

## 4 QUALITY AND RELEVANCE OF SCIENCE

WorldFish is a research organization whose reputation depends upon the quality and relevance of its outputs. The processes and mechanisms to ensure that the scientific research executed is of high quality and that the outputs are relevant to the Center's mission are therefore vital. As staff are the single most important component in ensuring success in this respect, it is important that appropriate systems are in place to evaluate and monitor performance at all levels.

### 4.1 Quality of Inputs

#### 4.1.1 Staff Quality

Currently WorldFish has 302 staff distributed across nine locations. There was a total of 45 professional scientific staff at the end of 2005 compared with 48 in 1999, not including 6 and 11 respectively who were involved in management (Table 2.4 Ch2). The reduction in the number of scientists has occurred despite an increase in projects from 39 in 1999 to 65 in 2005. Conceivably WorldFish is now in the situation of having to meet more project commitments with the same or fewer scientists. In addition, the new matrix structure places a high demand on professional staff and requires three Discipline Directors (NRM, Aquaculture & PESS) and up to eight Portfolio Directors (geographic regions) all of whom will have limited time for running research projects. In the context of the matrix management structure which is in place and described in Chapter 2, with at least 11 senior scientists occupying management positions, the Center is clearly understaffed in project level scientists if the current commitments detailed in Chapter 3 are to be maintained or expanded.

During the review period there has been a high turnover of scientists. Between 1999 and 2005, 31 scientists left and 60% of the current scientists have joined WorldFish since 2001. However, a significant number of the scientists who left (or will soon be leaving), particularly those in Natural Resources Management were senior staff with an international reputation and a good publications record. Such staff are essential for WorldFish if it is to maintain its objective of being 'the science provider of choice'. In the view of the Panel they have been replaced by less experienced or younger scientists whose output has been much lower. With respect to getting a balance between younger and older staff, approximately 25% of the scientists received their PhD in the last five years and more than half in the last 15 years.

In terms of refereed papers produced per year between 2003 and 2005, the mean number per scientist was 0.9, but 9 scientists wrote none, 15 wrote less than one, 12 less than two, and four scientists produced between two and four. These figures compare less favorably with some other CGIAR centers, for which recent EPMRs have been conducted, e.g. IFPRI where the mean number of refereed publications is 1.4 and IRRI where it is about two (at IRRI 50% of staff produce more than two refereed papers per year), but are similar to others such as CIMMYT where the mean varies between 0.5 and 1.2. However, WorldFish are at the bottom of list for the CG Center s based on the 2004 performance monitoring system (averaging only 0.7 peer reviewed publications per scientist), and perhaps more importantly, are below the generally accepted international norm of two refereed papers per year (WorldFish's own KPG for staff is now set at two for 2006). The poor publication record is also reflected in the low total number of journals (A total of 32, but only 16 were international with an IF) for which WorldFish scientists are reviewers.

Based on staff CV data provided to the Panel, 33 of its staff (of 42 CVs made available) did not review a single refereed journal during the period 2003 to 2005.

Center scientists supervised 117 post-graduates between 2003 and 2005, but the load was very unevenly spread with seven staff responsible for 84 students. Twenty one staff did not supervise any students. There is a similar uneven distribution of representation on external committees, with only five staff accounting for membership of 33 of the total of 62 committees on which WorldFish is represented, with 25 staff on no committees.

*Given the poor scientific publications record and its current limited scientific expertise and reputation, the Panel recommends the Center give high priority to:*

- *recruitment of senior scientists with a proven track record or the involvement of such scientists in Center projects through various forms of partnership and adjunct arrangements, and*
- *recruitment of a cadre of younger, recent PhD graduates, particularly in view of present and past difficulties in attracting more senior scientists.*

Although performance with regard to scientific publications has been below expectations, during the period under review WorldFish staff received a number of awards, which recognize both the quality and relevance of its work. A total of nine awards were received in the reporting period although there were none in 1999 or 2000. Of particular note were (a) Dr. Modadugu V. Gupta formerly Deputy Director General for International Cooperation was awarded the 2005 World Food Prize, the premier recognition for those fighting against hunger. Dr Gupta was recognized for his work to enhance the nutrition of an estimated one million people, mostly very poor women, through the expansion of low-cost and environmentally friendly aquaculture in Asia, Southeast Asia and Africa.; (b) the Community-Based Fisheries Management project, executed in collaboration with several national partner organizations in Bangladesh was awarded Outstanding Partnership by the Consultative Group on International Agricultural Research. In addition, the Board Chair and the current and previous Directors General received prestigious Australian awards for their contributions to fisheries science.

