top-grade sea products was very high and the demand seemed limitless. In a context of uncertainty concerning economic conditions, institutional rules and characteristics of the demand, it is very important to have tools to facilitate decision-making by investors, bankers, entrepreneurs, researchers and public-policy makers.

The first tool we propose is the market analysis. This is necessary to check adequacy between supply and demand. It is aimed at describing the present state of the market for a range of products (origin, characteristics, seasonality, volume and price) in order to focus the target on the aquaculture project. The second tool is the project analysis. This method makes it possible to have a good knowledge of what will be produced in terms of cost and quality, by taking into account the comparative advantages given to this project. A full range of criteria has to be presented to evaluate the project from different view-points : return on investment, financial feasibility during the first years, profitability on the long run and breakdown of production costs. Thanks to these links between project analysis and market analysis, it is possible to assess the possibilities to look for price-competitiveness and quality-competitiveness when entering the market.

This method has been applied to scallop in France and sea-bass projects in Greece. As far as scallop is concerned, the results show that price-competitiveness is impossible to reach and that the market to attain is the market for raw shell-off scallop. For the sea-bass, it is very difficult to choose quality-competitiveness because of the difficulty to make products' differentiation while the importance of natural endowments in the production costs gives comparative advantages to southern Mediterranean countries.

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## INTRODUCTION

Till now, aquaculture projects have concerned some species like salmon, sea-bass, sea-bream, turbot and scallop on the basis of high price for these species, of spat availability (from hatchery or from the wild) and of lack of technical barrier.

But the experience of the pioneers has shown on the one hand that the market was something in permanent evolution, influenced by larger social trends and often unforeseeable, and on the other hand that aquacultural techniques did not make it possible to produce any kind of product you want.

Getting adequacy between demand and supply is something you have to work for. It is not something naturally given. That is why market analysis and project analysis are required to help aquaculture fit demand and to help the enterprises to look for competitive advantages in the international competition.

## 1. METHODOLOGICAL ASPECTS

Like in the "egg or hen dilemma", it is very difficult to decide whether market or project study has to be done first, but whatever your choice is, the final decision will be the result of several go and back between the two studies.

### **1.1 Market analysis**

#### **1.1.1. general trend in sea-products consumption**

First, it is important to know as well as possible what are the general trends of the market for sea-products, beyond the usual affirmation that the demand for sea-products is increasing. Actually, as far as French market is concerned, the situation is not so simple. The study of the households consumption shows the decreasing part of the food (fig. 1). Among the food products, fresh sea-products are increasing less than the average, especially less than processed food (fig.2). This trend is not good for aquaculture which produces above all fresh products.

#### **1.1.2. description of the present market for the product**

Most often, the target market is heterogeneous, with a whole range of products the differentiation factors of which may be :

- price,
- size,
- aspect,
- seasonality,
- origin (regional, national, international),
- level of processing (alive, fresh, frozen, processed).

All these factors except price may be grouped in the term of "quality".

These products may be marketed through different distribution channels (direct sell, catering, traditional fishmongers, hypermarkets).

This step is aimed at knowing what are the needs of each distribution channel in terms of quality, price and volume for this product.

### **1.1.2. recent evolution of the market**

In order to define a price of reference for an aquaculture project, price and volume data of the preceding years have to be collected, for each quality and each distribution mean.

## **1.2. Project analysis**

### **1.2.1. general presentation**

This first approach of the market, and the knowledge of the technical results obtained by aquaculture experiments make it possible to figure out approximately which kind of product may be produced and in what range of price it could be sold.

It is important now to check whether it seems possible or not to develop a profitable activity with the available techniques.

As a project depends on natural conditions, on technical choices and on marketing strategies, the only way to answer to the former question is to study one project, identified by several technical, biological and economic hypotheses, then to study different variants of this project and to compare them.

Therefore the project study may be carried out with the help of a simulation tool built on the basis of a spreadsheet. The Marine Economics Service at IFREMER has developed in close co-operation with the biologists a software called PROJAQ based on Microsoft EXCEL (Paquotte and Fleury, 1993). This simulation tool does not pretend to be an universal model for any kind of aquaculture enterprise but to facilitate the application of a multi-step project analysis methodology to all sorts of projects, by taking into account the peculiarities of each species and of each site.

The principle of this simulation tool is to create links between the physical flows and the financial flows (Hemidy, 1990) of the enterprise in order to assess the financial consequences of any change in the technical choices, of any variation in the natural conditions or in the economic data. It is a deliberate choice not to use formal accounting outputs, because they hide the specificity of the activity and prevent from understanding how biological or technical changes may induce economic changes.

### **1.2.2. the different steps**

#### *Project identification.*

The project is defined first by type of actors, location, farming operations and production targets. These choices lead to draw a weekly schedule for the use of equipment and manpower. All the institutional constraints have to be taken into account like the regulations concerning access to land, leases or impact on the environment.

### *First estimation of costs and revenues.*

Secondly, it is necessary to assess annual costs and revenues for a convenient time frame depending on the length of the farming cycle (from 6 years to 15 years) :

- amount of initial investment, depreciation and renewal,
- manpower and other operating costs,
- stocks, yield and expected revenues.

A financial plan is proposed to meet the need for initial investments, taking into account the availability of subsidies and the legislation regulating debt and indicating the origin of the capital (private, public, co-operative).

### *Financial analysis.*

The third step is financial analysis which supplies different criteria :

- **the return on investment** through the Internal Rate of Return (IRR) which measures the rate at which the money would have to be invested elsewhere to get the same return as in this project. This first step doesn't take into account either the financial plan of the project or the interest expenses. This analysis examines the project from the standpoint of the investor ;
- **the project feasibility** through monitoring of the cash position in order to demonstrate potential problems and permit a revision of initial financial choices. This elements are particularly important to the lending banker;
- **the profitability of the activity** and the factors causing variation. The breakdown of the costs in five main items (purchases, salaries, taxes, depreciation and interest expenses) is a good method to appraise the profitability of the activity according to different ratios, such as Operating Result/Turnover or Net Result/Turnover. These criteria represent the entrepreneur's point of view
- **the analysis of costs** through a breakdown of operating expenses and particularly of depreciation expenses in order to highlight relevant profitability issues and possible productivity gains. This breakdown is helpful to the researcher in charge of improving culture technique.

### *Sensitiveness analysis*

The results of financial analysis depend on hypothesis on different factors beyond the control of the entrepreneur such as growth speed, survival rate and market price. Therefore, the simulation tool makes it possible to test other hypothesis and to consider the new results of the financial analysis. It is a way to take into account the risks which exist in an activity which depends on natural conditions.

### *Study of variants*

The last step is the study of variants in which the project is partly modified because of results from the prior analysis. These results may lead to new choices, for instance changing the organisational structure, the equipment or the financial plan, and consequently lead to a new project identification (return to the first step of the analysis).

## 2. APPLICATION OF THE METHOD TO TWO CASES : SEA-BASS AND SCALLOP

### 2.1. Scallop

#### 2.1.1. market analysis

##### *General features*

The annual world production reaches 1 000 000 tons, of which almost 30% are involved in international trade. The main producers are Japan, China, Canada, Australia and New Zealand. France is one of the three big markets for scallops in the world, with Japan and the USA (Dao et Paquotte, 1994). But there is a great diversity of species under the generic name scallop and only some of them may be called "King Scallop", or "Coquille Saint-Jacques" in France. French production does not exceed 13 000 tonnes (King scallop) but annual imports reach 70 000 tons, i.e. 520 MF (almost 100 millions US\$), 10% of the French imports of sea products in value and 25% of the international trade of scallops. That is why supply of scallops is a significant issue in France at the present time. France is also sort of a hub for scallop trade in South Europe (fig. 3).

##### *Analysis by product*

Three different types of products may be distinguished (fig 4) :

- fresh scallop in the shell, exclusively King scallop from French fisheries.

Inside this category, another differentiation has to be done according to the presence or not of roe (called "corail"), particularly appreciated on the French market.

- fresh meat, mainly King scallop from United Kingdom, most often roe-on,

- frozen meat, imported from Pacific or North Atlantic.

Prices are very different for each product of this wide range, as well as the distribution channel. Compared to other fresh sea-products, the market share of hyper markets for scallops is rather low since it is under 30%. However it is increasing at the same pace, i.e. 2% per year (fig. 5).

