

3. Overall results

3.1 SHOULD AQUACULTURE BE ENCOURAGED AND WHY?

Experts in all six regions surveyed (Africa, Asia and the Pacific, Latin America, North America, Eastern Europe and Western Europe) agreed that aquaculture should be encouraged. However, their reasons differed. No check list of possible reasons was given; instead, experts were asked to suggest their own. These suggestions were ranked in later rounds. In three regions (Africa, Asia and North America), aquaculture's role as a source of food was ranked as "very important" whereas in Eastern Europe and Latin America its contribution to economic development was considered paramount. In Western Europe the principal role of aquaculture was to improve sustainability of fisheries (Table 2).

This latter rationale – the contribution of aquaculture to sustainability of fisheries – was unexpected. Aquaculture and fisheries are often perceived as competitors for markets or for coastal resources, yet the experts evidently thought that aquaculture would have a beneficial impact on fisheries. The positive contribution of aquaculture to fisheries was emphasized not only by experts from Western Europe, for whom it was the primary rationale for aquaculture development. North American experts ranked aquaculture's contribution to sustainability as "very important". Explicitly they stated that aquaculture production would halt depletion of wild fish stocks and contribute to rebuild the living aquatic resource base. Experts in Asia also thought that aquaculture should be developed because of its "important" contribution to sustaining aquatic resources and fisheries.

3.2 WHAT FACTORS HAVE CONTRIBUTED TO THE POSITIVE DEVELOPMENT OF AQUACULTURE IN THE PAST?

Surveys in the initial round were similar for all regions, with the exception of Africa. Experts were first asked what factors had contributed to the past positive development of aquaculture. Demand factors were considered to have a "very large impact" in all regions, whether because of a growing preference for fish, the lower price of farmed fish, the profitability of farming certain species, or the declining output of substitutes to farmed fish. Supply factors such as the availability of suitable sites, and of financing (in Western Europe) also had a "very large impact".

When asked what factors would contribute to aquaculture development in the future and would be "very likely to happen", market demand was paramount (Table 3). This was expected because of higher expected incomes (in Eastern Europe), increasing consumer demand for fish (Western Europe), and less competition from agriculture and fisheries (Latin America). In Asia, explicit policies to support aquaculture are expected to drive demand.

TABLE 2

Summary of major reasons for supporting aquaculture (according to regional experts), where 1 = very important and 2 = important

Challenges	Africa	Asia and the Pacific	Latin America	North America	Eastern Europe	Western Europe
Economic development	1	2	1	1	1	
Improve sustainability of fisheries/resources	2	2		2		1
Source of food	1	1		2		

TABLE 3

Summary of major factors that have positively affected and will impact aquaculture development (according to regional experts), where 1 = most important reason; 2 = factor that will become increasingly important

Challenges	Africa	Asia and the Pacific	Latin America	North America	Eastern Europe	Western Europe
Demand factors		1+2	2	2	2	2
Financing and sites				1		1
Supporting policies		2				
Economic contribution		1+2	1			
General environment		1	1			

3.3 WHAT FACTORS AFFECTED AQUACULTURE DEVELOPMENT NEGATIVELY IN THE PAST – WILL THEY BECOME MORE DETERMINANT OVERTIME?

Experts were asked about constraints to aquaculture development in their regions: what factors had slowed down development and were expected to become more influential over the next 15 years (until 2020). In the second round, experts were asked to suggest mitigating policies.

Because of the slow and erratic development of aquaculture in Africa, experts were initially asked what factors had negatively affected aquaculture in the continent, and whether those factors would become more acute over time. This question was posed to recognize challenges in the region that should be addressed by policy-makers as a priority. Several factors were cited including lack of capital for investment, constraints on feed and seed availability, poor capacity, and lack of research. *However the principal factor cited was the “absence of suitable policies”* subsumed into: a) wrongly focused national policies, with an overemphasis on small-scale subsistence aquaculture (driven in particular by the international donor community) and aquaculture as a means of rural livelihood; b) the oversight of profit when promoting aquaculture; c) lack of clear property rights; d) neglect of private-sector investments; and e) lack of business-friendly legislation. Second and third rounds then explored mitigating policies that might counter these constraints.

In the first round, Latin American experts cited technology transfer and markets as limiting constraints but these were expected to improve (technology transfer), or simply disappeared from the discussion by the third round (market access). In contrast, lack of technical support (particularly for farming endemic species) and lack of financing were cited among the major concerns.

In North America, lack of financing is a constraint expected to become more acute overtime. Opposition from the public and the media and spatial limitations are also expected to have very large negative effects on aquaculture development.