#### **4.1.2 Information Services for Scientists**

##### *Library Services*

Access to scientific literature, in which libraries play a central role, is of primary importance for research scientists, without which, project design, implementation and reporting are severely hampered. Material taken from a review report, "...from collections to connections..." prepared by Dr Johannes Keizer from FAO-GIL (Library and Documentation Systems Division) following a study tour of WorldFish, IWMI and CIFOR in March 2005 is included in Appendix 2 and details the usage of the library. WorldFish plans to use the recommendations arising from this report to reorient and upgrade its library to play a more central, and eventually leading role in managing knowledge. This includes integration of the library with other information and communication services such as print and online publishing. Key points relate to the continued importance of access to peer reviewed journals, and changing from paper to electronic subscriptions. The overall message from of this report was that the library should become the focal point of knowledge management exchange and dissemination in the Center. The Panel endorses this suggestion and notes the importance given by WorldFish to subscriptions which was about three times that of CIFOR and six times that

of IWMI. Furthermore the Panel strongly encourages the Center to maintain and continue to improve its library services, particularly with regard to documenting and making available the extensive 'grey literature' on fisheries.

#### **4.1.3 Infrastructure**

Although WorldFish has first class facilities at its headquarters in Penang, it also has a set of high quality facilities for freshwater tropical species at the experimental stations at Abbassa (Egypt) and Zomba (Malawi) and has access to the facilities at Jitra (Malaysia). These stations have skilled and motivated technical staff and represent a large diversity of ecological situations. In addition, field laboratory facilities are available in Abbassa and Jitra. The experimental stations confer a major strength for WorldFish and the Panel encourages WorldFish to devote efforts to maintaining and strengthening these facilities.

#### **4.1.4 Databases**

The Panel noted that WorldFish staff has access to most major databases necessary for their work. Access to the biological and technical databases provided by the Center and CGIAR System is excellent, and availability of access to such information is not seen as a constraint to research.

### **4.2 Project Planning, Management and Review Processes**

WorldFish has in place comprehensive processes for planning projects that involves both external and internal consultations including assessments of the relevance of the science, and once projects are established a monitoring and reporting system that may include several types of reviews.

#### **4.2.1 External Consultations**

In order to help ensure that research and the knowledge generated are relevant to and can help key stakeholders address the major fisheries and aquaculture development challenges they face, the Center has engaged in local regional and national consultations with a view to setting priorities and designing research projects.

For example in Malawi and Bangladesh where WorldFish has a substantial and long-standing presence and more recently in Cambodia, national priorities are identified through ongoing engagement and structured consultation with partners. In some cases, such as Bangladesh and the Philippines, they have worked through specific technical or policy workshops, e.g. the national policy workshop in Bangladesh (2005); the national workshop on fish, food security and nutrition in Malawi (2004). A number of regional consultations have been held. For example in developing the first regional strategy for Africa and West Asia (2002-2006) WorldFish sought views of national, regional and international stakeholders on key issues in the region and the role of the Center. Building on this a consultative workshop was held in April 2001 bring together over 30 participants from the region. More recently as WorldFish has sought to extend further its Africa program and build stronger partnerships with NEPAD and regional economic communities, several continental workshops and sub-regional workshops have been held under the auspices of these regional bodies. In the Panel's opinion these regional consultations have merit, but notes that such consultations have been de-emphasized in the last two years.

#### **4.2.2 Internal consultations**

In 2000 and 2001, the Center carried out in-house reviews that discussed research and set priorities for research projects. These were replaced from 2002 to 2004 by a 'Science Week'. The 'Science Weeks' were very successful and attended by all available headquarters staff, representatives from regional sites and invited NARS scientists. The event contained a mix of scientific reporting on projects, information sharing presentations, workshops to discuss priorities and focus, and finally summaries of new ideas for scientific excellence and project development in the context of manpower and financial constraints and relevance to the Center's partners, goals and mission. Research-to-impact pathways were discussed at the 2003 Science Week and were published in NAGA (Volume 27-3). The Panel's view is that this paper in NAGA represents 'guidelines' for partners. The Panel commends WorldFish for developing this approach, but would like to see more evidence of its use by the Center and its partners.