##### *Trends in volume and price :*

The situation is very different whether you consider fresh product from French fisheries or imports. Landings have continuously weakened from the mid seventies because of over fishing and stocks depletion (Paquotte, 1992). Then, thanks to very good environmental conditions favouring recruitment, landings have been jumping for two years. Quite a good correlation is observed between volume and price on the 76 to 93 period :  $\text{Price} = 27,7 - \text{Quantity}$  ( $r^2 = 0,8$ ) with price in French Francs and Quantity in 1 000 tons (fig. 6). As the biologists in charge of the survey have noticed a poor recruitment this year, smaller landings are expected in the near future, and consequently higher prices too.

But the study of the recent evolution of wholesale market price for different presentations of scallops in France showed that whatever the origin, the price in 1993 is 30% less (in real price) that it used to be 5 years ago. (fig. 7). During that time, the imported volumes have been rather steady. So, it is not possible anymore to say that low price for fresh scallop is due only to high supply, and the come back to high price when landings are weak is not certain. A complementary study should be done on this question, including the evolution of the price for

other expensive fish species as well as substitute products like frog thighs, snails, "foie gras" and smoked salmon.

### *Definition of a reference price*

Even among the fresh scallops from fisheries, the price is subject to change according to quality and marketing. The most similar product to the aquacultural product is the scallop from Rade de Brest, which is better valued thanks to direct sale (not through auction), quality (permanently roe-on) and small quantities (fig. 8). That is why a price of 20 F/kg will be kept for project analysis.

## **2.1.2. project analysis**

### *identification of the project*

This integrated project from hatchery to harvest of seedlings has a production capacity of 12 millions post-larvae, 3,6 millions of juveniles to seed, and 150 to 180 tons of adult scallops. The rearing cycle lasts 4 years, with extensive growout on leased sea-beds. The most critical technical parameter is the survival rate on the sea-bed, which goes usually from 25% to 30%, sometimes much less, sometimes more. The total investment reaches one million US dollars, of which 20% comes from personal funds, 35% from subsidies (Europe 4028 policy and regional grants) and 45% from bank loans.

### *results of the financial analysis*

Two fundamental results :

- the sensitiveness to the variation of the survival rate, within the range of biological uncertainty. The different criteria of return on investment, profitability of the activity on the long-term and cash position are negative with a survival rate of 25% while they are positive at a survival rate of 30% (fig. 9, 10 et 11).
- The ratio Operating Result/Turn-Over is rather good, and makes it possible to take the risks into account, but the cash position is too weak, even with 30% survival rate, during the first ten years. This project suffers from too low personal funds, because the constitution of the stock has required important long-term loans (the ratio loans/personal funds is 4), and would not resist to any loss in the production.

## **2.2. Sea-bass**

### **2.2.1. market analysis**

#### *General trends of fish consumption in France*

The only data available here concern French market, but similar information for other countries would be particularly valuable. In France, a diminution of whole fresh fish is noticeable, while the demand expands for fresh fillets or frozen fish, two categories of products which are not the target for aquaculture (fig. 12).

Even for the fresh fish, the market share of the hyper markets is increasing, reaching half of the volume sold for household consumption (fig. 13). This point is important for this channel of distribution has very strong claims for quality, regularity of the supply and low price.

### *Evolution of the price for sea-bass on Italian market*

This market is the outlet for about 80% of the sea-bass production in Europe. The price fall (fig. 14) has happened much earlier in the development phase as in salmon farming, and it has been rougher too. The price of reference now on the Italian market for sea bass is only 46 F/kg (1900 dr). The salmon industry has succeeded better in its adaptation to the demand by the creation of a large range of products. From 1982 to 1992, the decreasing price of imported fresh farmed salmon (68 F/kg to 31 F/kg in constant francs) has been associated with a huge development of the market (3 500 tons to 60 000 tons) and a diversification of the products (small size, big size, fillets, slices, smoked) (Paquotte, 1993).

#### **2.2.2. project analysis**

Only two criteria will be studied to point out how the profitability of the activity may be influenced by external factors.

##### *Influence of the market price*

On the 1992 market basis, a project of sea-bass farming in cages in Greece, capacity of production 250 tons and 1 million juveniles (not including internal consumption), could expect a profitability ratio of 28%, before financial expenses. In 1994, everything else assumed steady, this ratio is only 7%, which means that this farm has better not to be submitted to high financial expenses, and that it can't afford any bad biological result. Only the expectation of technological gain may enable this enterprise to be less fragile.

##### *Breakdown of production costs*

The figure 15 shows that some ratios are typical of an activity in technical evolution, like the proportion of food in the costs. This proportion is rather low compared to salmon or shrimp farming, although it is well known that the food industry has not really developed a totally efficient product. On the contrary, it means that some other items like salaries, consumables or investments should be reduced thanks to technological gain.

### **3. WHAT KIND OF COMPETITIVENESS IS IT WORTHWHILE TO LOOK FOR ?**

Once market analysis and project analysis have been completed, it is possible to point out the comparative advantages the project has in front of the competitors. These comparative advantages are given by the environmental, economic and institutional context.

After having identified what sort of product, at what price it could be produced and if it was matching a demand, it is possible to assess the factors of competitiveness to look for :

- Price-competitiveness

In this case, the target is to reduce the production costs either by internal factors (know-how, innovation, economies of scale, managerial skills) or by using co-operation (economies of scope, collective equipment sharing)

- Quality competitiveness

In that case, the factors involved are the control of the marketing, the relations with the down side of the industrial activity (processing, distribution), the product differentiation and the control of quality.

In France, it seems useless to look for price-competitiveness in scallop aquaculture compare to the frozen imported product. But the control of hatchery techniques makes it possible to choose good strains which produce roe-on animals, and to forecast the period of commercialisation. According to the trends of the market (preference for meat without shell by the youngsters and by the hyper markets), the market of roe-on scallop meat has to be focused.

As for sea-bass, it is very difficult to look for price-competitiveness right now when some new producers announce production costs of 21F/kg like in Turkey or 30 F/kg in Malta. Because of high investments in Italy, because of high salaries and low temperature in France, because of high interest rates; inflation and currency parity movements in Greece, it seems impossible to reduce that much the production costs in the short term. A strategy of quality competitiveness is difficult to attain too, because of the difficulty to differentiate the products on the basis of objective criteria. Same size, same food, same strains make sea-bass from France very similar to sea-bass from Tunisia, sea-bass from small scale firm very similar to sea-bass from industrial plant. But the example of other food products has shown that a vertical differentiation was possible on the basis of the origin of the product or of the quality of the presentation to the consumer (Norwegian salmon, Country chicken). In this case, in order to get a better price on the market, the quality product has to have differentiation factors from the basic product, and both of them, cheap and more expensive product, have to be offered to the consumers. Some experiments of labellisation of sea-bass in south of France have been a failure because there was no basic product to be compared with. On the long term, technological gains may be expected thanks to research in genetics and nutrition, making possible to get reduced production costs and better adequation to the demand of bigger fish.

## CONCLUSION

Market analysis and project analysis help to change the traditional question "How to sell farmed fish" in an other one : "What kind of fish to produce, at what price and in what competitive conditions". But these tools are not a cristal ball, and their results are subject to change according to economic changes (inflation, interest rates, currency parity) and according to evolution in international competition (new producers with better comparative advantages). They just facilitate the taking into account of these changes in the expectation of profitability of the activity.



