

**TECHNOLOGY TRANSFER THROUGH NETWORKS: EXPERIENCES FROM  
THE NORWEGIAN SEAFOOD INDUSTRY**



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## **TECHNOLOGY TRANSFER THROUGH NETWORKS: EXPERIENCES FROM THE NORWEGIAN SEAFOOD INDUSTRY**

by

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Courses held at the Norwegian Institute of Fisheries and Aquaculture Research for fish dealers and producers. *(Photographs courtesy of Fiskeriforskning)*



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### **ABSTRACT**

The value of research for society in general is contingent on a successful transfer of knowledge and new technology to the public.

This paper presents how the Norwegian seafood industry in collaboration with research institutions established networks for professionals who were in the same line of business to improve communication between research societies and industry. It is described how these networks were organized and operated, and how they developed to play an important role as to what priorities should be given for research programmes related to the seafood industry. Moreover, another long-term, but hardly not expected, effect of the network collaboration was that the seafood industry gradually developed a more positive attitude towards research and development in general. Thanks to this change of attitude, the Norwegian Seafood Federation, together with the fishermen's and the fish farmers' associations, approved the introduction of a research levy, regulated by law and collected on the export value of seafood from Norway. Such a law became effective from 1 January 2001, and the annual sum collected to strengthen the seafood and fishing industry's research effort totals approximately NKr90 million (US\$15 million).

Finally, the paper has a concluding discussion on to what extent networks based on the Norwegian model can work among small-scale food producers in developing countries.



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## **Introduction**

The value of research for society in general is primarily contingent on communication of the results and newly-acquired knowledge to the public, authorities and industry. The information should be in a form which enables them to utilize the results productively and for improving the circumstances and quality of life of the people. This is clear understood both in the research and among those who will receive and apply new knowledge.

Research institutions have often and sometimes justifiably, been accused of placing too little emphasis on communication and the transfer of knowledge. However, research institutions have been able to claim that successful transfer of knowledge requires a competent receiver and translation apparatus for those who are going to utilize the knowledge. The most important factors will continue to be the exercise of caution when defining the target groups for different communication initiatives, making appropriate selections based on criteria of relevance, need and potential and that there is emphasis applying good and relevant methods for communicating knowledge. Good communication of scientifically acquired knowledge often requires elements of demonstration. The general term R&D should therefore be expanded to RD&D – Research, Development and Demonstration – when it applies to the research institutions' industry-oriented research activities.

Another field where industrial participants have often raised criticism against research is prioritization and selection of research themes. Most of the criticism has been that there has been too little priority placed on areas where the possibilities for achieving applicable results are good and where it is economically and technologically realistic for the industrial participants to implement the research results.

The opinions given above regarding a lack of quality and relevance in communication between research and industry seem to be universally disseminated. It has been an observable and articulated phenomenon in many countries, seemingly independent of level of the industrial development and geographic location.

### **The Norwegian network of bacalao and saltfish producers (Bacalao Forum)**

In the early 1990s, the Norwegian Seafood Federation (NSF) and the Norwegian Institute of Fisheries and Aquaculture Research (Fiskeriforskning) entered into an agreement. One of the purposes of this agreement was to establish a better dialogue between industry and the Institute regarding the priority placed on research assignments, and to improve the communication of knowledge. An important underlying goal was to coordinate the work by obtaining the necessary finance for new projects both from government sources and through internal financing from industry. As an initial step in this work the position of Research Coordinator was created in NSF, towards which Fiskeriforskning contributed financially.

At this time Fiskeriforskning had completed or was working on a number of projects dealing with the improvement of yield and quality of saltfish. The studies included important factors across a wide spectrum, from catch methods and the handling of raw materials in the catch segment to the composition of different minerals in the salt. This research resulted in new knowledge which, when applied in an appropriate way in the industry, would mean a considerable improvement in profitability and competitive strength for saltfish producers. Much of the knowledge that was developed had little relevance for other forms of production. Hence both Fiskeriforskning and NSF determined that the communication of knowledge

should be directed towards the saltfish producers. The conclusion was that all saltfish producers who were members of NSF were invited to become part of a network. At special membership meetings they would be informed directly by the researchers about newfound knowledge and how this could be applied. The initiative was very well received in the industry. The network, which was named the Saltfish Forum (“Saltfiskforum”), was established in 1994 and eventually had 41 member companies. (The network has subsequently been re-named the Bacalao Forum).

