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PRODUCTION COSTS IN FRENCH SCALLOP FARMING

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Abstract

The French King scallop farming method (hatchery, intermediate culture in cages and sea-bed extensive ongrowing) has been developed since 1983. A multi-steps project analysis has been carried out to estimate the economic feasability of the rearing activity. Because there is no market for spat in France at the moment, the project concerns the whole production cycle from hatchery to harvest. The project is designed to supply 150 m.t. of maketable scallops, which is the expected French farmed production in the near future. The project analysis software developed by IFREMER provides the main financial criteria, i.e. internal rate of return, potential earning power, cash requirements and a breakdown of the production costs. The first simulations allow us to expect the French scallop farming activity being profitable, but much attention has to be given to the cash position because of the lack of income during the first years. Broadly speaking, whatever the rearing strategies are, it turns out that a survival rate of 30% after sowing is required to expect economic feasability when the ex-farm price of the scallop is about 3.6 US $/kg.

Introduction

The development of French scallop *(Pecten maximus)* farming activity is supported by the French government and the regional authorities of Brittany. Technical progress is unquestionnable and public policy makers now want to know about the economic feasability of this production. While going on working on improving the technical results, IFREMER (the French Public Organization for Marine Research) has begun an economic evaluation taking into account the study of production costs, the pectinid market analysis and the social and legal constraints. The study of production costs presented now is carried out on the basis of a project analysis. It allows the prediction of both the financial needs and the profitability of the activity.

For lack of natural spat and because of the insufficient growth of *Pecten maximus* in hanging culture, French scallop farming is characterized by the production of 2 mm post-larvae in hatchery-nursery, the intermediate culture of spat in cages in the sea (from 2 mm to 30 mm), bottom extensive on-growing (density 10/ m²) and dredging 2½ or 3 years later (maketable size > 100 mm).

As the technical standards are clearly defined and the results are steady, it is possible to determine precisely the needs in equipment, manpower, etc... Only the recaptures from seedings are still variable (20% to 50%), but they have little influence on the size and amount of the equipment and on the input, for they come at the end of the rearing cycle. But as they influence the revenues directly, we shall see that they have a big effect on the cash position of the firm.

1. The method : the project analysis.

1.1. Project identification.

The project is defined first by the location, the actors, the farming operations and the production targets. These choices lead to the drawing of an annual schedule for the use of equipment and manpower **(figure 1)**.

1.2. Costs and revenues first estimation.

Then it is necessary to assess the costs and revenues for each year during 15 years (convenient time-frame because of the length of the farming cycle, i.e. 3 years) :

- the amount of the first investments, their depreciable life and their renewal,
- the manpower and the other operating costs,
- the stocks, the yield and the expected revenues.

A financial plan is proposed to meet the need for initial investments, taking into account the avaibality of subsidies and the legislation regulating debt.

All these figures are computerized on tablesheets for an automatic calculation of accounting data and cash position survey, with the help of *PROJAQ*, a software we have developed on the basis of *Microsoft EXCEL* **(figure 2)**.

