Performance Benchmarking in the Irrigation and Drainage Sector

Experiences to date and conclusions

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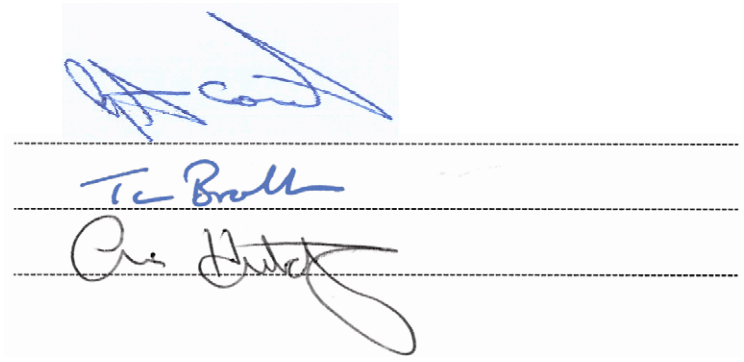

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Summary

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It is approximately five years since the launch of an initiative to promote the use of performance benchmarking as a management tool aimed at improving the level of service provision delivered by irrigation agencies, particularly in the developing world. This report presents the findings of a research study that began in December 2002 with the aim of supporting that initiative and documenting the constraints and opportunities for performance benchmarking as a means of improving performance in the sector. The study was funded by the British government's Department for International Development under research contract R8164 of the Knowledge and Research programme.

Direct, collaborative, field evaluation of the benchmarking process was carried out with the National Centre for Irrigation and Drainage Development in China and with the Mexican Institute of Water Technology in Mexico. The scope of the project was broadened through field visits to Maharashtra and Sri Lanka and correspondence with actors involved in the benchmarking programme in Australia. The project has also taken account of information presented at workshops hosted by the World Bank in Washington in May 2002 and March 2003 and at meetings of the ICID Task Force on performance benchmarking in Montpellier in September 2003 and in Moscow in September 2004.

The project held workshops in China and Mexico which drew together the findings of the evaluation programmes in those countries and an international forum was held in Aurangabad, India, in January 2005, attended by 53 representatives from 10 countries.

One of the key conclusions arising from the study is that performance benchmarking requires a number of seasons, or even years, to be tailored to the needs of a particular service provider, evaluated and then extended beyond an initial pilot phase. Thus the field experiences, results and conclusions that are presented here are a first attempt to diagnose the experience of a range of different agencies – they are not the last word. In Australia and Maharashtra State the processes of data collection, processing and wide-scale dissemination are well-established and these data are being used by managers to shape their management plans. In other locations the process has not evolved beyond a pilot phase. In Mexico there are proposals to apply benchmarking across the state of Sonora, where many of the country's largest irrigation districts are found. China proposes to apply what has been learnt during pilot evaluation across 60 schemes in Hubei and Henan Provinces but it is still too soon to report on the outcome of these proposed applications.

The early experiences captured in this report lead to the following general conclusions and recommendations:

What has been achieved?
The benchmarking initiative, promoted by the World Bank, FAO/IPTRID, ICID and IWMI, has contributed in moving the concepts of performance assessment and measurement beyond the academic and research community and into the thinking and culture of national agencies

Summary continued

charged with the management of irrigation and drainage infrastructure. However, performance benchmarking cannot, in isolation, bring about significant reform of the irrigation and drainage sector. Performance benchmarking is a management tool that can assist managers or regulatory authorities to better understand the systems that they are managing and to bring about improvements, where they are motivated to do so. The motivation, or driver, that will prompt a manager to use benchmarking as management tool must come from wider institutional changes. These will often include the definition of minimum, agreed, levels of service and the establishment of mechanisms and a culture where irrigation service providers and irrigators are accountable for their actions.

The benchmarking process can be used to highlight the aspects of performance where change is necessary and possible but the establishment of a management culture where managers want to improve and can implement change must precede this.

Defining service delivery
The level of service delivered to a farmer is commonly defined in terms of the adequacy, reliability, equity and flexibility of the supply. For any irrigation system, physical and institutional factors determine the level of service that it is practical to deliver. These aspects of service delivery are well understood and documented but it remains unusual to find irrigation service providers in the public sector that have consulted with farmers and quantified the level of service that can be delivered and against which they can be judged.