The NSF assumed the Secretariat function for the Forum. The costs for maintaining the Secretariat position and operating the network were covered by a participation fee from each of the member companies. During the start-up phase, the Research Council of Norway also granted a one-time sum. The individual member companies had to cover their own travel and accommodation expenses for participating in network meetings, but each company could participate with as many persons as they wished and found economically acceptable.

The first network meetings of the Saltfish Forum consisted entirely of dialogue meetings between researchers and persons representing the producers. The researchers gave an account of recent research results and presented recommendations for improving methods and procedures based on newfound knowledge. The producers on their side had clear ideas about which problems the researchers should first set to work on. One must assume that the recommendations an industry makes with regard to priority of research themes are determined based on the then prevailing effective technical/economical bottlenecks in production. In principle, following the producers’ advice should then also imply an approximate optimal use of research funds, at least in respect of the choice of themes for technological development in the short term.

In addition to the exchange of information and opinions between the researchers and industry, the exchange of experience between members was, of course, ascribed great importance. Furthermore, during network meetings members could develop personal and social relationships that could later lead to commercial and industrial policy collaboration to the benefit of all parties.

The Saltfish Forum became an immediate success. Salt- and clipfish of northeast Atlantic cod was a tradition-rich and tradition-tied product, where the knowledge was passed down from generation to generation over several hundred years. In Norway, very few scientific analyses and experiments had been done with an eye to a scientific description and understanding of the production process until Fiskeriforskning commenced the work sometime around 1990. It also became apparent that the producers, to a much greater extent than one might anticipate with regard to such a tradition-bound production process, were open to experiment with alternative production plans in accordance with researchers’ recommendations. Production managers and foremen were the usual participants at the first network meetings, which emphasized information about research results and communication. That these individuals really were motivated to pick up potentially applicable elements from research and prepared to utilize research results was well attested to by the fact that during or immediately following the presentation of particularly interesting results from a researcher, individuals would disappear from the meeting for a while. Upon closer investigation of the cause for such vanishing acts, it became apparent that individuals were leaving the meeting to telephone their companies and discuss immediate adjustments of the parameters for production that was already in process!

## Other networks based on the “saltfish and bacalao” model

The particularly positive experiences with the Saltfish Forum triggered strong desires among industrial actors to establish corresponding networks directed towards other segments of the industry. This was followed up by the Secretariat in NSF. In the years that followed and up until the present, the following networks were established under the direction of NSF and are in operation by and for NSF's members:

<b>Name of network</b>	<b>Target group</b>
Bacalao Forum (bacalao, saltfish)	Producers of saltfish and bacalao
Fillet Forum (codfish fillets)	Fillet producers
Prawn Forum (shrimps, prawns)	Shrimp and prawn producers
Pelagic Forum (pelagic species)	Producers/exporters of seafood from pelagic species (herring, mackerel, etc.)
Stockfish Forum (stockfish)	Producers/exporters of stockfish
Technical Forum (equipment, automation)	Network for promoting technical know-how in all branches of the fishing industry

The Norwegian Seafood Federation organizes and holds the Secretariat for all fora. All participating companies must also be members of NSF. Outsiders are invited to individual network meetings to offer their professional contributions and to make suggestions for plans of action, etc. In addition to researchers and consultants this includes equipment and service suppliers.

For maintaining the Secretariat and operation of the network, the individual member company pays an annual membership fee in the range of Nkr5 000-10 000 (€600–1 200). To the extent that R&D projects are initiated and implemented with NSF as the project-managing institution, after improvements and recommendations by the Forum, the projects will return funds for operation of the Forum. The companies cover travel, accommodation and wage expenses for their own participants at meetings/network meetings and can generally participate with as many persons as they wish at each meeting.

Each network normally holds two or three meetings per year. As mentioned above, researchers, consultants, suppliers and other competent persons are typically invited to the meetings to provide information about selected relevant themes. The network meetings thereby become an arena for exchanging views, inviting and inspiring active participation by the members. A more general agenda for a network meeting might look like this:

- Exchange of experience
- Competence-developing initiatives
- Research news, general
- Innovation and development, research needs
- Planning, financing and initiation of R&D projects
- Reporting and follow-up of implemented projects
- Implementation of results

Each forum has a Steering Committee who holds meetings between network meetings, and whose duties include submitting recommendations for plans of action and special priorities for the network in close collaboration with the Secretariat. The members of the Steering Committee normally have their travel and accommodation expenses for the meetings covered.