In Asia, constraints that are expected to become more restrictive include stringent trade barriers, environmental issues, lack of domestic feed industries, poor government policies, and the media’s sensationalist coverage of aquaculture. Experts in Eastern Europe are concerned about the region’s competitiveness due to rising energy and feed costs or non-optimal growout conditions for salmonids. In Western Europe, market access is a constraint expected to become “much more important than before”; similarly, competition over coastal resources, breeding programmes for major species and public opposition are constraints that will become increasingly important.

Tables 4 and 5 summarize the major challenges by region, including those constraints that are expected to become increasingly important in the future.

3.4 WHAT ARE THE “UNEXPLORED OPPORTUNITIES” THAT WOULD HAVE A VERY LARGE POSITIVE IMPACT IN REGIONS?

In addition to private profit-driven aquaculture development, which experts consider has been ignored in the region, unexplored opportunities in Africa include trade (both

TABLE 4
Summary of major challenges by regions (according to regional experts), where 1 = "very important"

Challenges	Africa	Asia and the Pacific	Latin America	North America	Eastern Europe	Western Europe
Supporting policies	1	1	1	1	1	1
Capital	1	1	1	1		1
Capacity	1	1			1	
Seed	1				1	
Extension services & research	1		1			
Feed	1	1	1		1	1
Technology	1	1	1	1		1
Infrastructures	1					
Market	1	1			1	1
Governance	1					
Access to/use of water and sites	1	1		1	1	1
Negative publicity and opposition	1	1	1	1		1
Environmental management		1	1	1	1	1
Trade barriers/international competition		1		1		1
Disease outbreaks		1	1		1	1
Environment issues (incl. climate change)	1	1			1	
Cost and price fluctuation		1		1	1	1
HIV/AIDS	1					
Macro environment	1		1			
Natural disasters		1				
Migration of trained staff	1					

TABLE 5
Most important challenges to aquaculture development (according to regional experts), where 1 = currently "very important" and 2 = challenges that will become increasingly important

Challenges	Africa	Asia and the Pacific	Latin America	North America	Eastern Europe	Western Europe
Supporting policies	1	1	2			
Capital	2		2	2		
Competitiveness	1				2	
Feed	1	2				
Access to/use of water and sites		2		1		2
Negative publicity and opposition		2		1		2
Trade barriers/International competition		2			2	2
Environment issues (incl. climate change)		2				
Human capacity	2					
Technical support			2			

intraregional and international), the cultivation of aquatic plants, the concept of nucleus farms with small-scale satellite farms, networking national institutions, and national broodstock management programmes.

Unexplored opportunities with potentially very large impacts in Asia are: genetically improved species, appropriate environmental management, cooperative fish farming and improvement of product quality in order to meet international standards. This latter focus on product quality coincides with the two policies that experts think are most practical and would have a "very large positive impact" if implemented: improving market access and ensuring that food safety standards are met.

Latin American experts considered that the region has adequate spatial, geographical and water resources available. Regional integration remains an unexplored opportunity.

TABLE 6
Major opportunities for aquacultural development (according to regional experts), where 1= “very important”

OPPORTUNITIES	Africa	Asia and the Pacific	Latin America	North America	Eastern Europe	Western Europe
Improved/new species		1	1	1	1	
Technological innovations			1	1		1
Profit-driven aquaculture	1					
Promoting quality products		1				
Environmental management		1				
Capacity building			1			
Legislative framework			1			
Incentives for fish feed					1	

Policies that would make “a very large” contribution emphasize capacity building and education, as well as providing a suitable legislative framework. Recommended policies include training of government and private personnel and education of the general public about the potential of aquaculture.

Unexplored opportunities that would have a “very large positive” impact on aquaculture development in North America are expanded land-based aquaculture, diversification into new species, and value-added processing. This coincides with factors that experts think will have a predominant role in the next fifteen years: technology and markets. Experts ranked multitrophic aquaculture, offshore aquaculture, and diversification into new species as projects that would have a very large positive impact. Other factors included improving access to financing, simplification of regulations, and giving aquaculture a more prominent role within government bureaucracies.

In Eastern Europe, unexplored opportunities include introduction of new species and incentives to produce fish feed. Practical means that would have a very large positive impact include extensive and semi-intensive freshwater aquaculture in reservoirs and pond fish breeding using specialized technologies. In Western Europe, new technologies aimed at diminishing impacts on the environment and increasing efficiency are considered to be an unexplored means of influencing aquaculture development. Two strategies that would have a very large positive impact are identification and allocation of marine sites and generous economic incentives.

Table 6 summarizes the major opportunities for aquacultural development by region.