Amongst the countries reviewed, Australia gathers the largest amount of data relating to service delivery and customer satisfaction. It is an assumption amongst the Australian irrigation service providers, and their customers, that service delivery and customer satisfaction will be defined and monitored. None of the other country programmes are so comprehensive in their assessment of service delivery. Several include no reference to the adequacy, reliability, equity or flexibility of supply, either because the measurement of these attributes is technically demanding or more fundamentally, because there is no formal agreement on what the level of service should be.

Selection of performance indicators
The selection of performance indicators has evolved over time and remains fluid, as the users gain experience with the collection, analysis and diagnosis of the data. Both Australia and Maharashtra, where the process has been mainstreamed, have made annual changes to the number of indicators used and the format of their publication. With the exception of Australia, countries have given little attention to the accurate and consistent description of schemes in a way that facilitates the comparison of like with like or the identification of practices that enhance performance when compared with peers.

Whilst international researchers and academics are keen to see a uniform set of performance measures applied across a range of countries and system types, national agencies see less value in such international performance benchmarking. There is considerable consensus in the aspects of performance that are measured and in some of the individual indicators used, but the details of indicator definition frequently vary between countries. At this time, national agencies are still working to ensure that the definition of indicators is consistent at the national level.

Summary continued

Ensuring data quality
Accurate data are essential for the benchmarking procedure to gain credibility. Without accurate data, the diagnosis of apparently 'good performance' will quickly reveal errors in the underlying data and published data will be ignored.

In all the countries reviewed, the group charged with establishing and overseeing the evaluation and promotion of the benchmarking programme have spent many hours checking data sets and contacting schemes to verify or re-calculate data. As the benchmarking process becomes established and used effectively this need to review how data have been derived should diminish, but it is an important and unavoidable start-up cost.

Improving the quality of data may best be achieved through establishing a 'virtuous cycle'. Where the transparency of data sets is ensured and data are effectively distributed amongst managers, the accuracy of data is likely to improve, as those submitting it will self-check. Furthermore, where staff know that the data they are collecting or processing are used to make decisions they may take greater care. However, this does not avoid the need for considerable resource input when a programme is established. Consultation is required to agree the accurate definition of parameters and wide-scale training is then needed to ensure that the definitions are understood by all those involved.

Grouping schemes for effective performance comparison
Although no two schemes are identical, pragmatism suggests that it is normally possible, within an area, to group schemes according to the dominant parameters that influence a given aspect of performance, such that useful lessons can be drawn from comparisons made between them. This recognises that the membership of a 'peer group' of similar schemes may vary according to the aspect of performance considered. Unfortunately, little work has been done at a national programme level to permit schemes to be grouped pragmatically such that meaningful performance comparisons can be made. Equally, there has been little focus to date on the definition or use of appropriate performance targets, despite the fact that for some indices of performance, if no point of reference is defined it becomes difficult to judge if a reported level of performance is good, moderate or poor.

Information exchange
There must be effective feedback and exchange of performance data between scheme managers and the body charged with collating and processing the data. Publication of the performance data, and its distribution, in a format that is widely available to all interested parties, can play an important role in achieving effective information exchange, although the publication of performance data must not be regarded as the end point of the benchmarking process. The data are only useful to the extent that they allow comparative analysis to take place, leading to the identification and emulation of good practice. The two programmes which can be considered to have 'mainstreamed' the benchmarking process – Maharashtra and Australia – both publish the results.

Where data flow only from the field to a central processing group, without the facility for effective information exchange and comparison between peers, it is unlikely that the full, cyclic process of benchmarking, which includes diagnosis of the causes of under-performance and their correction, will occur. The identification of good or 'best' management practice, diagnosis of under-performance and planning of interventions, cannot be done by an isolated, central group. It must be owned and implemented by the managers who have responsibility for scheme performance.