## **The role of the networks in the planning, organization and implementation of R&D projects**

From the beginning of the first network, i.e. the Saltfish Forum, both the members and NSF were quite convinced that an important task for the Forum was to chart the industry's research needs and to communicate needs, priorities and financing with the research institutions and appropriating authorities, particularly with the Research Council of Norway.

It would become apparent that such an "upstream" form of work for generating ideas and the selection of project alternatives for further processing, was successful. Formal project descriptions and applications for finance were normally prepared by the Secretariat of NSF and the researchers, who tentatively would be tied to the project in question. Applications were then based on goals, methods of execution and financial plans that were thoroughly discussed in advance by the network members and behind which they stood united. This form of work and the work efforts expended by the members to realize the projects also helped them to arrive at cost-effective methods of execution. It was made clear at an early stage what kind of internal financing the members were willing to put in, either as their own investments in the form of providing premises, capital equipment and work efforts, or in the form of ordinary monetary "funding".

Those who were going to consider and assess the project recommendations with an eye to granting financial support could thus feel safe with regard to the project's industrial relevance. When in addition – as a rule – a significant internal financial share was documented and rendered likely a cost-effective method of execution, the network's project recommendations became extremely competitive in the battle for available research funds. As a result adequate government assistance was generally granted to begin and accomplish the project.

The form of work with "upstream" idea generation and the network's role as decision-maker gave the network members a kind of "ownership" in the projects. This in turn caused them to follow closely along with how projects developed, and they could therefore make recommendations for adjustments and corrective action during the course of projects. They were, of course, also very motivated and prepared to apply the results from the projects in their commercial activities. In retrospect, the network participants did not judge one single project as not being advantageous for their activities.

The projects that were begun and accomplished under the direction of the networks were largely developmental in character within the framework of familiar and available technology. The members were particularly interested in how, through handling of raw materials and processing, they could achieve higher and more stable quality of the end products. Product development, market adaptation and measures to increase value were generally given high priority as compared with e.g. cost minimization. However, it must be said here that the participants, within the possibilities and limitations that were inherent in the production technology they used, regarded cost efficiency as a matter of course which the individual had responsibility for.

### **Changes in attitude and other long-term effects of the network collaboration**

A particularly important long-term effect of the network collaboration was undoubtedly that the participants gradually developed a more positive attitude towards research and development in general. Industrialists who have to operate and compete in a free market must

be impatient people. Norwegian seafood producers are no exception and the words from people in the industry have not always been kindly directed towards researchers. A general complaint against research has typically been lack of effectiveness and productivity in research with too little industrial relevance in thematic prioritizations.

Work in the networks revealed at the start that misunderstandings could easily arise in communications between the researchers and the industrialists, which in the worst case affected mutual trust. However, this was not difficult to remedy once the problem had been acknowledged. To the extent that the network members' opinion of research and researchers had previously been surrounded by a slight aura of mystique, such ideas disappeared quickly. To say it a little irreverently: The industry's representatives discovered that researchers also had obvious human characteristics. But above all, the researchers learned that the collective experiences and observations of the industrialists could make extremely important contributions to scientific progress and innovation.

During the last half of the 1990s and up until the turn of the century there was a noticeable change in attitude towards research within the Norwegian fishing industry. Perhaps especially within the land-based processing industry. This was largely due to the realization that sustainable exploitation of resources and adequate competitive strength in a steadily more demanding international market could only be achieved and maintained if the industry were in front with regard to knowledge and the application of technology. Included in this was a realization of the necessity of basic research at universities as well as the long-term, strategic research in the research institutes which, like the basic research, is largely dependent on government financing. With that came the realization that quality and relevance of research can best be improved by good dialogue between researchers and those who benefit from the results. Industrialists therefore almost unanimously believed that it was absolutely essential to escalate the applied, industry-oriented research in Norway. Most important of all they realized that this was only possible if the industry itself covered part of the total national research investment.