The Panel noted the success of the 'Science Week', but is not convinced that the Center has put in place a coherent mechanism for priority setting in the last two years, as highlighted in Chapter 2.

The Panel also noted that the Center is taking steps to appropriately position itself on the R-D continuum, with a view to minimizing its involvement in development type activities. This would permit the Center to concentrate on science and only facilitate the implementation of its science outcomes where it is indispensable (See Chapter 5).

Although these principles have now been clearly articulated, and the implementation plan for the WorldFish revised strategy reflects this (See Chapter 2), it is recognized that this ideal balance may not always have been achieved in the past. The emphasis may, by necessity, shift downstream beyond the idealized norm in some situations where there is insufficient local capacity and there is a risk that the achievement of impacts will be compromised without greater engagement by WorldFish at this end of the value chain.

With regard to scientific discussion and the exchange of ideas, the Panel noted that the Center schedules seminars by visiting scientists whenever possible. However, the Panel urges the Center to give thought to organizing a system of regular in-house seminars (open to all, including non-WorldFish scientists from other institutions) to encourage exchange of ideas and promote science excellence.

#### **4.2.3 Proposal Development**

Project ideas are normally developed with input from the Portfolio Director, Discipline Director and relevant scientists. The Business Development office provides advice on prospective donors. All project proposals go through a formal clearance process before they are submitted to donors.

#### **4.2.4 Performance Monitoring**

Performance indicators were only adopted in 2004 in response to a CGIAR performance monitoring system and appear for the first time in the 2005-2007 MTP. The Center designed performance indicators to parallel the CGIAR requirement for Future Harvest Centers. In 2004, the WorldFish Board approved a proposal to develop a Center-wide database on indicators for WorldFish to allow internal monitoring and evaluation in anticipation of further requests by the CGIAR donors and in preparation for the next scheduled WorldFish External Program and Management Review. The major categories

of indicators developed were: Financial Health; Outputs; Institutional Health/Governance; Partnerships; and Impacts. In particular, the indicators related to specific outcomes and impacts will ensure, from an ex post perspective, that the Center's outputs are contributing to addressing its mission. The establishment of thematic and annual KPGs for all staff was only introduced in 2005 (2006-2008 MTP). The Panel notes with satisfaction the increasing emphasis by management on monitoring and evaluating staff performance and goals.

#### *Staff performance*

Monitoring and evaluation of WorldFish science is carried out at a number of levels. At the lowest level, individual project managers are responsible for supervising the progress of each research project, and reporting to their supervisors. The CGIAR project manager database is now being used to record all relevant status and progress information for each project, including reports, agreements, and milestones. Portfolio Directors are responsible for ensuring that all projects in their portfolio are on track, and meeting all obligations to donors and achieving all internal deadlines and milestones for outputs. Discipline Directors are responsible for ensuring the quality of all scientific outputs of a project. They must clear all reports and scientific publications. They are also responsible for reviewing the performance of staff at 6 monthly intervals. At a higher level the Director for Science Coordination is responsible for ensuring that all research projects are being effectively managed and that all outputs and deliverables are on time. Each individual staff member is evaluated annually using standard performance assessment criteria.

#### *Center Performance*

##### *Key Performance Goals and Key Performance Indicators*

Internally the Center sets annual key performance goals which include several that are related directly to science outputs and quality. There are specific indicators and targets for each of these Goals, and these are monitored on a quarterly basis by the Director of Science Coordination. The Board of Trustees approves the proposed targets for each year and reviews performance against these targets at the end of the year. A dedicated internal website keeps track of progress towards achievement of the annual KPG targets. The Panel endorses the approaches that have been put in place and notes that they were implemented in 2005 and that new goals are in place for 2006.

As part of the CGIAR process of measuring performance through system-wide Key Performance Indicators, the Center, through the office of the Director of Science Coordination, monitors and reports on the various indicators set by the Science Council each year. This includes monitoring of impacts and outputs achieved against the Centers Medium Term Plan.