Summary continued

Next steps

There is a danger that the focus of resources on performance assessment and benchmarking that accompanied the launch of the benchmarking initiative, may dwindle as the interest of the international agencies moves to other issues. However, those agencies that contributed to the performance benchmarking initiative should recognise that its adoption is an evolutionary process rather than something that is switched on instantly. Where possible, they should continue to use their resources and influence to clarify the use of performance benchmarking as a routine management tool and encourage its evaluation and adoption.

Acknowledgements

This project collaborated directly with agencies in China and Mexico to assist in and document the pilot evaluation of the benchmarking process in those countries. In China, the programme was directed by Professor Li Yuanhua of the National Centre of Irrigation and Drainage Development, working with Dr Yuanlai Cui and Ms Zhu Xiuzhen from the University of Wuhan.

Dr Arturo González Casillas and Dr Benjamin de León Mojarro, from the Mexican Institute of Water Technology, managed the project in Mexico, applying the benchmarking process with the 16 water user associations (Modulós) of the Río Mayo irrigation district in Sonora.

These two teams, in China and Mexico, and the numerous staff and farmers with whom they interacted, played a key role in allowing this project to document the adoption and impact of performance benchmarking in the irrigation and drainage sector.

Further understanding of the practical value of performance benchmarking and its implementation was gained through field visits and correspondence with individuals in Maharashtra, India, Sri Lanka and Australia. Substantial support was provided by Dr Sanjay Belsare, Under Secretary for Irrigation in Maharashtra, and several of his senior staff. In Sri Lanka, Mr H M Jayatillake, Deputy Director of Irrigation within the Irrigation Department, answered numerous questions about the role of benchmarking in his Department. In Australia, correspondence with Ms Lois Hunt of the Ministry of Agriculture Fisheries and Forestry Australia, Mr John Mapson of ANCID, Mr Peter Alexander of Hydro Environmental and Mr Kevin Kelly from the Coleambally Irrigation Corporation, provided valuable insights into the adoption and use of performance benchmarking.

The work of the Water and Land Management Institute (WALMI) in Aurangabad, Maharashtra, in effectively organising and hosting, at relatively short notice, an International Forum on performance benchmarking, should also be acknowledged.

Finally the valuable inputs of past and present colleagues at HR Wallingford Ltd, Mr John Skutsch and Mr Tom Brabben, in project management and the preparation of this report, merits recognition.

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1. Introduction

1.1 WHAT IS THE BENCHMARKING PROCESS?

Before considering the introduction and value of performance benchmarking in the irrigation and drainage sector, it is important to define the terms and ideas that are commonly used in this field. There are several different types of benchmarking tool or process requiring different methods of working and analysis. However, benchmarking, of whatever type, is a process, based on comparison between different groups or organisations, or the comparison of a single organisation with its own track record or a defined target. The objective of such comparison is to identify differences between actual and potential levels of performance as the basis for making changes to improve performance. The following definitions, provided by The Public Sector Benchmarking Service (PSBS, 2005) web site, support this view:

> *"Benchmarking means improving ourselves by learning from others"*
>
> *"Benchmarking is simply about making comparisons with other organisations and then learning the lessons that those comparisons throw up"*. Source: The European Benchmarking Code of Conduct.
>
> *"Benchmarking is the continuous process of measuring products, services and practices against the toughest competitors or those companies recognised as industry leaders (best in class)"*. Source: The Xerox Corporation.

Malano and Burton (2001), in their guidelines for benchmarking in the irrigation and drainage sector, define benchmarking as:

> *"A systematic process for securing continual improvement through comparison with relevant and achievable internal or external norms and standards"*

It is important to distinguish clearly between benchmarking data and the larger benchmarking process. **Benchmarking data** are simply performance indicator values and targets. The **benchmarking process** refers to the use of benchmarking, or performance, data to identify gaps between present practice and 'best practice' which then leads to changes being made to improve performance.

The process of benchmarking is best considered as a series of steps encompassing:

- Regularly comparing aspects of performance (functions or processes) with best practice, past track record or a recognised target or norm
- Identifying gaps in performance
- Identifying the causes of under-performance and proposing measures to address them
- Following through with the implementing of improvements
- Following up by monitoring progress and reviewing the benefits.