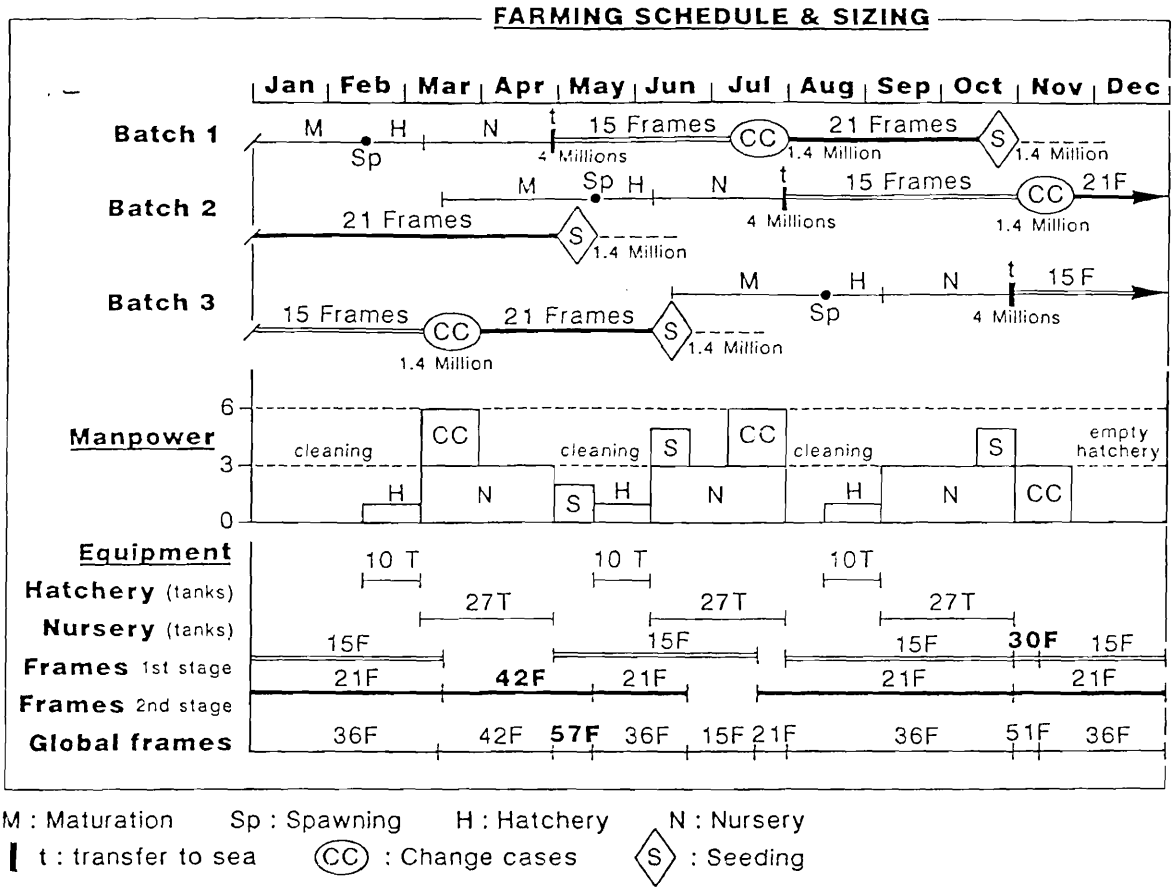
A breakdown of the operating costs among the different rearing phases has also been carried out, in order to obtain an analytical accounting and to assess the cost of the intermediate products : post-larvae and juveniles. It remains that this breakdown, like any other analytical accounting method, depends on somewhat arbitrary assumptions.

1.3. Financial analysis.

The third step is the financial analysis, realized with *PROJAQ* from computerized accounting data and other parameters beyond the control of the entrepreneur, such as the survival rate during intermediate culture (as long as it doesn't greatly modify the size of the project), the recapture rate from seedings, the market price of scallops and the financial rate of discount (now 8% in France).

From these elements, *PROJAQ* supplies within a few minutes :

- **the return on investment** through the Internal Rate of Return (IRR) over 15 years. The IRR 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 feasability** through the monitoring of the cash position within the next 15 years in order to suggest potential problems and permit a revision of initial financial choices. The definitive financial plan is obtained after a succession of iterations carried out by *PROJAQ*. This elements are particularly important to the lending banker;
- **the profitability of the activity** and its factors of variation. The breakdown of the costs in five main items (purchases, salaries, taxes, depreciation and interest expenses) is a good way 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



M : Maturation Sp : Spawning H : Hatchery N : Nursery
t : transfer to sea (CC) : Change cases (S) : Seeding