The Panel notes that the system of KPGs is a good mechanism and seems to be working effectively.

##### a) Center Commissioned External Reviews

As part of the ongoing monitoring and evaluation of its work, The WorldFish Center commissions independent reviews of its activities for programs and regions. Since the 2nd EPMR in 1999, 5 CCERs have been carried out for the following 3 programs – Policy Research and Impact Assessment(2002); Coastal Resources Management Research (2003)

and Genetic Resources (2004); and 2 regions – Sub-Saharan Africa and, East and South East Asia. A CCER of WorldFish's work in the Greater Mekong region is planned for early 2006. The Panel notes the value of these reviews for the EPMR, but also notes that their quality and level of detail are inconsistent (See Chapter 6).

#### b) Investor Commissioned Reviews

In addition to the External Program and Management Review a number of reviews have been commissioned by investors of projects they have funded. Recent reviews which have been made available to the EPMR Panel include:

- European Commission (2004) review of genetics and breeding work supported through specified funding
- US Agency for International Development (2004) review of Development of Sustainable Aquaculture Practices in Bangladesh
- European Commission (2005) review of conservation-related work supported through specified funding
- UK Department for International Development (2005) review of Community-based Fisheries Management in Bangladesh

The Panel notes the value to the EPMR of these reviews, which were comparable to, and supplemented, those of the CCERs.

### 4.3 Outputs

#### 4.3.1 Scientific Publications

##### *Overall productivity*

According its data base, WorldFish has produced 613 documents from 1999 to 2005. This represents a mean production of 89 documents per full year (1999 – 2004, 2005 still incomplete), a figure quite similar to the 1994 – 1997 period (109, see EPMR 2).

The number of scientists in 2005 was lower than in 1999, but there is a slightly higher number of PhDs. (see Table 4.1). The mean annual number of documents per PhD scientist was 2.6 and this could be considered satisfactory using the global norm (3), if they were refereed papers. Unfortunately, mean number of refereed papers per scientist was only 1 or less.

**Table 4.1 - Scientific Staff of the WorldFish**

<b>June 2005 per category (Source: doc.32)</b>				
<b>Category</b>	<b>PhD</b>	<b>MSc</b>	<b>BSc</b>	<b>Total</b>
<b>IRS</b>	27	3	0	30
<b>NRS &amp; RRS</b>	11	10	5	26
<b>Total</b>	38	13	5	56
<b>January 1999 per category (Source: EPMR2)</b>				
<b>IRS</b>	23	2	0	25
<b>NRS &amp; RRS</b>	12	34	9	55
<b>Total</b>	35	36	9	80

The breakdown of this production by categories has been made with the frame used by EPMR 2 (Table 4.2) (In this analysis, we take the number of PhD scientists as the reference for an estimate of scientific productivity and not the total number of scientific staff): 31.8% of the documents were externally refereed; WorldFish published quite half of the non-refereed documents. Communications in seminars, symposia, workshops... represented about 30% of this production, i.e. about one communication per year and PhD scientist. The comparison with the 1994-1997 period (Table 4.3) indicates a stable proportion of refereed documents, but a decrease of internal publication activity for non-refereed documents. Thereby, the annual number of refereed documents per PhD scientist remains rather low (0.78 per year from 1999 to 2004) and has decreased in comparison with the 1994 – 1997 period (1.0). The above mean differs slightly from that of 0.9 given in section 4.2 (inputs) because the latter is calculated from staff CVs for the past three years.