Unfortunately, much of the literature reporting the initial introduction of benchmarking in the irrigation and drainage sector, and literature from other sectors, frequently blurs the distinction between the data and the process that uses those data. Thus, there are numerous reports and papers that purport to describe the benchmarking of service providers that only present performance data, with little analysis of the data or

indication of changes taken in the light of that data. The importance of following through the process rather than only collecting and reporting performance data will be returned to later in this report.

1.2 TYPES OF BENCHMARKING

Several *types* of benchmarking are identified in the literature and terms are not always used in a consistent way. However, the most common types, and their definitions, are listed here:

Strategic benchmarking - involves the analysis of agencies' or companies' core activities and competencies, potentially leading to the delivery of new services or products or a change in the balance of activities. Thus, it addresses strategic planning and decision making and is similar to a strategic review.

Performance, or metric, benchmarking – In this an agency or company compares its performance in the delivery or sale of key products or services with similar service providers or manufacturers. By defining numeric indicators of performance, specific targets for improvement can be set and subsequently monitored. However, by only measuring outcome and comparing that with competitors or with an agreed target, this form of benchmarking does not provide information on the underlying processes that may be constraining performance. This requires the identification and analysis of key processes. *It is this type of benchmarking that is being promoted in the irrigation and drainage sector*.

Process benchmarking – is the study of the key processes involved in the delivery of services or the manufacture and selling of a product. Comparisons may be made between different types of agency or company that have a similar process, for example, raw materials sourcing, handling customer complaints or billing and charging for services. The literature warns that process benchmarking will require a huge commitment in time and resource. Some sources warn that, "Results may take a long time to come through and if the benchmarking process is handled badly the whole experience can be de-motivating".
(http://www.comparisoninternational.com/Business%20users/process%20pop%20up.htm)

Diagnostic benchmarking – is a hybrid between metric and process benchmarking. Quantitative and qualitative information is gathered from an organisation on both performance and practices. By comparing against 'best practice' examples, gaps in performance can be quickly identified along with relative strengths and weaknesses. Diagnostic benchmarking identifies problem areas but does not necessarily identify a specific solution. Planning that begins to translate ideas into practical solutions, must form a part of the process.

In addition to these different *types* of benchmarking, the literature also distinguishes between the levels at which comparisons are made. **Internal** benchmarking restricts comparisons to within a given organisation or agency but can still lead to the setting of norms or standards which that organisation then seeks to achieve. **External** benchmarking makes comparisons between different organisations with a view to identifying and then applying relevant "best practice" procedures. At a third level, **international** benchmarking is an extension of external benchmarking with comparisons made between organisations or agencies in different countries.

Distinction is also made between different types of metric indicator that are used to quantify aspects of an organisation's performance. Again, terminology and definitions

of indicator types are not always consistent but Table 1 provides an indication of the general distinctions made between indicators.

Cutting across these more general terms and definitions, Burt and Styles (1999), in a recent study of comparative performance assessment in the irrigation sector, distinguish between External Performance Indicators and Internal Process Indicators. They define an **external performance indicator** as anything based on measured inputs or outputs to or from the irrigated agricultural system. Much of the earlier literature on performance indicators in the irrigation and drainage sector uses this type of 'external indicator'. **Internal process indicators** characterise how an irrigation system functions internally and allow analysis of where technical or managerial change should be focused in order to improve performance, particularly in terms of the flexibility and reliability of water supply. They are not conventional indicators in the form of a ratio but are based on an assessor's scoring of particular factors or characteristics. In the terminology of Table 1 they would be described as explanatory descriptors.

Molden *et al* (1998) in a slightly earlier report on performance indicators suitable for the comparisons between irrigated agricultural systems, make a different distinction between internal and external indicators. They define internal indicators as measures of internal processes such as the area irrigated, or the volume of water delivered, the reliability of water supply, or cropping intensities. They suggest that these indicators are likely to be of greater interest to system managers in the day to day operation of schemes. It is striking, in the light of the more recent benchmarking initiative, that they conclude that internal indicators, quantifying internal processes of a scheme, are likely to be of little value in making comparisons between different schemes. External indicators are defined as those that relate the outputs from a system to the inputs provided. In the terminology of Table 1 these are impact indicators and generally relate to the productivity of land or water within an irrigated agricultural system. The paper by Molden *et al* makes no explicit reference to boundaries of responsibility or control but it is implicit in the title and the material presented that they are concerned with the wider, irrigated agricultural system rather than just the operation and maintenance of irrigation and drainage infrastructure to deliver a service to farmers.