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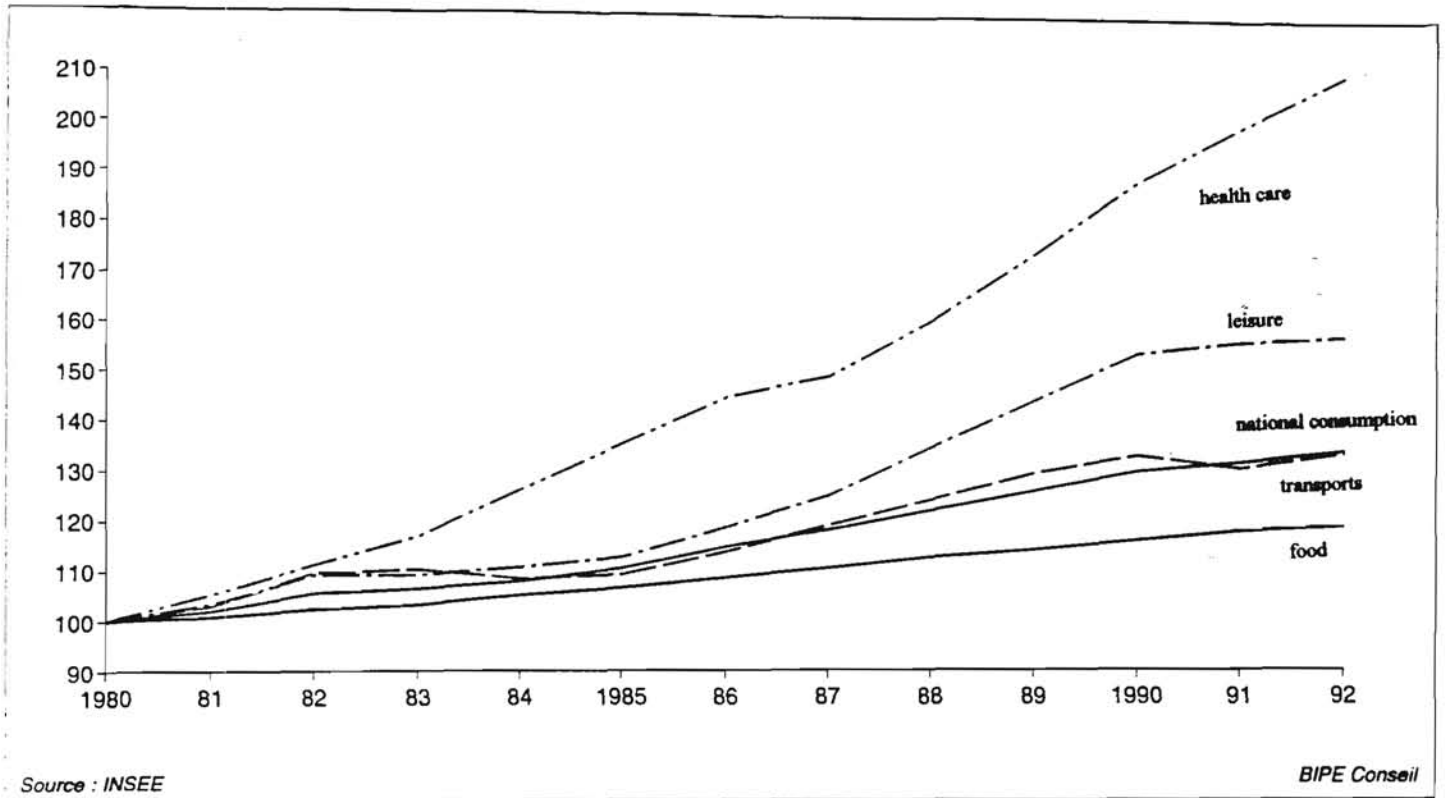
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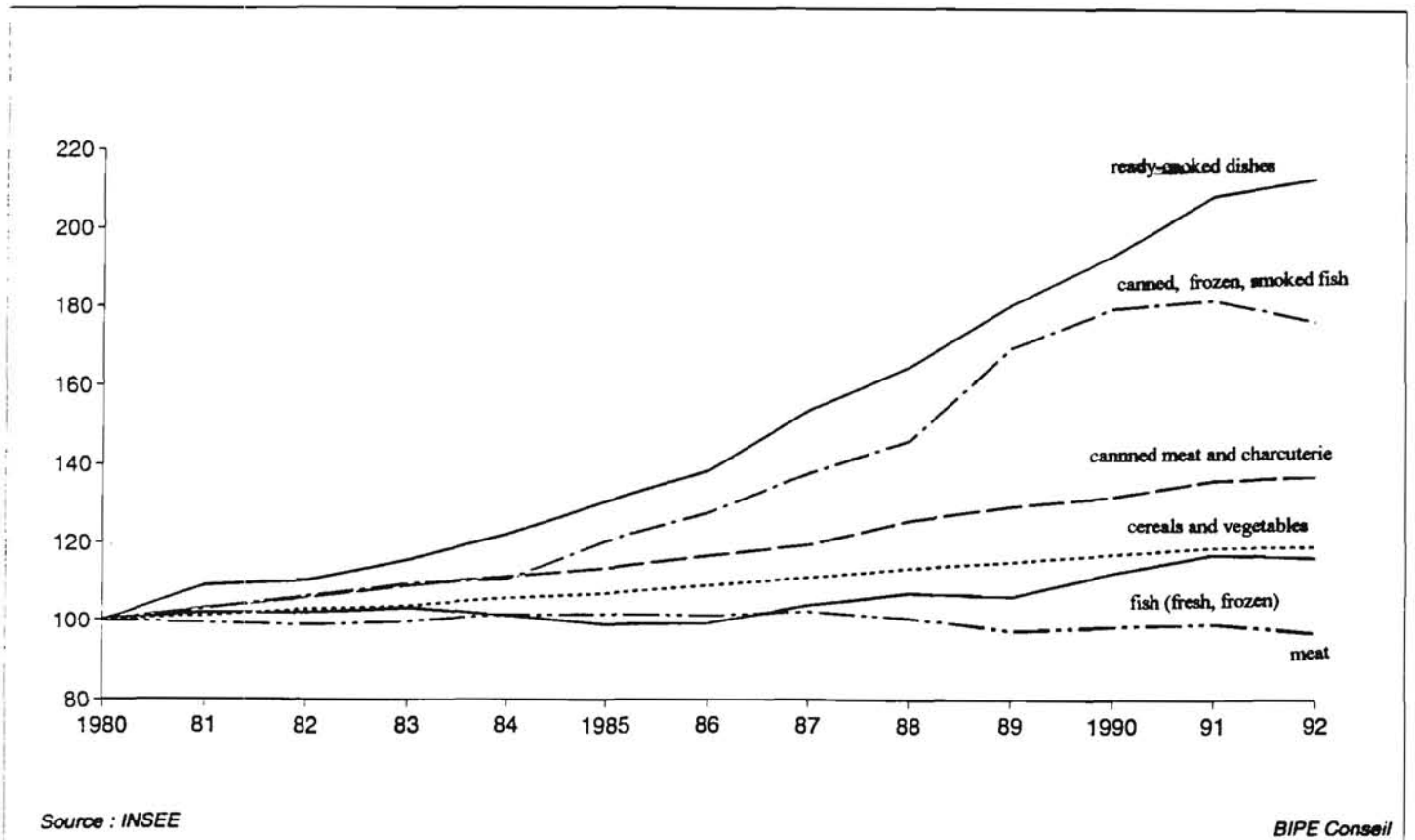
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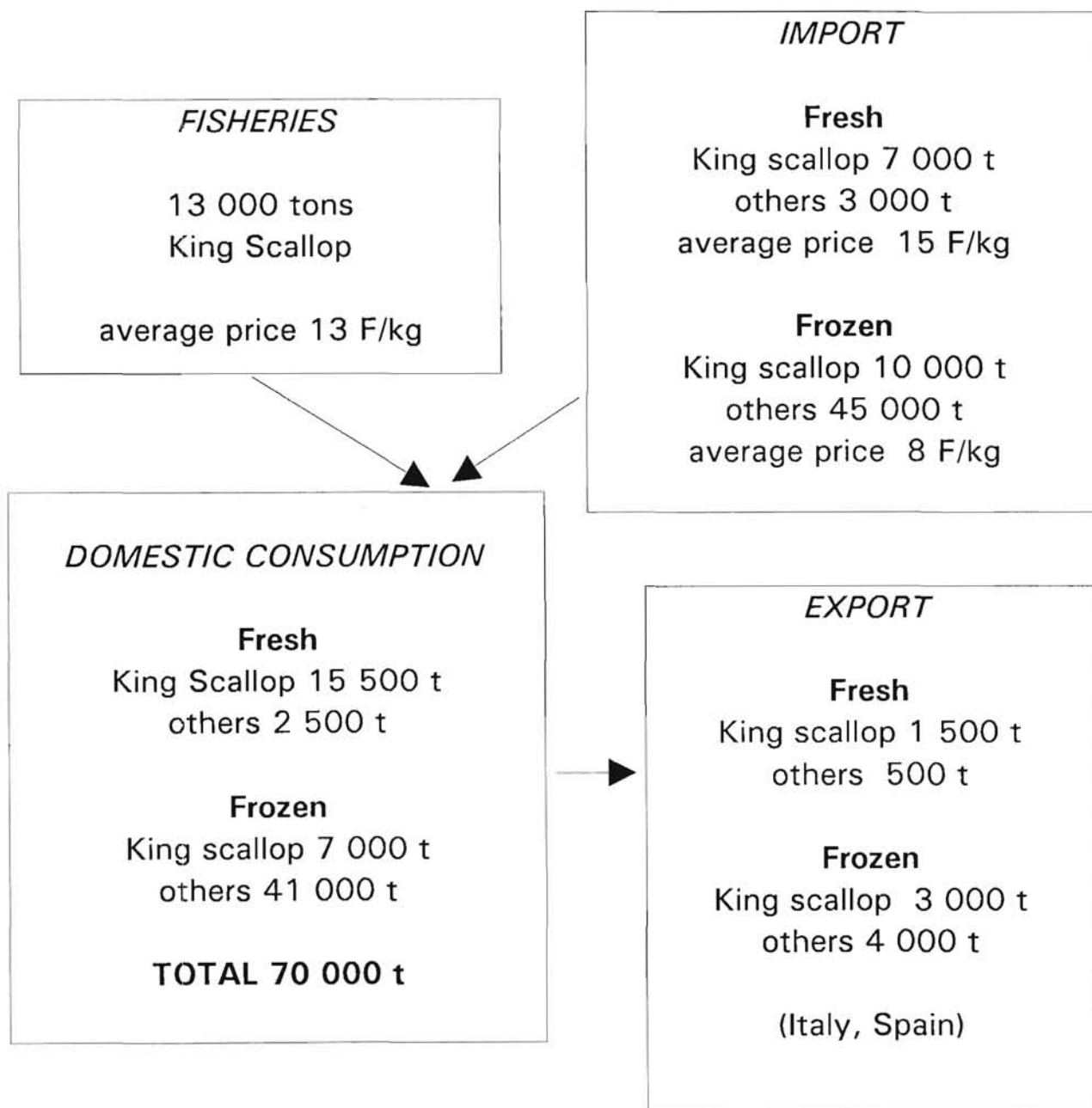
**FIGURE 1 : EVOLUTION OF HOUSEHOLD CONSUMPTION IN FRANCE**