### **The Norwegian system of research and innovation funding**

The total Norwegian research investment in 2003 was approximately Nkr27 billion, which constituted 1.75 percent of the GNP. The average for the OECD member states in was approximately 2.3 percent. Norway's research investment measured as a share of the GNP is thus considerably lower than for comparable industrialized countries. The government, however, covers a relatively high share of the national research investment. In 2001, government financing totalled circa Nkr11 billion, or 44 percent of the total investment. Industry stood for approximately 50 percent, while the remaining 6 percent came from miscellaneous non-governmental public sources, idealistic organizations and from abroad.

The Norwegian system for research and higher education is such that the government is responsible for all education at the college and university levels. This is the purview of the Ministry of Education and Research, which also has responsibility for basic research, both by direct grants to the universities and by pure research programmes in the Research Council of Norway. The government's responsibility and organization of applied, industry-oriented research is accomplished according to a type of sector principle. This entails that the Ministry of Trade and Industry tends to the branch-independent, industry-oriented research, innovation and industrial development, the Ministry of Fisheries looks after the fishery- and aquaculture-

related research, and the Ministry of Agriculture attends to land- and forestry-related research, etc.

The Norwegian Ministry of Fisheries is a small ministry in terms of total manpower and annual budget, but relatively important regarding research and development. The annual grants for R&D amount to almost NKr 700 million, which constitutes about 40 percent of the department's total budget. With the large sea areas over which Norway has control and international and self-imposed requirements for sustainable resource management, large investments directed towards research biology and the marine environment are necessary. More than half of research funds from the Ministry of Fisheries are therefore used for this type of research and for the operation of research vessels. There has always been broad agreement about this in Norway, even though such a prioritization has meant that funds from the Ministry of Fisheries for e.g. fishery-related marketing and product and process development have been rather modest.

The Norwegian seafood processing industry consists of a large number of small and medium-sized plants scattered along the long coastline. Although there has been a movement towards larger units for the last four to five years, there are still some 600 companies employing about 13 000 people, including the fishmeal, fish oil and marine biochemical production businesses. The large majority of companies have less than 25 employees. In Norway, as well as in most other European countries, a general condition for obtaining governmental financial support for applied research or industrial development projects is that a company or a group of companies takes the steering responsibility for the project and that they cover a share of the total project costs, normally 50 percent. Their financial share can in whole or in part be covered by giving the project access to equipment and premises, and by placing test materials, man-hours and operational services at the disposal of the project.

In the mid-1990s, there was a broad consensus within all branches of the fishery and aquaculture industry and the political authorities in Norway, that national R&D efforts should be strengthened. There was, however, no common opinion on the actions required to stimulate or to realize the desired growth. The industry demanded that the government increase the grant provision in the National Budget, while the government declared that the industry itself had to match additional grants from the government by equity capital and its own efforts. A small company employing less than 50 people normally has neither the financial capability nor the human resources necessary to run projects on their own. Because of the small company structure of the Norwegian seafood industry, it was not realistic to expect a growth in R&D financed by the industry itself that would be sufficient for the future needs to maintain, not to mention strengthen, industry's competitive ability. In accordance with long Norwegian traditions, the idea of a levy on seafood production or exports earmarked for research and development was put forward. The levy would be used for the benefit of all branches of the industry: Fishermen and vessel owners, fish- and shellfish farmers, seafood producers and exporters, etc.

While fishermen and fish farmers were broadly in favour of introducing a "research levy", seafood producers and exporters in general did not applaud the idea. The obvious reason for this was that producers and exporters knew that they could never obtain 100 percent recompense from their customers for such additional costs, and that the "burden" would be shared between buyer and seller depending on the market's price elasticity for the commodity in question. Furthermore, producers and exporters were afraid they would be given responsibility, and thereby further additional costs, for collecting the levy. However, seafood



producers also realized the necessity for strengthening research, development and innovation. This recognition, the positive experiences and applicable results from the projects organized within the networks and not least the change to a more positive attitude towards research and “researchers”, (which was one of the outcomes of their collaboration with scientists in the network programmes), were all factors contributing to why the Norwegian Seafood Federation ended up with a declaration of support for a research levy. However, the Federation, together with the Norwegian Fishermen's Association and the Norwegian Fish Farmers Association (which is now a branch of NSF), put forward the following conditions for their approval of introducing a levy:

- The levy should be considered as the industry's own money.
- Consequently, the levy should not be incorporated in the National Budget.
- The industry itself, through its federations and labour unions, should have the absolute right to decide on the use of money collected.
- The right to collect (and duty to pay) the levy should be regulated by law.

