

The purpose of these *Key Sheets* is to provide decision-makers with an easy and up-to-date point of reference on issues relating to the provision of support for sustainable livelihoods.

The sheets are designed for those who are managing change and who are concerned to make well-informed implementation decisions. They aim to distil theoretical debate and field experience so that it becomes easily accessible and useful across a range of situations. Their purpose is to assist in the process of decision-making rather than to provide definitive answers.

The sheets address three broad sets of issues:

- Service Delivery
- Resource Management
- Policy Planning and Implementation

A list of contact details for organisations is provided for each sub-series.

## Overview of the debate

Over the past 5 years, the debate about aquaculture has focused on:

- Whether and how the benefits of aquaculture can be made available to the poor.
- The extent of the social and environmental implications of intensive aquaculture.
- How aquaculture can help support and enhance natural fisheries resources.
- How technical inputs to system design, productivity, health management and genetics can be linked with farmer-centred processes.
- The implications of introducing exotic species and genetically modified organisms.
- The role of public sector institutions and NGOs in supporting and regulating aquaculture.

## Key issues in decision-making

Aquaculture is the farming of aquatic organisms such as fish, shellfish and aquatic plants. As well as contributing to household income, these are important in human nutrition and can play a key role in child development and health. The scope for expansion of aquaculture is significant: demand for aquatic foodstuffs is rising beyond the capacity of capture fisheries, people are seeking new ways to secure their livelihoods and suitable natural resources for aquaculture exist in many places. There are four main ways in which aquaculture can be supported:

- introducing aquaculture into areas where it has not previously been practised;
- extending and raising the productivity of existing low-input systems;
- releasing farmed stocks into open waters to support and enhance fisheries; and
- using intensive systems to supply higher value and export markets (usually a private sector undertaking).

When promoted as a component of rural and peri-urban livelihoods, aquaculture can help achieve one or more of the following:

- increase household food supply (a primary target);
- increase household resilience through diversification of income and food sources;
- strengthen marginal economies, increasing employment and reducing food prices;
- improve water resource and nutrient management at household or community level (providing knock-on benefits for other activities such as horticulture and animal production);
- restore aquatic biodiversity through restocking native species; and
- rehabilitate degraded resources (such as weed-choked waterways and abandoned ponds).

Sustainable, poverty-focused aquaculture development requires a conducive policy and institutional environment. Policies may be poorly defined due to the relative novelty of aquaculture and historical ties with capture fisheries (rather than the wider areas of agriculture and rural development).

- Which policies affect the environment for aquaculture (e.g. economic, agricultural, environmental and land use policies, investment support, water access, export promotion)?
- Do these create a stable and positive outlook and motivate small scale producers to invest in skill development for aquaculture?
- Which bodies are responsible for policy formulation and application?
- Do they have access to adequate information about the potential benefits of small scale aquaculture? Are they incorporating this effectively?
- Are there explicit mechanisms to safeguard resource access for the poor (e.g. public access rights, tenure protection, support to local management structures)?

The attractiveness of aquaculture will depend upon many factors, including the local history of fish culture and water management and the way in which aquaculture interacts with and complements the overall livelihood strategies of different household members and groups.

- Is aquaculture already practised? If so, what role does it play in local cultural, social and economic systems? Which social groups are involved in aquaculture?
- What types of production system are used? Where do the constraints to further development lie?
- How can links between established aquaculturalists and new entrants be used to best effect?
- Is there scope for extending the involvement of the poor? (Additional activity may be required to ensure that they have adequate access to natural/financial resources and markets.)
- Can women's income earning opportunities be extended through aquacultural production, processing and marketing? (The availability of low cost technology will be an important factor.)
- Can the benefits of aquaculture be extended by integrating it with rice growing, horticulture, animal production, integrated pest management - and/or processing?
- How effective and reliable are the marketing channels for aquaculture products? (These may need to be developed to reduce producers' vulnerability.)
- How will the expansion of aquaculture affect those who rely on capture fisheries?