**FIGURE 2 : EVOLUTION OF FOODSTUFF HOUSEHOLD CONSUMPTION IN FRANCE**



**FIGURE 3 : FRENCH MARKET FOR SCALLOPS (1993)**



**World Production : 900 000 tons**

**World Trade : 300 000 tons**

*data : FAO, CNPM, Douanes, IFREMER*

**FIGURE 4 : STRUCTURE OF THE FRENCH MARKET FOR SCALLOPS**

TYPE OF PRODUCT	PRICE (production or import)	VOLUME (equivalent whole shell)	PRICE (equivalent whole shell)	DISTRIBUTION CHANNEL
preserves	King scallop 90 F/kg	7 000 tons	13 F/kg	supermarkets freezer-centers
prepared dishes	others 50 F/kg	41 000 tons	7 F/kg	
frozen meat				
fresh meat with roe	King scallop 120 F/kg	8 000 tons	17 F/kg	supermarkets 50%
	others 80 F/kg	2 000 tons	11 F/kg	fishmongers 50%
fresh scallop in shell	without roe 10-15 F/kg	7 000 tons	10-15 F/kg	fishmongers 70%
	roe-on 15-30 F/kg	6 000 tons	15-30 F/kg	supermarkets 30%

1 kg meat = 7 kgs whole animal

data : IFREMER, CNPM, Douanes

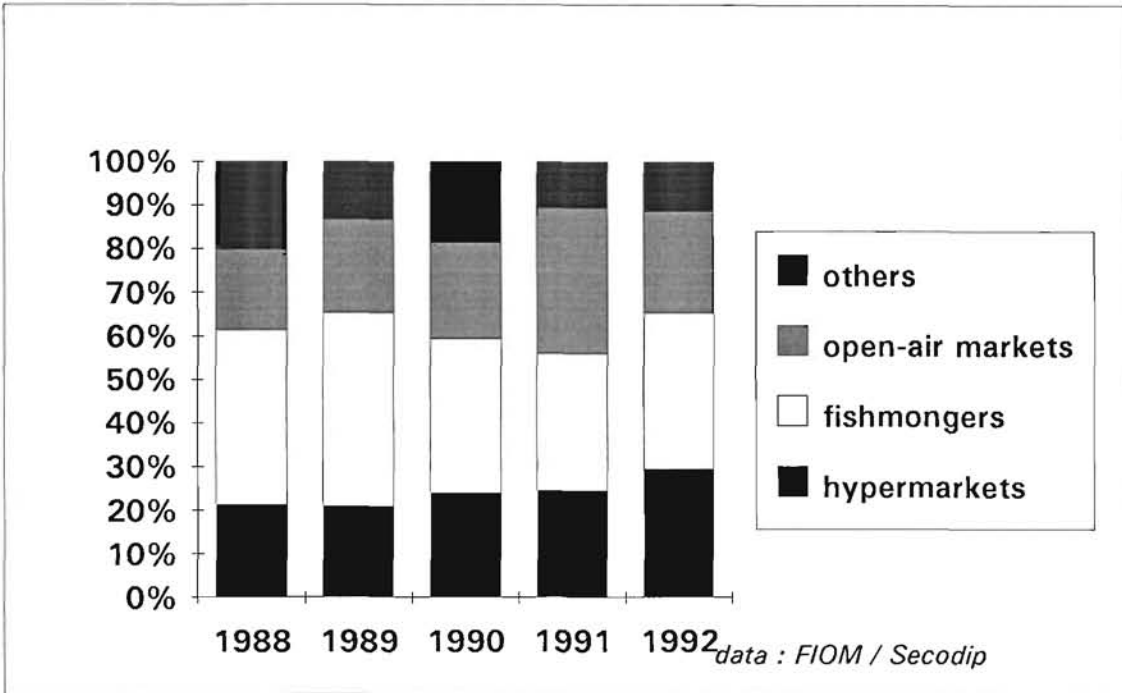


FIGURE 5 : EVOLUTION OF FRESH SCALLOP MARKETING BY DISTRIBUTION CHANNEL IN FRANCE

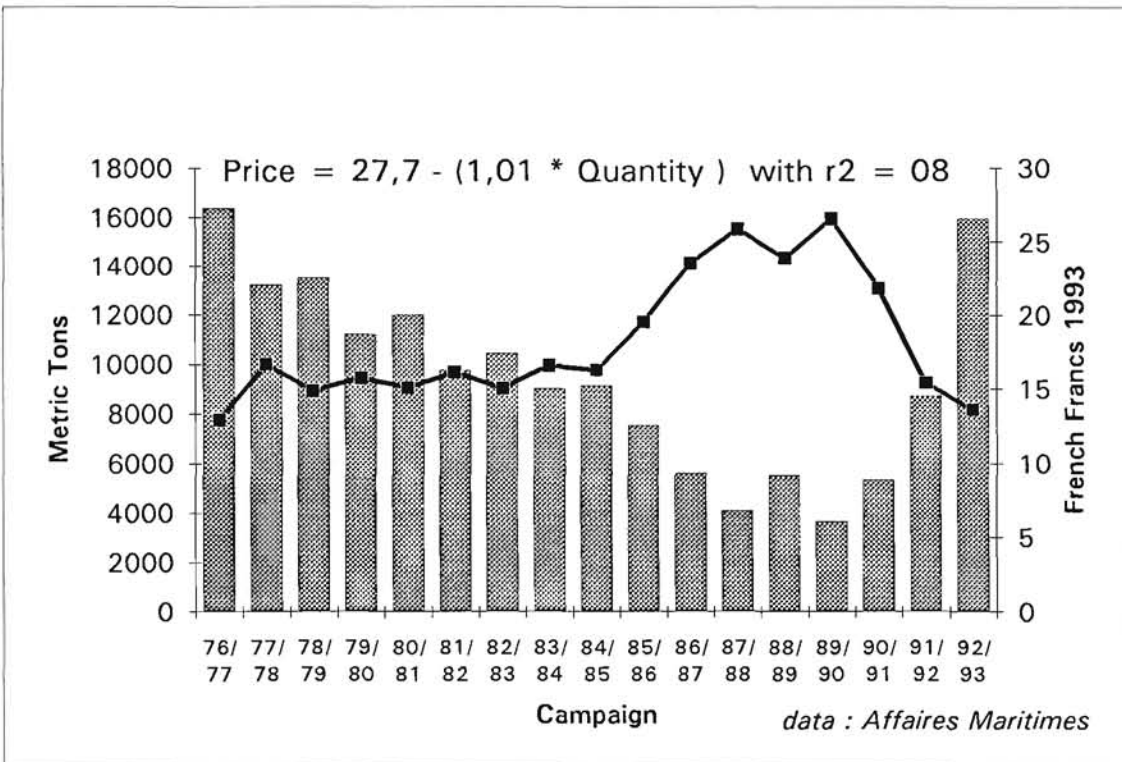


FIGURE 6 : EVOLUTION OF FRENCH LANDINGS AND PRICES FOR SCALLOP

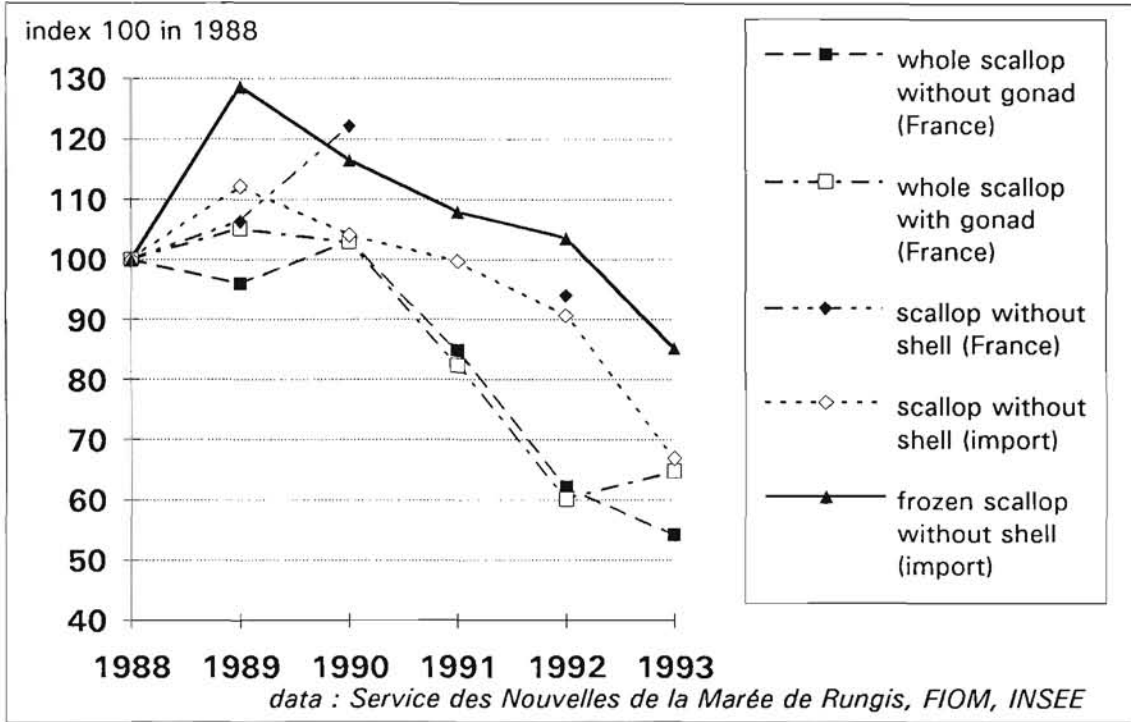


FIGURE 7 : EVOLUTION OF WHOLESALE MARKET PRICE FOR DIFFERENT PRESENTATIONS OF SCALLOPS (real 1993 price)

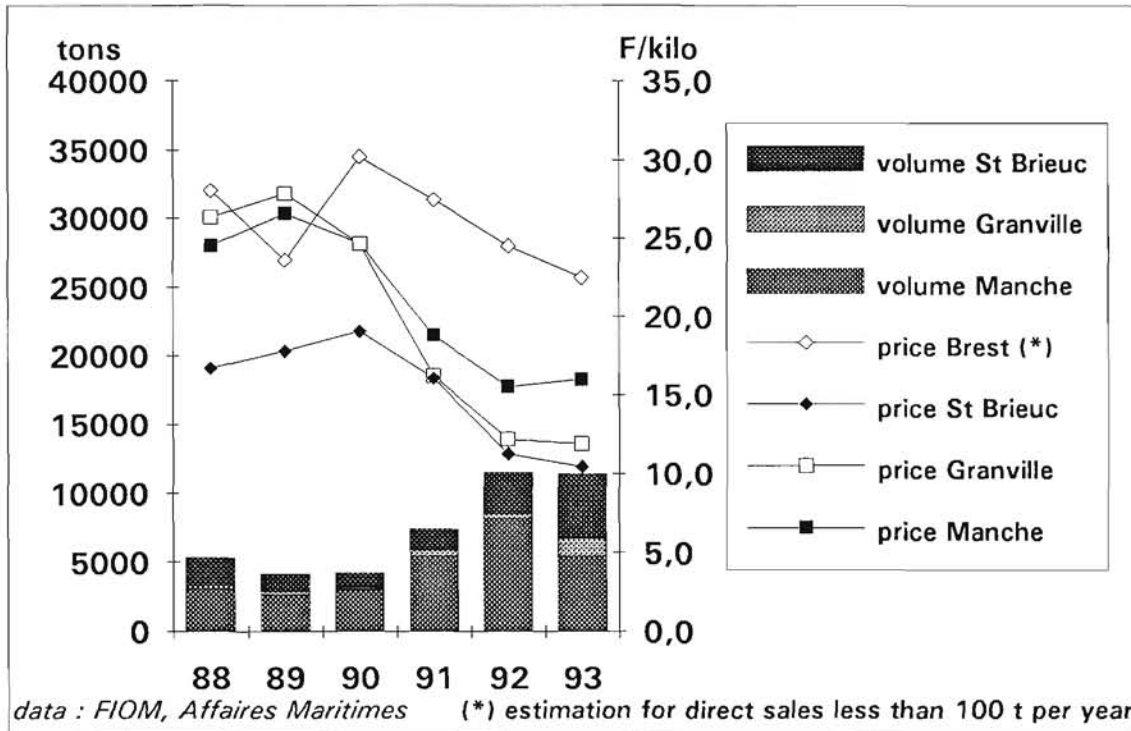
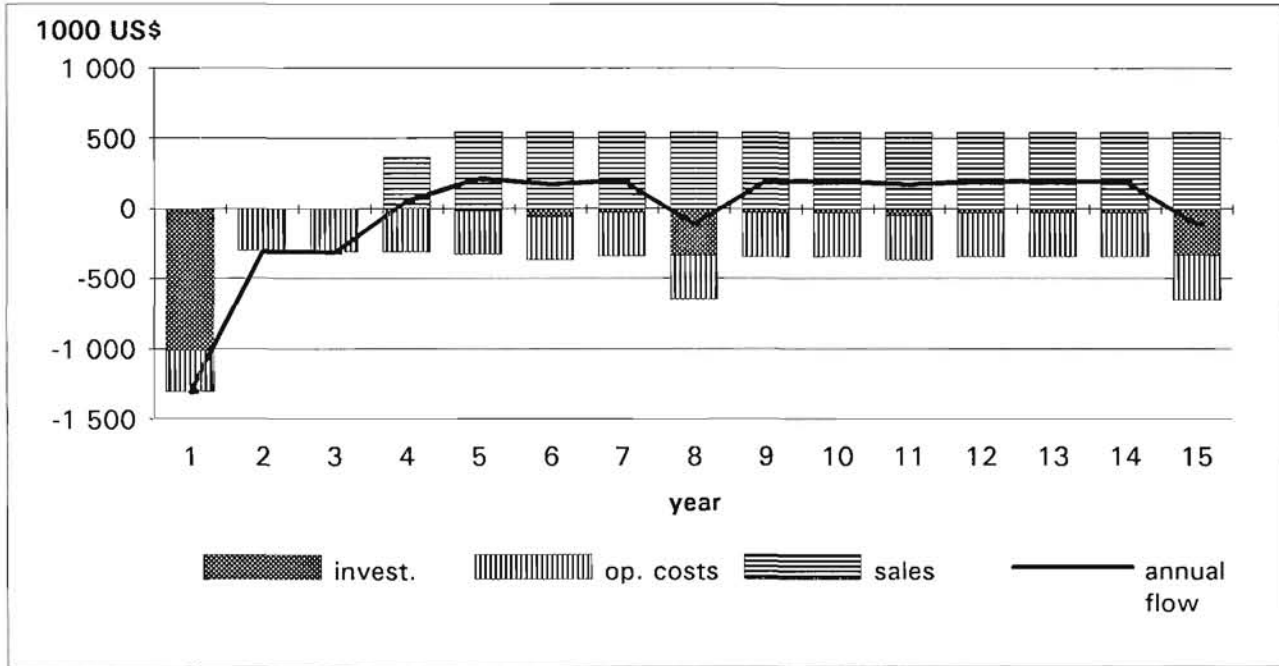