The organizations were emphatic that the scheme for a research levy should under no circumstances reduce future grants from the government. On the contrary, the organizations would expect an understanding from the government that governmental funding of fishery research should increase equivalently to the yearly sum of money raised from the levy.

The consensus reached by the main organizations of the fishery industry was in itself an historic event. Based on the framework the organizations had agreed upon, the government passed a law to create the legal basis for the fee. The law became effective from 1 January 2001. From this date a levy was collected equal to 0.3 percent of the export value of seafood from Norway. The annual sum collected totals approximately Nkr90 million.

Norway exports 90 percent of its seafood production. Collecting the levy on exports will not differ greatly from a system based on total catch and production, including domestic use. The Norwegian fishmeal industry is, however, exempt from the law, as almost 100 percent of the production is utilized for domestic fish feed.

### **The Norwegian Fishery and Aquaculture Industry Research Fund (FHF)**

According to by-laws established by the Ministry of Fisheries, FHF's purpose is:

*– To strengthen financing of research and development, to arrange for increased added value, environmental adaptation, adjustments and innovation in the fishery and aquaculture industry.*

It is important to note that conditions concerning the environment in the mission statement are given equal status with classical industrial and financial success factors.

It is further established in the by-laws that the Fund is a financing agency and that the funds shall be utilized for industry-oriented R&D work. This work should be for the benefit of either the entire or parts of the industry. This will be accomplished by distributing the funds as grants to research programmes and large projects. Results from research which is wholly or partly financed by the Fund shall be generally available according to the rules that apply to projects with government support. It is also established in the by-laws that the Fund must establish an agreement with the Research Council of Norway to ensure strategic and

operational coordination and division of labour. The by-laws also state that work to initiate and develop programmes shall normally be accomplished through the purchase of services. The purpose of this, of course, is to prevent the Fund from establishing an unnecessarily large Secretariat, thereby ensuring that the greatest possible share of the funds will be used for their primary purpose.

The Fund has a Board of seven members who are formally appointed by the Ministry of Fisheries. The Norwegian Seafood Federation, which represents the fishing industry, the seafood exporters and the fish farmers, shall have three members. The Norwegian Fishermen's Association shall have two members, while two members are appointed on recommendations from the Norwegian Confederation of Trade Unions. The decisions of the Board must be *unanimous* in order to ensure that the Fund's assets are not used for controversial initiatives.

The by-laws also state – in accordance with the opinion of industrialists – that the Board shall distribute the funds on its own initiative and not on the basis of applications for support for individual projects. This means that the Board plays a very active role with regard to the selection of priority areas for funds. Some of the funds are used to strengthen existing or planned programmes under the direction of the Research Council of Norway or the Norwegian Industrial and Regional Development Fund (SND). However, a large share of the funds goes into self-defined programmes and large projects, where research institutes or research groups are invited to draw up outlines for implementation with corresponding work schedules and cost estimates. Thus, on the one hand, a healthy competition is achieved between the research institutes, as well as a foundation for collaboration between several environments to reach good solutions.

One of the earliest and largest self-defined projects selected by the Fund was automation of the pinbone detection process in the filleting industry. Detecting and removing the bones is and has been a very work intensive operation in this industry. In addition to the profitability challenges of this process with regard to the competitive strength in relation to low costs, pinboning is a physically exhausting job for which there are considerable problems in recruiting labour. It is mostly women who perform these tasks. This project was started as a cooperative venture between three Norwegian research institutes, the Icelandic equipment company Marel, and Marel's Danish subsidiary, Carnitech. The filleting industry itself had the superior project management and project coordination through the "Fillet Forum" network, with the network's Secretary as Project Manager. In the autumn of 2003, the project launched new technology which must be said to represent a very promising solution to a complicated problem. The project has thus far incurred costs of around NKR40 million, of which the equipment companies Marel and Carnitech have covered approximately half, while the remainder is financed by FHF and SND.

Ever since its inception, the network has given very high priority to the challenges involved in automating the pinbone detection process. Without financing from the Fund, the automating process could not have been accomplished and without research levies on seafood exports the industry would not have had a research fund. However, without the work and collaboration between the industrialists in the networks under NSF, there most likely would not have been any research levy. It can therefore be claimed – based on a solid background – that if networks had not been established during the first half of the 1990s, the industry a decade later would neither have its own research fund nor be about to start using new technology for the automation of pinboning in the filleting industry.