**Table 4.2 - Breakdown of publications 1999 – 2005 (up to 25/10/05)**

SUPPORT	TYPE	2005	2004	2003	2002	2001	2000	1999	TOTAL
<b>External refereed</b>	<i>Papers in journal</i>	15	21	23	23	8	35	28	153
	<i>Communications</i>	0	4	0	3	0	4	10	21
	<i>Books or B. Chapters</i>	2	1	5	7	3	0	3	21
	<b>TOTAL REFEREED</b>	<b>17</b>	<b>26</b>	<b>28</b>	<b>33</b>	<b>11</b>	<b>39</b>	<b>41</b>	<b>195</b>
<b>WorldFish Publications</b>	<i>Articles</i>	0	15	10	4	7	13	12	61
	<i>Communications</i>	2	11	12	9	4	4	15	57
	<i>Manual</i>	0	2	0	0	0	1	0	3
	<i>Others</i>	2	13	14	7	10	11	11	68
	<b>TOTAL WorldFish</b>	<b>4</b>	<b>41</b>	<b>36</b>	<b>20</b>	<b>21</b>	<b>29</b>	<b>38</b>	<b>189</b>
<b>External non-refereed</b>	<i>Papers in journal</i>	0	7	10	4	16	3	4	44
	<i>Communications</i>	1	10	19	36	20	16	4	106
	<i>Books or B. Chapters</i>	3	6	18	8	6	6	7	54
	<i>Report</i>	0	2	2	4	5	5	7	25
	<b>TOTAL EXT. NR</b>	<b>4</b>	<b>25</b>	<b>49</b>	<b>52</b>	<b>47</b>	<b>30</b>	<b>22</b>	<b>229</b>
<b>TOTAL</b>		<b>25</b>	<b>92</b>	<b>113</b>	<b>105</b>	<b>79</b>	<b>98</b>	<b>101</b>	<b>613</b>

**Table 4.3 - Comparison with the 1994-1997 period (source: EPMR2)**

SUPPORT	TYPE	1994-1997	%	N/y x Ph.D*	1999-2004	%	N/y x Ph.D*
<b>External refereed</b>	<i>Papers in journal</i>	62	14.2	0.44	138	23.5	0.61
	<i>Communications</i>	40	9.1	0.29	21	3.6	0.09
	<i>Books or B. Chapters</i>	38	8.7	0.27	19	3.2	0.08
	<b>TOTAL REFEREED</b>	<b>140</b>	<b>32.0</b>	<b>1.00</b>	<b>178</b>	<b>30.3</b>	<b>0.78</b>
<b>WorldFish Publications</b>	<i>Articles</i>	108	24.7	0.77	61	10.4	0.27
	<i>Communications</i>	85	19.4	0.61	55	9.4	0.24
	<i>Manual</i>	7	1.6	0.05	3	0.5	0.01
	<i>Others</i>	37	8.4	0.26	66	11.2	0.29
<b>TOTAL WorldFish</b>		<b>237</b>	<b>54.1</b>	<b>1.69</b>	<b>185</b>	<b>31.5</b>	<b>0.81</b>
<b>External Non-refereed Total</b>		<b>61</b>	<b>13.9</b>	<b>0.44</b>	<b>225</b>	<b>38.3</b>	<b>0.99</b>
<b>TOTAL</b>		<b>438</b>	<b>100.0</b>	<b>3.13</b>	<b>588</b>	<b>100.0</b>	<b>2.58</b>

\* number per full year and per Ph.D scientist

In order to make a more precise diagnosis of this production, the Panel carried out a specific analysis on the articles in “refereed journals” (according the database) and this is shown in Appendix 5.

### 4.3.2 *Review Papers/Books*

'Fish for All' was an important WorldFish initiative, one contribution to which was the joint initiative between WorldFish and the International Food Policy Research Institute, to produce the book *'Fish to 2020: Supply and demand in changing global markets'*. The collaboration started with a consultative conference between WorldFish and IFPRI in 1997 to define the key policy research issues confronting fisheries in developing countries, and to recommend a common agenda for policy research. One of the outcomes was the expressed need for a book to bring together all the complex tradeoffs within the fisheries sector, interactions outside the sector, and the impact of fisheries on food issues. The book has been widely lauded and projects the likely changes in the fisheries sector over the next two decades. A key finding was that developing countries will consume and produce a much greater share of the world's fish in the future.

The new review *"Restocking and stock enhancement of marine invertebrate species"* was published in *Advances in Marine Biology* in December 2005 is particularly commendable. This publication in a prestigious book series, is highly relevant to the many restocking issues around the world, and will undoubtedly become the first reference of choice for managers and research scientists dealing with this topic.