FIGURE 8 : YEARLY AVERAGE VOLUMES AND PRICES FOR SCALLOPS IN FRENCH AUCTIONS (nominal price)

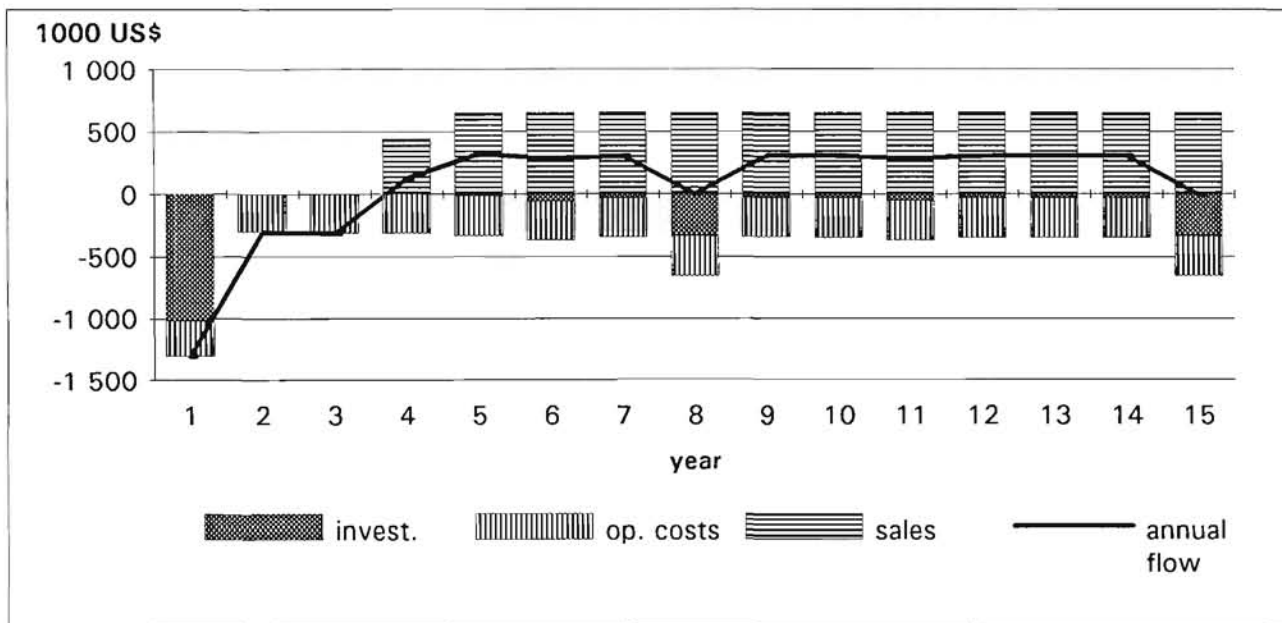
**FIGURE 9 : COSTS AND REVENUES FIRST ESTIMATION  
OF A SCALLOP AQUACULTURE PROJECT**

**25% recapture rate**



**INTERNAL RATE OF RETURN = negative**

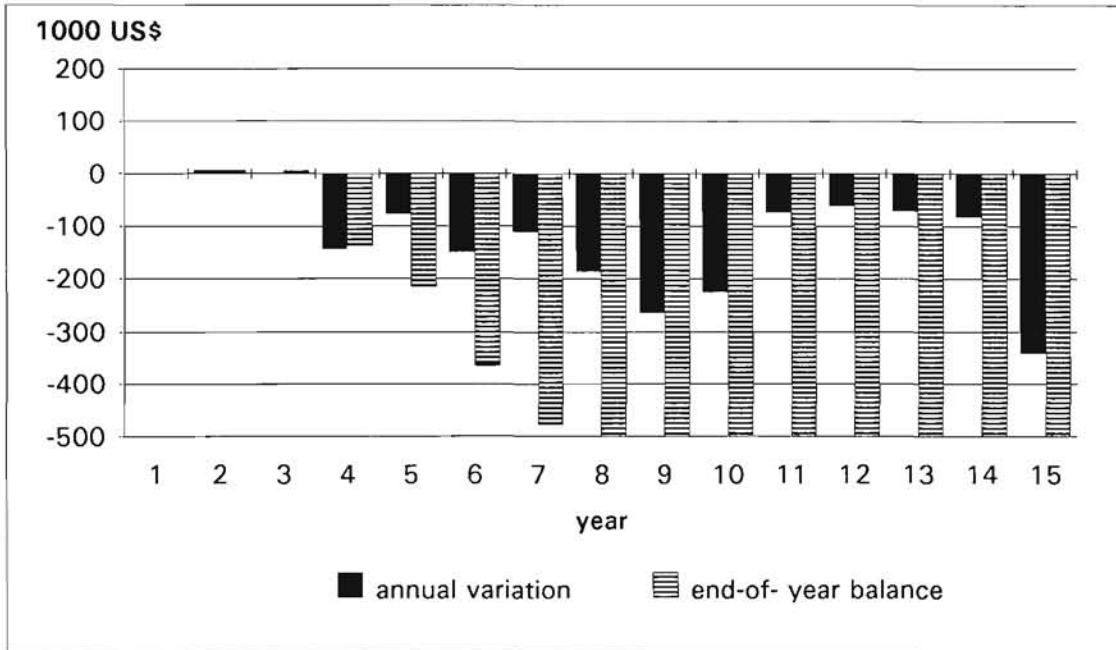
**30% recapture rate**



**INTERNAL RATE OF RETURN = 6.4 %**

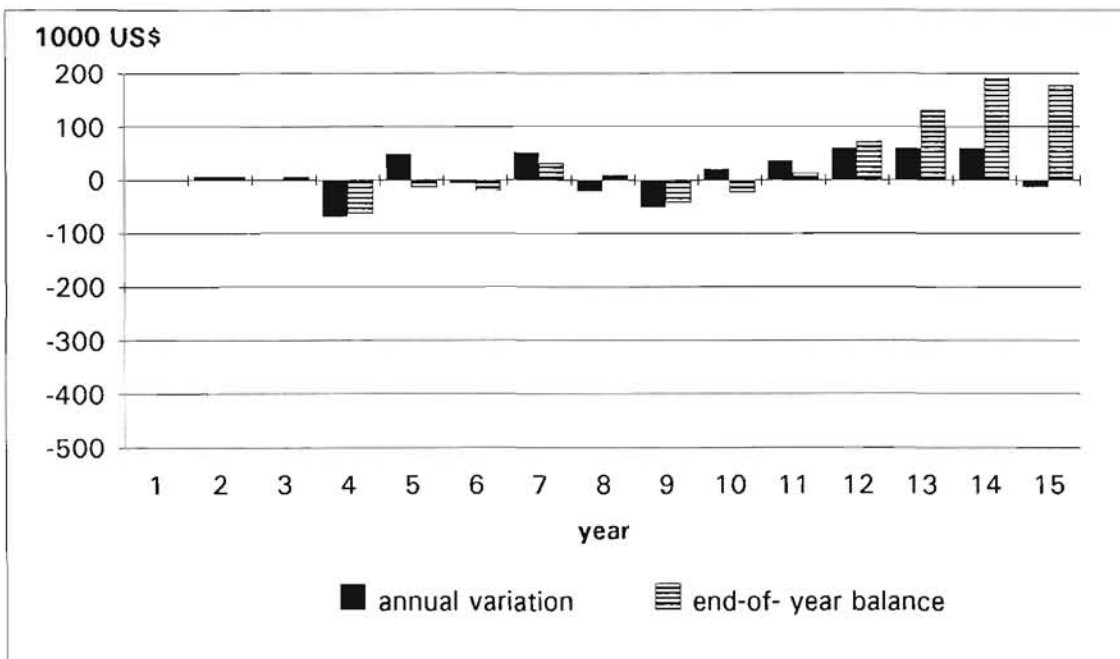
**FIGURE 10 : EVOLUTION OF THE CASH POSITION  
OF A SCALLOP AQUACULTURE PROJECT**