## **Important results of research projects initiated by the networks**

Perhaps the most important result of the work in the networks organized by the Norwegian Seafood Federation (NSF) is the change in attitude towards the R&D work that took place among the network participants. The scepticism and somewhat negative attitude of the research institutions and the universities that held the field at the beginning of the 1990s was turned to a clear realization that the R&D work had to be strengthened, and that the industry participants themselves had to financially contribute towards this. Without this clear change in attitude, it would not have been possible to establish the Norwegian Fishery and Aquaculture Industry Research Fund (FHF).

A list of projects initiated by the networks, and with future financial support from FHF will include, among other things, the following (and many more individual projects):

- Quality-improving initiatives through catch methods, handling of fishing equipment and treatment of raw materials.
- Improvement of quality of raw materials for production of stockfish, saltfish and fillets.
- Optimal quality of pelagic raw materials.
- Market and product development of saltfish and clipfish.
- Automation of pinbone detection and removal.
- Technology for detection and removal of nematodes.
- Total utilization of the fish raw materials – marine by-products and biochemicals.
- Health, environment and safety in the fisheries industry.
- Environmental toxins in fish raw materials.
- Disease and disease-prevention initiatives for farmed fish.

With financial support from FHF, some of the networks have also prepared plans of action for future activity.

## **Similar networks in other industries/countries?**

During the past 10–15 years, various forms of network organization have been tested in a variety of ways in many countries and in different areas of society. However, the phenomenon has only been slightly described in the literature.

It has been asserted that the term *network* was created by the social anthropologist J.A. Barnes, when he in 1954 visited a small fishing community in Lofoten, Norway, to study the relations between the people living there. While trying to describe his experiences, he caught sight of the fishermen's gillnets hanging on drying racks. There and in that very moment he is supposed to have created the “network” term, inspired by the form and structure of the nets (Fyrand and Stave, 1984).

In general, we divide “human networks” into two main groups: social networks and professional networks. A social network can in its simplest form consist of people who live together in small settlements; friends who share common fields of interest (e.g. playing bridge), or a group of people who in some way or another have common challenges and needs and therefore find benefits in collaboration. A professional network are a group or groups of people with common technical needs and interests. A professional network will necessarily not have commercial goals or objectives. The individual membership in a non-commercial

professional network is normally motivated by the wish to share and exchange knowledge and thus improve and keep up to date the member's skills. The members will also have a strong identity to their own profession and to their fellow professionals.

In a wider context we may say that professional networks refer to groups of people who share one or more of the following:

- intellectual/professional ideas
- business interests
- work activities
- needs for actions (e.g. research efforts)

In such a context, professional networks can be directly or indirectly related to companies and industry, often business competitors, just like the members of the described Norwegian "fishing industry networks". When the members also are or represent business competitors, collaboration by mean of traditional co-organization will normally be impossible, or at least impracticable. "Networking" will under such conditions be an appropriate way to exercise collaboration.

The special characteristic of the Norwegian "fishing industry networks" is that the network members, i.e. the networks themselves, consist of the ground level in a structure, in this case, of basic producers in a sector of the fishing industry. The responsibility for the network's operation and form of work is therefore "at the bottom" of the industry- and decision structure, or the stream, if you prefer. One could say that the network triggers "upstream" idea generation and orders, and "downstream" deliveries. Correspondingly, any successes which may result from the network's efforts would presumably first and foremost be useful at the bottom of the structure, i.e. at the bottom of the stream.

Within the research sector and in different forms of development and assistance activities, collaboration and task solution through networks is very common. The European Commission has in its general programmes for research defined a separate type of network project – Concerted Action – which requires that researchers or research groups from several countries join together to perform a task. In the Nordic research collaboration with financial support from the Nordic Industrial Fund, network collaboration has included work on new technologies and methods in food production, with participation both by research groups and food producers (Bengtson, 2002). Common to these networks is that they are simultaneously defined as a project, i.e. relatively specific goals have been set that they will attempt to attain within a pre-determined fixed deadline. In addition, "the paths of action" are opposite to those of the producer-operated networks in the Norwegian fishing industry, with "downstream" orders (from authorities) and "upstream" deliveries (from businesses and research groups).

