

## Bioeconomic modelling and resource distribution (Workshop Report)

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“If the only tool that you have is a hammer –  
– all problems tend to look like nails!”

This thought was offered in discussion, partly as an observation on previous practice, but particularly as a warning against restricted, oversimplistic views of methods for fisheries analysis and management.

It was noted that the majority of papers presented to the symposium had concentrated on questions of production in relation to biological or environmental constraints. The closing theme of the symposium, and this Workshop, demonstrated and emphasized that production analysis must be supplemented by analysis of marketing, since the choice of cultured species and cultivation techniques will be guided by the demand for fish and shellfish relative to the costs of growing them. This point was made by Peterman (pp. 69–77), when he argued that choosing the optimum yield from both capture and culture fisheries requires an early assessment of the benefits and costs of hatchery operations.

Mariculture operations operate within institutional contexts which vary from country to country. For example, salmon ranching is emphasized in Sweden and Iceland, while salmon farming is pursued in Norway and the British Isles, not just for technical reasons, but also because political considerations favour one approach over the other. Directing scarce research resources towards particular species and approaches requires an understanding of the institutional arrangements selected in the various nations and the probability that these arrangements may change in the near future.

Early bioeconomic modelling has overemphasized general-purpose analyses and modellers have overgeneralized their results. The wide variety of physical, biological, economic, and social circumstances requires more site-specific analyses. What works in one area will not work in another. Recognition of the need for detailed case studies will reduce the waste and false expectations associated with carrying out a few general studies. Bioeconomic studies also need to be carried out under a careful experimental design, following the principles pointed out by Peterman (pp. 69–77). It is also important that the range of methods and models is as broad as possible to ensure a deeper understanding of the problems and their potential solutions.

Earlier Workshop reports (Bannister, pp. 191–192) mention the need for economic research to improve the cost–benefit analysis of new mariculture projects and similar studies to assess new public policies. Research is also needed in the general area of risk–benefit analysis. The Workshop on epidemiology and effects on gene pools identified important concerns. Those concerns parallel many other areas of modern technological development where society is faced with cases of small probabilities of outcomes with disastrous consequences. The emerging techniques of risk–benefit analysis have been helpful in analysing many environmental questions and should be applied to issues in extensive mariculture.

Quite often, public policies are introduced to assist certain groups, but post-hoc analysis suggests that some other group benefits instead. For example, policies in some countries to support small-scale, poor farmers often shift a large share of their subsidies or other benefits to the largest and wealthiest farmers. Who receives the benefits and who bears the costs of mariculture development will be important in many countries. Informed policy choices requires careful analysis but involving economists does not give a complete picture of social and economic consequences. Understanding rural systems requires insights from sociologists, anthropologists, and other policy analysts.

Management, co-management (delegation of decisions to affected parties such as fishermen or aquaculturists), and cooperative management (consultation and sometimes involvement of managed groups in decision-making) all require additional information to design new institutions. Although some papers addressed particular approaches such as licence limitation, individual transferable rights to cultured and capture fisheries, and taxation programmes, the discussion of the Workshop addressed the need for institutional information more broadly. New management approaches are needed, but no easy and obvious solutions are available. Instead a call was made for greater exchange of information between many nations on approaches they have used. The same principles used for good science are also needed for impartial and careful analysis of management approaches.

Once again it has been emphasized that multi-disciplinary, site-specific, problem-solving research is

needed to support the expansion of mariculture; critical gaps in our knowledge remain. The specific point made during this Workshop was that the disciplines must include economics (and sociology). The inclusion of economics and the participation of economists in this symposium was a valuable experience where they

showed that they do have a part to play. The majority, if not all of those who participated, urge ICES to build on this experience and draw the economists and sociologists into even more of its activities.

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