FIGURE 1 : MANPOWER AND EQUIPMENT SIZING AND FARMING SCHEDULE

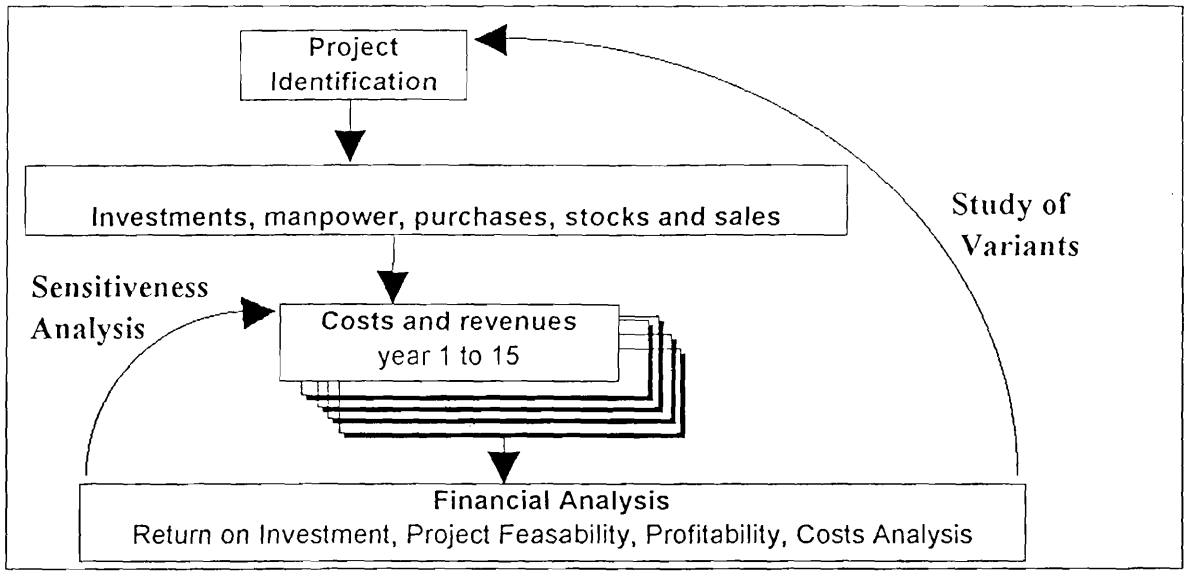


FIGURE 2 : PROJAQ SOFTWARE AND PROJECT ANALYSIS METHOD

- **an analysis of costs** through a breakdown of operating expenses and particularly of depreciation expenses by rearing phase and type of investment, in order to highlight relevant profitability issues and possible productivity gains. This breakdown is helpful to the researcher in charge of improving this farming technique.

1.4. 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 organizational structure, the equipment or the financial plan, and consequently lead to a new project identification (return to the first step of the analysis).

2. The entire scallop farming project.

Because there is no market for spat in France, and therefore no current price for either the 2 mm post-larvae or the 30 mm juveniles, the project concerns the whole production cycle from hatchery to harvest, and is not a project based on the purchase of spat. This integrated model has been designed according to expected results in the next few years. About a hundred fishermen are considered to be involved in the construction of a hatchery and of a base for intermediate culture, and in the management of extensive scallop seedings on a 150 hectares marine lease (50 hectares seeded every year). They produce 3 batches of 4 million post-larvae, i.e., 12 million every year, which gives 4.2 million juveniles, then 150 to 180 m.t. of marketable scallops 3 years later.

2.1. Investment.

On the whole, the project requires an investment of 1 million US$. The main investments are the hatchery (349,000 US$), 57 frames and 2000 cages for intermediate culture (224,000 US$), the pumping station (153,000 US$), the land (73,000 US$), the on-land working station with tanks (67,000 US$), a 15 meters dredging barge and a dinghy (67,000 US$). Part of this equipment has to be renewed after 5, 7, or 10 years with a spread over several years when possible. The total depreciation is 100,000 US$ per year. The first investment may be partly supported by the E.E.C. and the region (up to 50% in Brittany at the present time) if the entrepreneurs can demonstrate professionnal ability and contribute 10 to 15% of the financing. The rest is financed with loans adjusted according to the first results of the financial analysis (feed-back).