International or multinational collaboration at government and institution level often has the character of network collaboration when the work takes place over a long and indefinite period. The International Council for the Exploration of the Sea (ICES) can, for example, be regarded as a network organization with a large number of researchers from the member countries and a relatively small permanent Secretariat in Copenhagen.

A very interesting multinational network at the government level is the Network for Women and Gender in the Mekong Region and the Philippines (Matics, 1998; Matics, Poeu and Siason, 2001). This is collaboration at government level between Cambodia, the Lao People's

Democratic Republic, Thailand, Viet Nam and the Philippines to develop and implement a policy for women's participation in the fishing industry in the region. This network was established between the four first-mentioned countries in 2000, following establishment of national networks at high level. The Philippines has subsequently joined the network collaboration.

In the work and the battle for women's rights and equal opportunity network organizations, geographically and/or thematically, has been a much-used instrument. On the whole, women have been good at developing and using new forms and models of action to promote issues of common interest. In the Nordic countries a number of local and regional women's networks have been established. The goal of these is to provide with knowledge and initiatives that can stimulate women to establish and develop their own business activity. Some government financial support for such initiatives may also be granted.

The extremely difficult resource situation for northeast Atlantic cod during 1989-90, when the Minister of Fisheries declared a full stop in the cod fisheries from 18 April 1989 – “the cod moratorium” – caused severe problems for the fisheries in North Norway in general and in the small fishing communities in particular. In this situation, women in the fishing districts “went to the barricades” to defend their and their families' interests and to fight for a future in the fishing villages (Gerrard, 1995). The women themselves called their organization(s) “action group(s)” with no formal listing of memberships. The groups, therefore, can hardly be defined as “networks”, but the actions obviously could be characterized as upstream initiatives demanding downstream deliveries. As expected and intended, the actions were terminated and the groups dissolved when the resource situation improved and the processing plants started production again.

The author of this article has not succeeded in finding good examples of networks in fishing industries elsewhere in the world similar to those of Norwegian seafood producers. Some of the Norwegian networks have now been in operation for ten years and there are no indications of an early forthcoming termination. The reasons for the networks' viability and vitality must obviously be that the network members have drawn professional and commercial benefits from their membership. In addition, the members have had full influence and final power of decision relating to the priorities set and the tasks adopted by the networks.

### **Can the Norwegian model work among small-scale food producers in developing countries?**

The networks of Norwegian seafood producers discussed above have been an unconditional success with regard to the transfer of knowledge and technology from research environments to industry . However, they have also had an industrial policy, initiative-taking function, both towards governmental authorities and their own industry organizations. In addition – and this is perhaps just as important – they have had important attitude-forming effects among seafood producers in general with regard to appreciating and understanding the importance of knowledge as an absolute necessity for a sustainable and profitable execution of their own business activity.

Can the good experiences from Norway then be transferred to similar network forms for transfer of knowledge and technology, e.g. to small-scale producers in developing countries? There is probably no clear and universal answer to this. As a rule, one must be able to assume that organizations formed for the dissemination of knowledge in a wealthy and highly

industrialized country like Norway will not function as a matter of course in less industrially developed societies.

The Norwegian networks are distinctive in that almost without exception, people from the operational part of the business represent the member companies at the network meetings. This involves a particularly relevant prioritization of the tasks and problems one wishes to solve. This creates trust with the authorities, which in turn renders possible larger and more predictable government financial support for the development projects the networks want to start up.

Nonetheless, many of the basic qualities in the networks of Norwegian seafood producers that have been described in this article could probably have positive effects with similar network formations among small-scale producers in less developed countries.

A well-functioning network is also a community. A number of important conditions must therefore be present for the network organization to be able to have results. In order to establish a formal network, the following characteristics must be connected to the network members to the greatest extent possible:

- They must have an industrial, cultural and social community.
- They must practice their business activity on approximately the same technological level.
- They must have equal framework conditions in the practice of their business, e.g. equal rights to fisheries resources.
- They must all have the same type of problems and challenges that have to be solved if they are going to achieve better results from the business.
- They must define a few prioritized tasks which, if they are solved, can result in an improved yield for all the members.
- They must be willing to share their own experiences with the other network members;
- They must be willing to help each other in utilizing new knowledge, particularly knowledge acquired through network collaboration.

