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Twenty one experts on freshwater aquaculture, genetic, health, rural aquaculture and aquabusiness from national institutions, universities and private sector from 13 countries participating in the FAO Expert Workshop posed for a group photo during the field trip visiting a freshwater pearl oyster farm in Wuxi, China

Outcomes of the FAO Expert Workshop on Freshwater Seed as Global Resource for Aquaculture

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Wuxi, Jiangsu Province,
P.R. China

Melba B. Reantaso[1]

FAN 34 – December 2005 issue provided a prospectus of this FAO Expert Workshop which was hosted by the Freshwater Fisheries Research Center (FFRC) of the Chinese Academy of Fisheries Sciences (CAFS) in Wuxi, China. The Opening Ceremony was graced by Madam Wei Shaofen, Director of the Jiangsi Bureau of Marine and Fisheries and Prof. Xu Pao, Director of the FFRC/CAFS. FRC Deputy Director Miao Weimin ably chaired the sessions.

Purpose. The objective of the four-day Workshop was to analyse the current status of the freshwater seed sector used in aquaculture with special emphasis on rural aquaculture and to evaluate the current constraints and challenges faced by the sector as basis for identifying measures and generating action that will contribute to the sustainable development of this sector.

Process. Twenty case studies, 3 regional syntheses (Asia, Africa and Latin America), 5 thematic reviews (seed quality, genetics and breeding of important freshwater species, role of seed supply and technology in rural aquaculture, farmer innovations and women involvement in seed production) were commissioned between July 2005 to April 2006. Significant highlights of these studies plus 4 invited papers (self-recruiting species, decentralised seed networking in Bangladesh,

establishment of national broodstock centres in Viet Nam and private sector involvement in seed production and distribution) were presented during the Workshop and formed the basis for the Working Group discussions.

Participation. Twenty-one experts on freshwater aquaculture, genetics, health, rural aquaculture and aquabusiness from national institutions, universities and private sector from Australia, Bangladesh, Cambodia, China PR, Egypt, India, Indonesia, Mexico, the Philippines, Sri Lanka, Thailand, Viet Nam, and the United Kingdom participated in the Workshop; co-authors of the different presentations and country case studies participated remotely and provided additional information requirements that were also used during the workshop. The Workshop was facilitated by 3 FAO officers (MB Reantaso, MR Hasan and S FungeSmith).

Product. The products of the Workshop were: (a) a set of recommendations to COFI Sub-Committee on Aquaculture Third Session in September 2006 in India; and (b) FAO Fisheries Proceedings/Technical Paper which will contain the Workshop report (recommendations at various levels) and all the country case studies, regional syntheses, thematic reviews and invited presentations.

Major Recommendations to FAO

On key issues concerning seed quality, genetics, technology and certification, major recommendations to FAO include: (a) assisting member countries in the development of national broodstock certification programs (at national level) including provision of guidelines on development of national broodstock certification systems for public and/or private sector seed suppliers; (b) supporting the development of guidelines for establishing standardized protocols for optimizing seed quality and certifying hatcheries at national level; (c) reviewing the models used for certification in the livestock sector (and possibly agriculture sector generally), for processes of developing certification systems for seed quality; (d) supporting regional multi-disciplinary reviews of broodstock quality of key freshwater aquaculture species (that have a high likelihood of international/regional transfer); (e) developing species and/or systems specific checklists for seed quality for use by purchasers at the point of sale; and (f) reviewing the potential impact of past and current culture-based fisheries on genetic diversity in wild stocks in major regional watersheds.

On key issues concerning seed networking, distribution, entrepreneurship (and certification), major recommendations to FAO include: (a) development of technical guidelines for such registration, licensing and/or certification and providing assistance in the implementation of such guidelines; (b) conducting an international review on the experiences and status of aquaculture seed production and distribution and the effectiveness of strategies (including seed networking and public-private sector partnerships) implemented in various countries in order to come up with a set of best practices, including models and options for networking and partnerships, based on lessons learned; (c) encouraging the establishment of international networks for collaboration in genetic improvement, information sharing and sharing of genetic materials; (d) supporting the development and/or updating of training and extension materials related to seed production and distribution, incorporating development issues with technical inputs; and (e) conducting a livelihoods analysis of people in rural communities involved in various activities of seed production and distribution to generate information for policy development.

On key issues pertaining to development of the freshwater seed production sector that will benefit rural fishfarmers, major recommendations to FAO include: (a) capacity building in the areas of seed nursing, entrepreneurship and credit and savings management (targetting women); simple hands-on and practical training on various aspects of seed production (e.g., breeding; nursing; stress tests; simple seed quality test, basic health checks; condition, packaging and transporting; record keeping and basic accounting or simple bookkeeping; and simple understanding and managing of risks) for rural fishfarmers and hatchery/nursery operators and traders; (b) supporting a regional project to focus on enhancing the role and empowerment of women in aquatic food production with emphasis on the organization of women into Self-Help Groups (SHG) and skills development; (c) conducting sustainability studies using FPR in places where FFS has been practiced in rural aquaculture (e.g., Bangladesh, Indonesia, and Viet Nam), taking lessons learned and experiences and particularly incorporating seed production in the system; (d) reviewing and compiling all relevant published materials on indigenous knowledge and farmer innovations

and documenting other unpublished practices; and (e) creating databases of farmer innovations and making it accessible to all.

Highlights from Thematic Reviews

Harvests from freshwater aquaculture will continue to substantially contribute to global aquatic production. Basic production and human infrastructure, financial/business/marketing support, and policy and legal frameworks are the main elements for an enabling environment. As severe challenges will be faced concerning water allocation and land use for general aquaculture production, the following areas need careful consideration, in order to enhance the development of the freshwater seed production sector to support aquaculture sustainability.