Table 1 Types of performance indicator

Indicator type	Definition	Example from I&D sector
Process indicator	Measures how well an intermediate process is performed that contributes to a final output. The process is internal to the system being managed and evaluated.	Conveyance efficiency
Result or Output indicator	Measures an outcome that a manager can control and which forms part of his objective or key function.	Percentage fee recovery Volume supplied / irrigated area
Impact indicator	Measures an outcome that the manager can influence but which lies beyond his control and for which he cannot be held solely responsible.	Water productivity
Explanatory descriptor	A quantitative, descriptive parameter rather than a measure of performance, which will help in understanding a given level of performance and ensure that similar entities are compared.	Water source Climate Method of water control & division

They note that the main audience for such external indicators of performance, which help to answer the question, "Am I doing the right thing?" rather than "Am I doing things right?" will be policy makers and researchers interested in the strategic

management of land and water resources. This highlights an important issue that should not be overlooked, namely, different stakeholders have different perceptions of what is important in measuring "the performance" of an irrigation system. As a consequence they may prefer different diagnostic tools, or at the very least, different key indices of performance.

The wider lessons from this Section are that terms are often used loosely or have different meanings when used by different authors. Furthermore, because irrigated agricultural production is part of a series of nested systems, unless the boundaries are always consistently defined, dispute can easily arise over what is a process, an output and an impact. The definition of indicator types can therefore be confusing or misleading.

1.3 NORMS AND STANDARDS

An important thread running through much of the discussion of benchmarking is the identification and use of agreed 'norms and standards'. Malano *et al* (2004b), in a recent overview paper focused on benchmarking in the irrigation and drainage sector, cite the following definition from the Concise Oxford English Dictionary:

"A benchmark is a standard or point of reference against which things can be compared or assessed"

The same paper speaks of improving the performance of an organisation when compared against its mission and objectives. Malano and Van Hofwegen (1999), writing on the need for a service approach to the management of irrigation and drainage systems, stress the need for a clear statement of purpose, with defined goals and quantified objectives and targets. Where goals, targets and quantified levels of service are defined then these become clear points of reference against which performance can be judged. However, the institutional reforms required to move most public sector, irrigation service providers, from relatively unresponsive administrations to customer focused businesses, delivering defined and verifiable levels of service to irrigators, are generally still at their earliest stages. It may be questioned whether the introduction of performance benchmarking can move this reform process forwards or whether more fundamental reform must take place first – including the definition of objectives, targets and agreed levels of service – after which the benchmarking process can be used as a routine management tool.

Where targets, based on agreed levels of service and statements of purpose, are absent, it should still be possible to define performance targets at the level of a scheme or group of schemes, based on past performance and analysis of what is realistically feasible. The failure to define such targets considerably hinders the value of benchmarking. Schemes can be compared with their own past performance or with similar schemes, but without points of reference (benchmarks) it is difficult to judge if a reported level of performance is good, moderate or poor.

2. Benchmarking in the water sector

2.1 THE WATER SUPPLY AND SANITATION SECTOR

There is a considerable body of literature referring to both metric and process benchmarking in the water supply and sanitation (WSS) sector. Although it is easy to find reports and web sites detailing the collection and presentation of data, there is a lack of information documenting the application of benchmarking that has led to specific management change or performance improvements. Nevertheless, it is generally perceived that the WSS sector is ahead of irrigation and drainage in the adoption of benchmarking practices. This may be a consequence of the greater resources invested in research and development of management practices but it may also reflect higher expectations from consumers, regulators, funding agencies and other stakeholders that the sector must improve its performance and service delivery.

In 1997, the International Water Services Association[1] established a Task Force on Performance Indicators within its Operations and Management specialist group. The task force held more than 20 technical meetings in Europe, South America and Africa to obtain the views of different member bodies on the formulation of appropriate performance indicators (PI) (Alegre *et al,* 2002). A manual of best practice on "Performance Indicators for Water Supply Services" was published in July 2000, (Alegre *et al*, 2000) just as the international irrigation and drainage community was meeting for the first time to consider benchmarking.