It is important that the network “is operated” by neutral persons with relevant competence, at the same time as the members exercise a real “ownership” to the network.

If networks of this type are to be created or tested in developing countries, the initiative should come from the appropriate authorities. The preliminary phase must most likely also include considerable information activities around networks as a form of work, the possibilities for achieving and utilizing the results that lie inherent in this type of goal-oriented activity, and which demands must be made of the network participants. During the start-up phase governments must provide financial and organizational support for establishment and operation of the networks, and oversee the establishment of a binding collaboration is established between networks and competence environments such as universities and research institutions with idealistic and non-profit objectives.

Above all it is important to ensure that network participants themselves will have “right of ownership” to the network, with the rights and obligations this entails. The participants must decide which cases are to be given priority and the same participants will have first claim to utilize the results that emerge. Bringing small-scale producers from primary industries into

constructive dialogue with researchers and academics will in and of itself be an important contribution for promoting innovation and development in the societies it concerns.

## References

**Bengtsson, N. (ed.).** Nordic network on advanced sustainable food manufacturing. *Newsletter issue no. 1 (November 2002) and no. 2 (January 2003)*, SIK, Sweden.

**Fiskeridepartementet (Norwegian Ministry of Fisheries).** 2003. Nøkkeltall fiskeri og havbruk 2003 (*Key figures for Fisheries and Aquaculture 2003*).

**Fyrand, L. & Stave, G.** 1984. Sosialt nettverk – teori og praksis. Oslo 1984. (*Social networks – theory and practise. Oslo 1984*).

**Gerrard, S.** 1995. When women take the lead: Changing conditions for women's activities, roles and knowledge in North Norwegian fishing communities. *Social Science Information*, 34:593-631.

**Matics, K.L.** 1998. The role of networks in addressing research and development issues on women in fisheries: Fisheries networks in the Mekong Basin. *Proceedings from the International Symposium on Women in Asian Fisheries, Thailand 1998. WorldFish Center 2001*.

**Matics, K.I., Poeu, O. & Siason, I.M.** 2001. Networks for women and gender in fisheries development in the Mekong Region and the Philippines. *Proceedings from the Global Symposium on Women in Fisheries, Taiwan November 2001. WorldFish Center 2002*.

**Norges Fiskarlag (Norwegian Fishermen's Association).** 2000. Facts about the Norwegian fisheries industry.

**Research Council of Norway.** R&D-statistikk 2001 (*R&D Statistics 2001*).

### Organizations:

**Norwegian Confederation of Trade Unions** (*Landsorganisasjonen i Norge (LO)*), umbrella organization for a number of sector unions of workers, among them **Norwegian Union of Food and Allied Workers** (*Norsk Nærings- og Nytelsesmiddelarbeiderforbund (NNN)*), in which most of the workers in the seafood industry hold a membership.

**Norwegian Fishermen's Association** (*Norges Fiskarlag (NF)*), professional body for Norwegian fishermen and vessel owners.

**Norwegian Fish Farmers Association** (*Norske fiskeoppdretteres forening (NFF)*), professional body for the Norwegian fish farmers, now a branch within NSF (see below).

**Norwegian Fishery and Aquaculture Industry Research Fund** (*Fiskeri- og havbruksnæringens forskningsfond (FHF)*), body established by the professional organizations within the Norwegian fishery and aquaculture industry (in collaboration with the Ministry of Fisheries) to manage money collected from the Norwegian research levy on seafood exports.

**Norwegian Industrial and Regional Development Fund** (*Statens nærings- og distriktsutviklingsfond [SND]*), governmental body to promote and encourage industrial and regional development. Since 1 January 2004, SND has merged with three other governmental bodies into a new organization, **Innovation Norway** (*Innovasjon Norge*).

**Norwegian Institute of Fisheries and Aquaculture Research** (*Fiskeriforskning*), research institute whose main objectives are to conduct applied research and development for the fisheries and aquaculture industry.

**Norwegian Seafood Federation (NSF)** (*Fiskeri- og havbruksnæringens landsforening (FHL)*), professional body for the Norwegian seafood producers and exporters, fish farmers, and producers of fishmeal, oil and feed.

**Research Council of Norway** (*Norges Forskningsråd (NFR)*), governmental body which supports strategic and applied research within universities, institutes, public services and private companies.