2.2. Salaries and other operating costs.

According to the production schedule, the project requires 6 permanent employees and other operating costs have been calculated from the real accounting of the Local Fishermen Committees. The operating costs (excluding depreciation) is 320,000 US$ / year, of which 200,000 US$ for manpower. For lack of revenues during the first three years, these costs are financed by contributions from the partners and by bank loans with deferred payment. Here too, the definitive financing choices are made from the first results of the financial analysis (feed-back).

2.3. Output and sales.

The assumptions on farming data are based on present results with a survival rate of 25% in nursery, a survival rate of 35% during intermediate culture and on two assumptions for seedings recapture : 25% and 30% (both studied). An average price of 3.6 US$ /kg has been adopted because of the presence of gonads which are appreciated on the French market. After a small harvest in year 4, the full production starts on year 5 with 150 m.t., i.e. 545,000 US$ if 25% recapture from seedings and 180 m.t, i.e. 650,000 US$ if 30% recapture from seedings. Sales are usually above operating costs but the question is whether these results are sufficient to cover expenses during the first three years and the interest charges.

3. Results of the financial analysis and discussion.

4.1. The return on investment.

The importance of the investments as early as the first year and the lack of revenues during the first three years of activity are the main reasons for obtaining an Internal Rate of Return less than 6.4 % on the assumption of 30%, and an IRR of below zero on the assumption of 25% **(figure 3)**. This result should not be understood as a death sentence for the project, but indicates that this kind of activity is not likely to attract investors whose primary object is either a fast return on investment or a high internal rate of return.

4.2. The financial plan, the cash evolution and the project feasability.

A lot of investments have to be financed in year 1, then renewed in year 8 and in year 15. In addition, operating costs must also be financed during the first three years. Therefore, the firm cannot rely on personal contribution and subsidies alone, but must resort to borrowing. The definitive financial plan is calculated by *PROJAQ* after several iterations. With these financial conditions, the evolution of the cash position is very different for each assumption **(figure 4)**. At a recapture rate of 25%, the annual sales are not enough to meet the sum of operating costs and interest expenses. The feasibility of the project is jeopardized at this price level and with this way of financing. In contrast, at a recapture rate of 30%, the cash position stays positive during the first three years, thanks to the different loans, and is seesawing around zero till year 11. From year 12 on, the firm starts making a profit for most of the loans are reimbursed, and it is possible to repay the partner's contributions. The cash position in year 15 is enough to cope with the renewal of investments without any new loans. But this position is not good enough to permit the consideration of any new development or diversification of the activity before year 15.

4.3. Profitability of the activity.

The ratio of added value is over 80% whatever the seedings recapture rate is. After taking the operating charges into account , the ratio Operating Result / Turnover declines to 23% (for recapture rate = 25%) or 36% (for recapture rate = 30%). After including the financial expenses, the ratio Net Result / Turnover stays at 21% if the recapture rate is 30% This value seems sufficient to conclude that the activity is profitable under these financial conditions. But if the seeding recapture rate is only 25%, financial expenses are so high that they lead to a negative Net Result **(figure 5)**.

4.4. Analysis of production costs.

To have a better knowledge of the way the project works and of the factors affecting its profitability, it may be interesting to study it independently of financial expenses, in order to get