### 4.3.3 *Conclusions Regarding Publications*

As a conclusion, the Panel commends the WorldFish for producing a large number of documents for a wide variety of purposes. The number of communications in meetings, seminars, symposia has been satisfactory. The effort to disseminate results in technical brochures, books and reports has been high and is in accordance with the mission of the Center. The Panel has carried out an exhaustive review of WorldFish publications based on refereed journals, 'impact factors' and 'citation indices'. Unfortunately, the number of refereed papers in scientific journals remains too low (195 over 6 years) and the efforts in this area appear too dispersed, with no clear publication policy and no significant focus on a few journals with significant impact factors. The number of citations of the papers published in referenced impact factor journals (mean of 6) appears satisfactory, indicating a good audience in the scientific community for this small part of WorldFish production.

Hence although WorldFish has published 195 refereed papers since 1999, only 57 of these have been in international journals with a measurable impact factor, and of these most were published before 2002 (Annual mean of only 1 paper per scientist). Despite the often high standard of the science, there appears to be an unfortunate tendency to publish in local, regional and/or low profile journals with consequently low citations. This is inappropriate in relation to other research providers, and may compromise the vision statement "to be the science partner of choice for delivering fisheries and aquaculture solutions for developing countries". The Panel considered making a recommendation for seriously addressing the shortfall in output of scientific publications, but found evidence and received assurances that the problems are being addressed. The Panel commends the Center for its recent efforts to tackle this problem by setting the KPG for all scientific staff from 2006 onwards at a minimum of two refereed publications per year, and furthermore notes that new data indicate that based on accepted and in press papers, the NRM and AGI disciplines at least, will meet this target for 2006.



To ensure that the encouraging picture alluded to above is maintained the Panel advises the Center to implement a more formal internal system of reviewing and editing scientific papers before they are submitted. This could take the form firstly, of having two internal referees (outside the Center if no suitable scientist available within), and secondly, because for many Center scientists English is not their first language, copy and scientific editing. The latter is vital if Center scientists are to submit papers to high quality international journals.

#### **4.3.4 Major Conferences, Internal Reviews, Expert Meetings**

WorldFish staff attended 40 meetings between 2000 and 2003. Almost all were workshops and 28 were in-house. The distribution by area reflects the program/regional balance of projects. Of the 24 Major Planning Conferences and Expert Meetings attended by staff from 2000 to 2005 (EPMR Document #19), 16 were planning workshops and only 8 could be considered major international scientific conferences. Attendance at only 8 international scientific conferences over a five year period is very low for a research institute. The Panel urges the Center to be more outward looking in this respect. The attendance by WorldFish scientists at relevant scientific conferences and symposia is a core part of being a primary science institution and provider. It is also very important for staff development.

#### **4.3.5 Databases**

FishBase, ReefBase and TrawlBase (including FiRST) – see Chapter 3 for details. Not only are these databases the achievements for which WorldFish is best known and world famous, but they are also of primary importance for the planning and execution of WorldFish research as well as of other research institutions and organizations. FishBase has recently been comprehensively reviewed by the European Commission (2005), and the Panel has made a number of recommendations that are discussed in Chapter 3.

#### **4.3.6 Relevance of outputs**

During the period of review WorldFish conducted two ex post impact assessments that validate the relevance of their research:

1) on the development and dissemination of GIFT fish in six countries. This showed that the IRR from GIFT research, dissemination and related activities was 70.2% from 1988 to 2010. The GIFT technology has been highly successful and GIFT tilapia are now farmed in 13 countries where they contribute to increasing the supply of low cost, high quality protein for the poor.

2) on the development and dissemination of integrated agriculture-aquaculture technologies in Malawi. The estimated IRR from IAA research, dissemination and related activities was 15%. The adoption of IAA in Malawi has reduced childhood malnutrition by 15%, increased the number of fish farmers from 400 (1980) to 4000, and increased total annual fish production more than ten fold.

### **4.4 Overall Quality of Science**

The Panel has attempted to critically assess the quality and relevance of the science carried out by the Center with respect to the three major components of (a) quality and quantity of inputs, (b) planning and review processes, and (c) quality and quantity of outputs. The Panel concludes that the quality and relevance of the science undertaken by the Center indicates that the Center has the appropriate infrastructure, and has put in

place adequate processes to improve on the present poor publication record. The Panel considers however, that greater efforts should be devoted to strengthening the quality and quantity of staff, and should elaborate mechanisms to ensure the relevance of its work, including a more explicit priority setting process.