**25% recapture rate**



**CASH POSITION END-OF-YEAR 15 = -1,800,000 US\$**

**30% recapture rate**

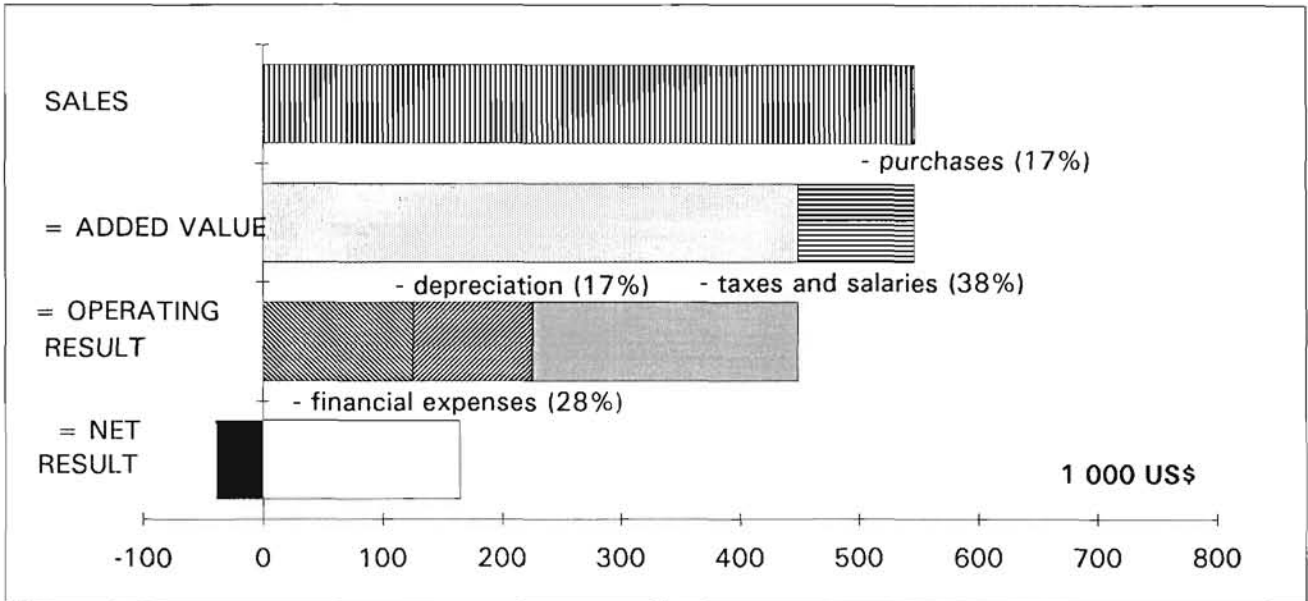


**CASH POSITION END-OF-YEAR 15 = + 178,000 US\$**



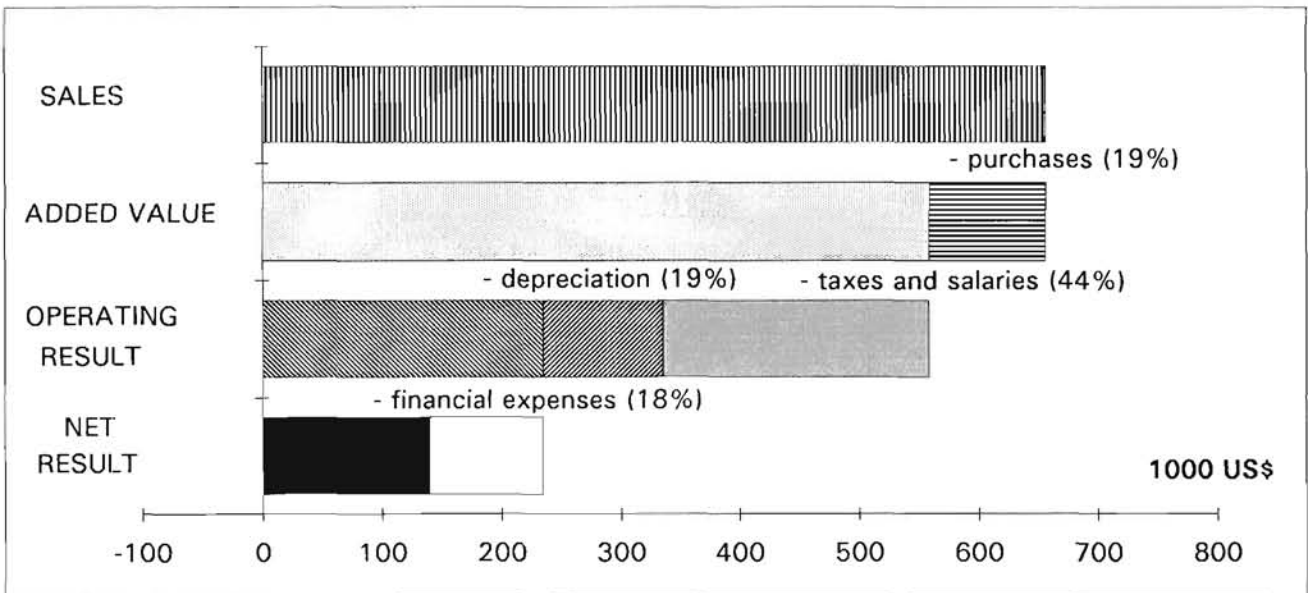
FIGURE 11 : PROFITABILITY OF A SCALLOP AQUACULTURE PROJECT

**25% recapture rate**



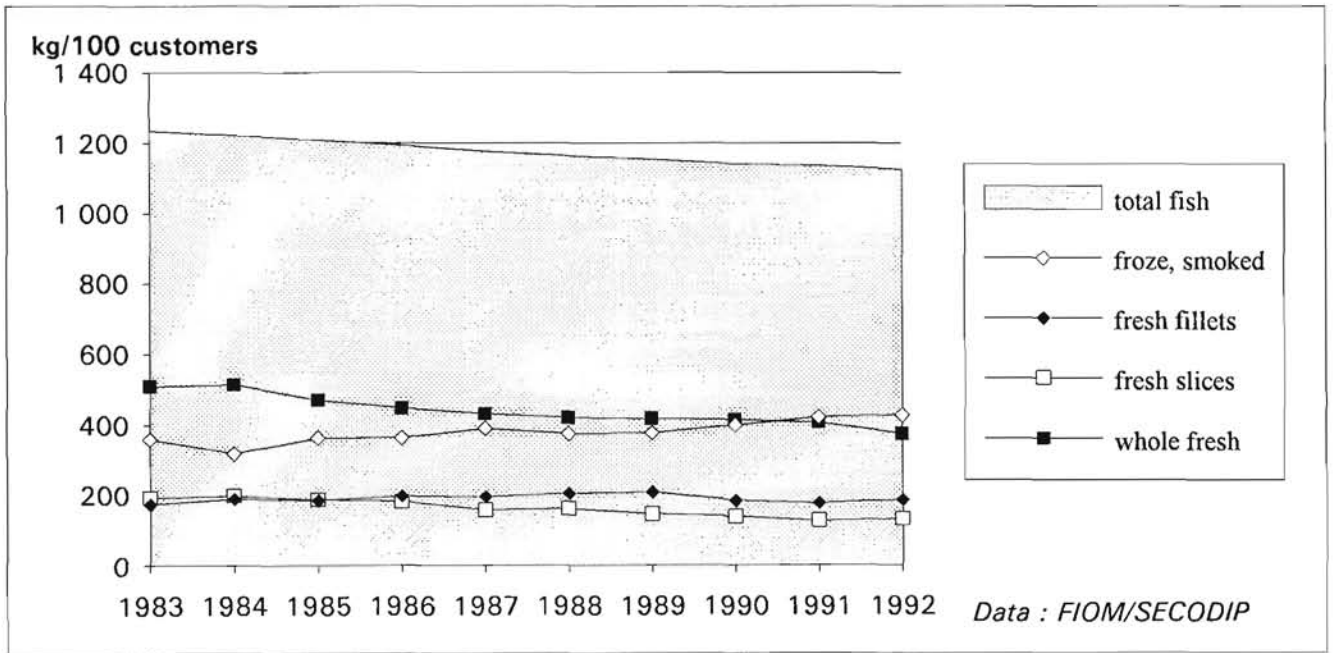
**ADDED VALUE / SALES = 82 %**  
**OPERATING COSTS / SALES = 23 %**  
**NET RESULT / SALES = - 7 %**