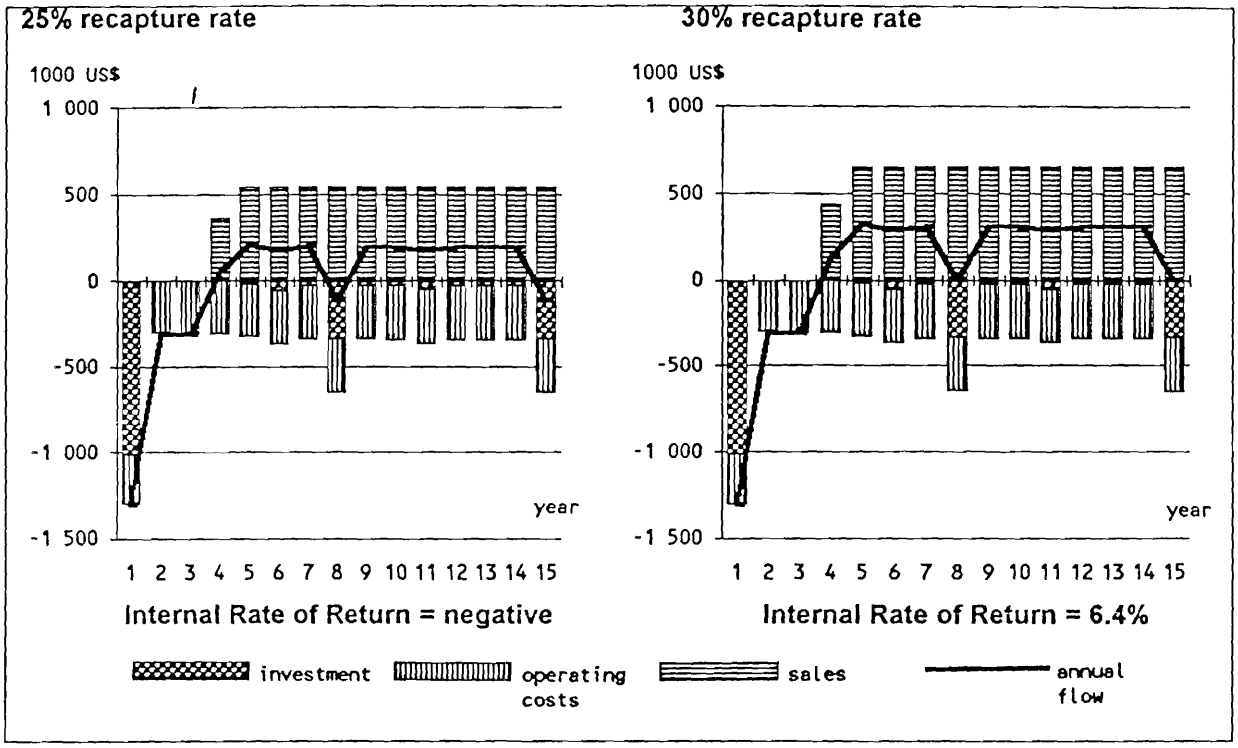


FIGURE 3 : COSTS AND REVENUES FIRST ESTIMATION AND RETURN ON INVESTMENT

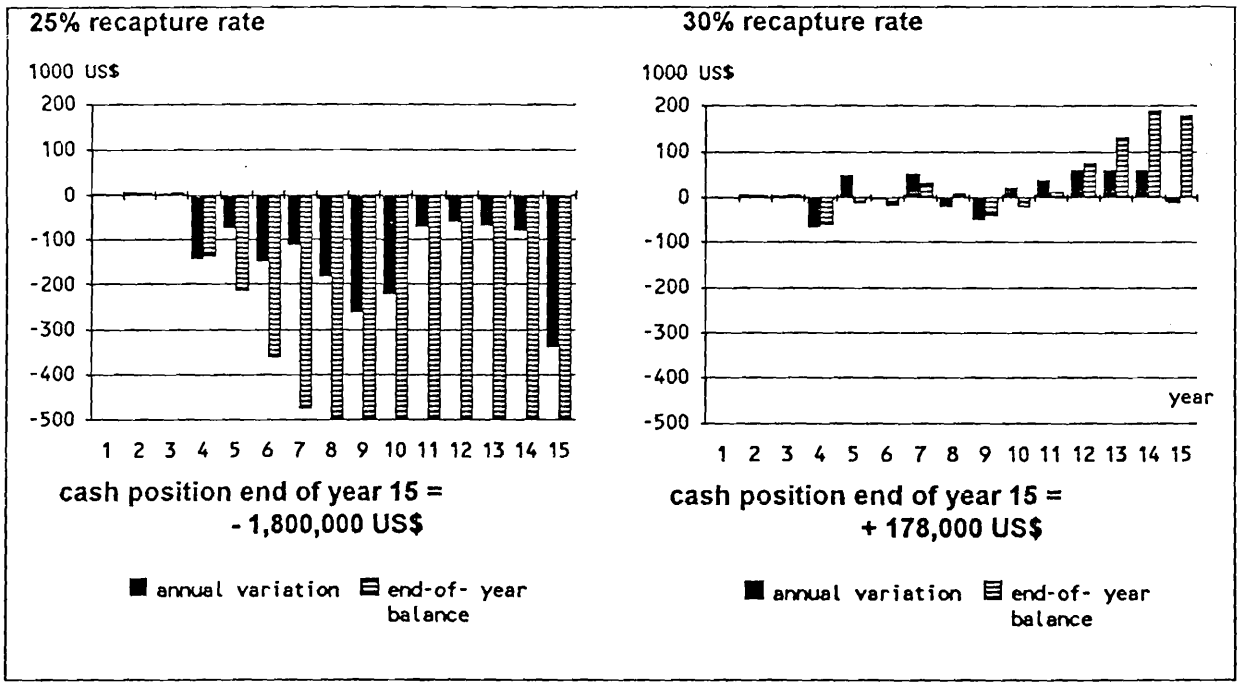


FIGURE 4 : EVOLUTION OF THE CASH POSITION

away from the influence of the financial plan, which depends a great deal on the institutional context (subsidies) and on the overall economic situation (interest rates). As the recapture rate (in the range 25-30%) has little influence on the operating costs, this analysis is the same in the two situations. The breakdown of the costs among the three rearing phases **(figure 6)** shows the prevalence of the hatchery with more than 50% of the costs while intermediate culture and ongrowing represent about 25% each.

The repartition of the costs among the different stages is a bit arbitrary but makes it possible to appraise the production cost at each level :
- 2 cents per post-larva ;
- 8 cents per juvenile (30 mm) ;
- 34 cents up to 40 cents per marketable scallop according to the seeding recapture rate (respectively 30 or 25%), i.e. 2.3 up to 2.8 US$ for 1 kg of entire scallop, or 16 up to 19 US$ for 1 kg of muscles (without gonads).

4.5. Discussion and variants.

Such a financial analysis makes it possible to assess the potentialities and the limits of scallop farming development in France. The cost of the hatchery seems very important but because of technical constraints, it is not possible to reduce the number of employees, and because of financial constraints, it would be hazardous to look for economies of scale by increasing its size. As for the intermediate culture, only a reduction of the price of frames and cages or a better control of the spat survival may lead to a reduction of the production costs.

But the recapture rate of seedings turns out to be the key for productivity gains principally for it comes at the end of the rearing cycle and brings a lot of added value. The existence of clear differences in the results of the financial analysis of this scallop farming project according to assumptions about the recapture rate underlines the absolute importance of obtaining more reliable technical results during ongrowing.