## DFID experience

- Various under Aquaculture Research Programme (Univ. of Stirling) (also links to High Potential Systems Programme, Land-Water Interface Research and DFID Engineering Research Programme)
- Bangladesh fisheries programmes (various)
- Thailand/Laos: AIT Aquaculture Outreach (start 1988/1993)

## The Netherlands' experience

- Vietnam: West-East-South Project (1993-1998)
- Costa Rica: Institutional support to University of San Heredia (start 1989)
- Indonesia: Institutional support to Brawijaya University (1983-1992)
- Zambia, Laos, Egypt, CAR, Thailand: Support to construction or upgrading of fish hatcheries (1980s)

## Centres of expertise

- AAHRI (Aquatic Animal Health Research Institute, Bangkok)
- Asian Institute of Technology
- FAO
- IAC, Wageningen
- ICLARM
- NACA (Network of Aquaculture Centres in Asia and the Pacific)
- University of Stirling, Institute of Aquaculture
- WAU, Department of Animal Sciences, Fish Culture and Fisheries

## Aquaculture *continued*

Aquaculture makes use of various types of resources: natural (e.g. bays, lagoons and streams), modified (e.g. ricefields, rainfed water storage) or engineered (e.g. ponds, reservoirs, irrigation and wastewater systems). This opens up opportunities but can cause conflict when use rights are poorly developed.

- What are the existing systems of use/management?
- Will these be strained by new opportunities in aquaculture (e.g. when production is based upon common resources the poor may be denied access as the resource becomes more valuable)?
- Can the rights of the poor be formalised before production begins to expand? What equity effects will this have?
- Will aquaculture have a positive or negative impact upon other demands for water (e.g. investment in water storage and management can be positive, competition for water can be negative)?

In previous decades, significant investments in large public sector hatcheries, linked to extension and credit services, have failed to deliver the intended gains from aquaculture; attention has now turned to the role of the private sector (both commercial and non-commercial). Private sector seed supply, microfinance and marketing organisations, together with well-targeted external inputs, may form the basis for informal micro-enterprise based information networks:

- How does the private sector link with remaining public sector extension and research?
- How can specialist aquaculture knowledge be integrated into generalist extension systems?
- Do researchers interact with aquaculturalists in a participatory mode? How can incentives be changed to encourage them to do so?
- How can the quality of private seed supply be ensured (e.g. developing and enforcing quality criteria and providing technical support to improve handling and distribution)?
- Is there a residual need for public investment to demonstrate the potential of aquaculture to the private sector (including financial services providers)?

Though commercial aquaculture can create valuable employment, some forms - notably (but not exclusively) coastal shrimp culture - have negative environmental and social impacts. These may include:

- damage to ecologically important habitats (such as mangroves), excess groundwater abstraction, salinisation of adjacent cropland and chemical pollution by effluents;
- threats to biodiversity and the advent of new diseases/parasites from the introduction of exotic species, or through poor genetic management of indigenous aquaculture stocks;
- displacement of local people from traditional areas and sources of livelihoods (e.g. fishing, trapping, foraging, tree cropping); and
- enforced income dependence for local people on commercial aquaculture enterprises.

These negative impacts are often masked by the apparent profitability of commercial aquaculture in the short term, leading policy makers to promote it to the detriment of more socially and environmentally valuable alternatives. Development agents can play a role in:

- helping people to understand the merits of the different approaches to aquaculture;
- helping to develop policy tools which allocate the true cost of resource use to commercial users;
- supporting the production and implementation of national and international Codes of Conduct and Guidelines for sustainable aquaculture (where appropriate, within overall integrated coastal management frameworks - see Key Sheet 3 in this sub-series);
- identifying alternative income generating activities for disadvantaged groups; and
- helping to develop and test technical and management solutions to environmental problems.

## Key literature

Edwards, P. and H. Demaine. (1997) *Rural Aquaculture: Overview & Framework*. Bangkok: FAO. FAO, Rome. Various Fisheries Department publications, particularly:

- (1995) *Code of Conduct for Responsible Fisheries & Technical Guidelines No. 5. Aquaculture Development*.
- (1996) Report No. 548. *Report of the Expert Consultation on Small-scale Rural Aquaculture*.
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Harrison, E. et al. (1994) *Fish Farming in Africa: What's the Catch?* London: DFID.

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Key Sheets are available on the Internet at: [www.odi.org.uk/keysheets/](http://www.odi.org.uk/keysheets/)  
or through the websites of DFID and the Netherlands Ministry of Foreign Affairs

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