Seed Quality. Seed quality is an essential attribute for optimizing the potential for aquaculture production (better yield and good returns) and is related to the quality of the broodstock used and the seed produced. Genetic quality and good hatchery/nursery management are the two main factors affecting seed quality. It is important to understand the factors that contribute to poor quality seed and develop interventions (*e.g.*, better management practices) to address the problem since, in all aquaculture systems, stocking quality seed does not necessarily ensure a successful crop. Seed certification and accreditation of practices should be continuously explored.

Genetics and Breeding. Approaches to genetic improvement using successful research findings (*e.g.*, selective breeding, application of genetic markers, sex control techniques, chromosome set manipulation, crossbreeding and transgenesis) should be integrated with good genetic management, during domestication and translocation of aquaculture stocks. In addition, such approaches should be supported by efficient and equitable dissemination and technology transfer strategies coupled with awareness and/or certification programs. Strengthening awareness of and institutional capacity to deal with ecological risks associated with introductions of alien and/or genetically improved fish will be essential. Use of indigenous species and their domestication for freshwater aquaculture production should be promoted.

Seed Certification. Seed certification is a quality assurance system aimed to produce and supply high quality seed to farmers, and that which meets certain minimum predetermined quality standards and criteria, *e.g.*, genetic purity, appropriate husbandry, high grow-out performance, freedom from major diseases, other market needs, etc. A process which adds value to the potential of aquaculture production, seed certification will outweigh the anticipated increased costs when done properly. Seed certification is part of a wider programme on genetics and breeding, biodiversity conservation and international trade. There are various levels, systems and levels of successes on seed certification for freshwater aquaculture seeds. There is value in reviewing certification models used in animal and plant sectors to determine which processes can be adapted for use in aquaculture.

Seed Networking and Entrepreneurship. The main actors in the freshwater seed networks are the breeders, hatchery and nursery operators, traders, growers and other input/service providers (*e.g.*, water suppliers, transport providers, sellers of hormones, nightsoil traders, extension workers, etc.). Seed networking has become an important component of freshwater seed production which enabled accessibility and delivery of fish seed in areas distant from traditional sources, thus, stimulating aquaculture development in marginal and remote rural areas. Seed networking should be promoted and supported with enabling policies and required infrastructure.

Seed Production Technology. Broodstock management will be a key issue in meeting the projected fingerling requirement to 2020. To meet this challenge, the required increase in fingerling production from 2003 production will range, for example, from 8 percent to 1 300 percent for carp and 8 percent to 4000 percent for tilapia. There will, therefore, be a need for a technology shift in freshwater aquaculture technology from intensive-water use land-based systems to water-saving and water productivity-enhancing interventions. Integrating fish seed production with irrigation systems and irrigated agriculture and optimizing the use of irrigated agricultural land as seen in several countries can be further explored for their expansion/commercialization potential. The use of cages and hapas for fry-to fingerling-rearing is becoming increasingly popular in some countries, particularly those having large numbers of perennial water bodies. Such initiatives not only contribute to the enhancement of productivity of irrigation water bodies; they also enable landless households to generate income and animal protein from

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Facilitated working group discussions enabled an exhaustive listing and discourse of various issues concerning freshwater seed production. In this photo, Working Group 3 tackled the issue concerning "Development of the freshwater aquaseed sector to benefit rural fishfarmers'.

fish culture activities provided there is equal access to such resources.

Farmer Innovations and Indigenous Knowledge. Many rural farmers have adopted technology innovations and applied indigenous knowledge in order to meet their livelihood necessities. In the seed production sector, farmers have developed innovations, for example, on hatchery technology (*i.e.*, bamboo/wood based circular technology), breeding techniques (*i.e.*, Bundh breeding in India), nursing techniques (*i.e.*, removal of egg stickiness by washing with milk prior to nursing in jars, application of fermented manure including oil cakes, stunting fish technology), local methods for fish collection and transportation, and others. Many such innovations and indigenous knowledge remain undocumented. Reviewing and compiling all relevant published materials on indigenous knowledge and farmer innovations; and documenting other unpublished practices; creating databases on farmer innovations and making it accessible to all; replicating and promoting fully tested innovations in other countries/regions; and recognising and honouring successful farmer innovators are suggested actions to enhance available human capital.

Private-Public Sector Partnership. Private-public sector partnership can be tapped by improving integration and linkages of inputs and efficient delivery of services of the broad spectrum of the freshwater fish seed production sector, for example: (a) large-scale hatchery operators supporting small-scale operators on training, information sharing, broodstock exchange and provision of high quality seed; (b) promoting government-private sector (large hatcheries) partnership for broodstock; and (c) promoting contract growing for fingerling production as practiced in China.

Benefitting Rural Aquafarmers. Aside from enabling policies, there are many strategic elements and approaches which can be promoted to enhance the benefits to and the participation and contribution of farmers. These include application of farmer field school (FFS), farmer participatory research (FPR), training of trainers (TOT); providing good access to rural microfinancing programmes; supporting formation of self-help groups (SHGs) and producer associations; harnessing farmer innovation and indigenous knowledge; building capacity on community-based aquatic resource management; and communicating the various risks in aquaculture production.

The Workshop proceedings are being finalized and targetted to be out of press during the second quarter of 2007 as an FAO Fisheries Technical Paper.

For further information, please contact: Melba.Reantaso@fao.org

[1]Melba B. Reantaso
Aquaculture Management and Conservation Service (FIMA)
FAO Fisheries and Aquaculture Department, Rome