These first conclusions may also lead to the study of such variants of the project with new rearing choices as partial or total supply of wild spat, marketing of surplus post-larvae, intermediate culture in cheaper frames. In that case, the counterpart in terms of maintenance costs and useful life or longer rearing cycle (4 years instead of 3) in order to increase the income by raising bigger animals has to be taken into account.

Conclusion : interests and limits of financial analysis and project analysis.

The design of *PROJAQ* makes it possible to assess all the effects of a technical innovation, a modification of the farming method or a change in biological standards in terms of production and financial results, for it takes into account the organization of the production on the whole within the firm. It is a simulation tool which helps to distinguish the results of different variants of the same project on numerous criteria.

But the results of the financial analysis cannot be accepted as definite or absolute data. The market uncertainty and the risks inherent in the dependence on the natural environment must be reckoned with. These results should be regarded as elements to facilitate decision-making by investors, bankers, entrepreneurs, researchers or public policy makers with respect to their own aversion to risk.

Finally, in the present economic context of extremely high real interest rates, very few projects may seem attractive strictly in terms of financial profitability. Agricultural and aquacultural

projects are particularly disadvantaged because they need a long time for a return on investment. These high interest rates are also the cause of cash difficulties if the biological results do not attain the norm, for bank charges come in addition to interest expenses.

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