**30% recapture rate**

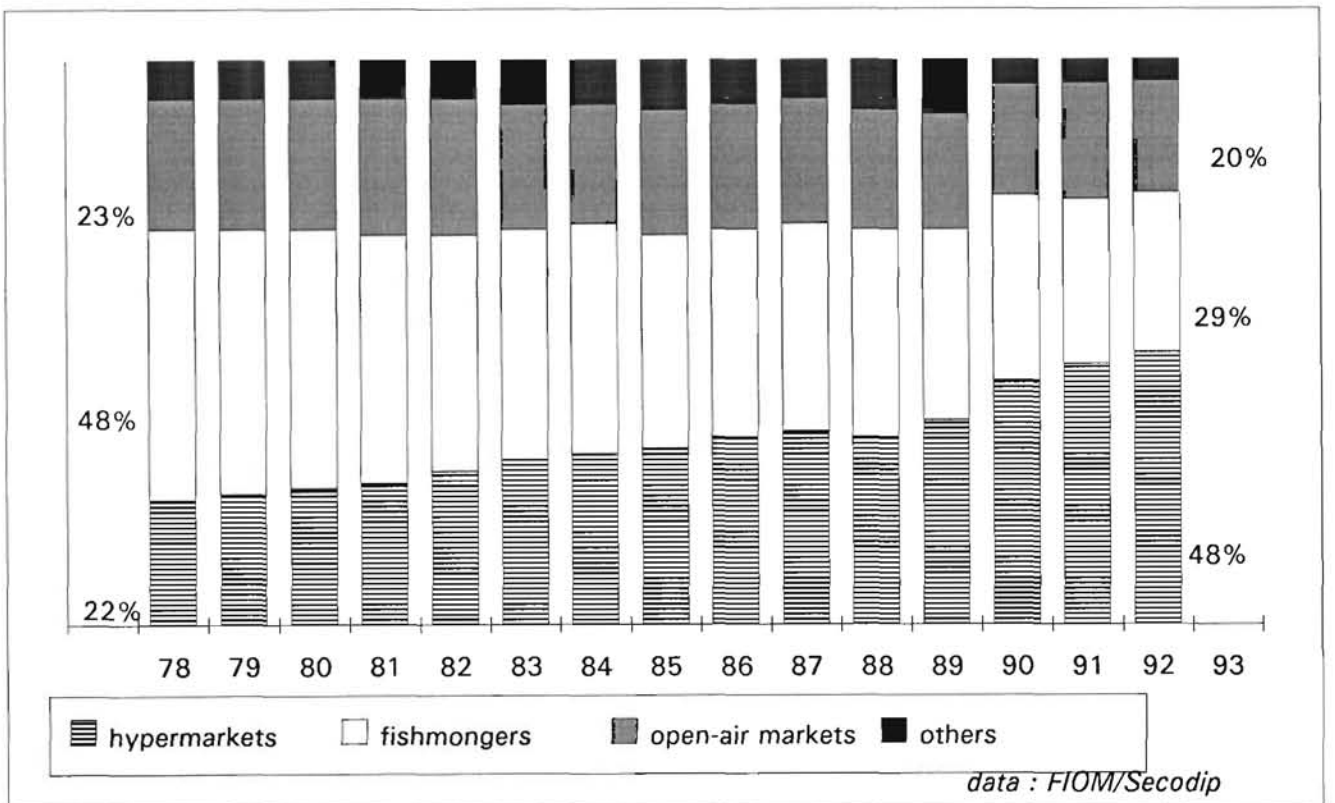


**ADDED VALUE / SALES = 85 %**  
**OPERATING COSTS / SALES = 36 %**  
**NET RESULT / SALES = 21 %**

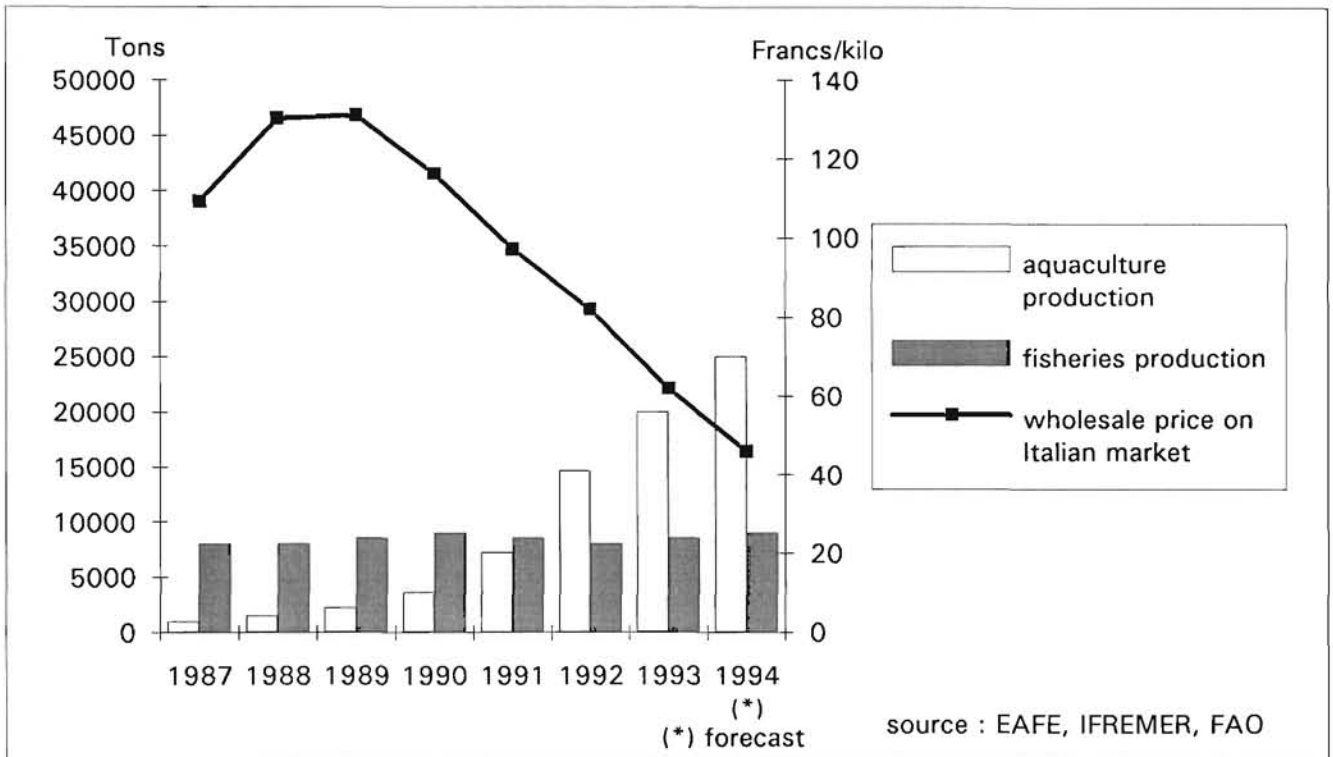
**FIGURE 12 : BREAKDOWN OF THE HOUSEHOLD FISH CONSUMPTION IN FRANCE BY TYPE OF PRESENTATION**



**FIGURE 13 : EVOLUTION OF THE FRENCH DISTRIBUTION CHANNELS FOR FRESH FISH**



**FIGURE 14 : EVOLUTION OF SEA-BASS PRODUCTION (EUROPE AND MEDITERRANEAN) AND PRICE (ITALIAN MARKET, REAL 1993 PRICE)**



**FIGURE 15 : BREAKDOWN OF SEA-BASS PRODUCTION COSTS**