Running in parallel with its task force on PIs, the IWA supported a separate task force on benchmarking, which reported in 2002 on process benchmarking relating to the *financial* performance of water supply utilities – issues of service provision, water quality and environment were specifically excluded, (Larsson *et al*. 2002). The practical relationship between the larger performance indicator report (Alegre *et al*. 2000), which provides tools for metric benchmarking and the precise definition of 133 indicators, and the proposed procedure for process benchmarking is difficult to grasp, despite attempts in the process benchmarking report of Larsson *et al*. to demonstrate a 'coherent philosophy'.

Other major groups and associations have also formulated lists of key indicators to allow utilities to compare themselves in external, metric benchmarking exercises. Table 2 summarises the range of indicators used, or defined by, the International Water Association (IWA), the World Bank (WB) and the American Water Works Association (AWWA).

The Water Utilities Partnership (WUP) in Africa, with funding from DFID, has also worked closely with WRc in the UK to agree upon a set of 38 indicators to assess the performance of water utilities in sub-Saharan Africa (Water Utilities Partnership, 2001).

Most of these metric performance indicators incorporate a means to indicate the reliability or accuracy of the data used to derive them. This is also adopted in the diagnostic indicators used by ITRC but significantly it has not been taken up in the performance indicator sets being considered for irrigation benchmarking, (See 2.2).

The lesson to draw from Table 2 is that there is no single set of performance indicators that should be applied by all those engaged in a sector, be it water supply and sanitation

[1] The International Water Services Association merged with the International Association of Water Quality in 1999 to form the International Water Association (IWA)

or irrigation and drainage. Service providers from the public and private sectors, regulators, international donors and service users will all have different concerns regarding 'performance' which is further influenced by the level of economic development of the community where the service is provided. The 'Global' benchmarking initiative, launched by the World Bank's Water Supply and Sanitation group, recognises this, as Box 1 illustrates.

Table 2 Strategic areas and numbers of performance indicators proposed by different agencies in the water supply and sanitation sector

IWA [1]	AWWA [2]	WB Start-up kit [3]
Water resources (2)	-	-
-	-	Coverage (2)
Personnel (22)	Organisational Development (4)	Costs & staffing (4)
Physical (12)	-	Metering practices (2)
Operational (36)	Water Operations (5)	Unaccounted for water (1)
		Production & Consumption (3)
		Pipe network performance (2)
Quality of service (25)	Customer relations (5)	Quality of service (3)
Financial (36)	Business operations (3)	Billings & collections (6)
		Financial (2)
		Capital investment (2)
-	Wastewater ops (5)	-
Total 133	**Total 22**	**Total 27**

1. International Water Association. Alegre *et al* (2002)
2. American Water Works Association
http://www.awwa.org/science/qualserve/overview/13benchmarkingpi.cfm
3. World Bank http://www.worldbank.org/watsan/topics/uom_bench.html

The World Bank's 'Start-up kit' is an attempt to define and promote the core set of indicators referred to in Box 1. This process continues to be supported by the launch of the International Benchmarking Network (IBNET), funded by DFID in partnership with the World Bank which allows WSS utilities to use and report a 'standard set of performance indicators' and compare their performance with a selected peer group of similar utilities.

Box 1 Experiences of the World Bank with the benchmarking Start-up kit for WSS

"… international data sets will be hard to develop because:

- It is difficult to agree on a universal set of indicators and their detailed definitions;
- The availability of reliable data can be limited;
- Comparisons between countries can be influenced by the different operating environment each faces; and
- The usefulness of an indicator, and its likelihood to be monitored, varies across countries.

Given these difficulties and the sector's decentralized organization, it is unlikely that a central monitoring system can or should be developed. A more feasible objective, enabled through the internet, is for a distributed network of stakeholders to build their own monitoring capacities and make their data available publicly on a voluntary basis.

If shared definitions are used by a sufficient number of participants, at least for a core set of indicators, this network will add value to all its users and contributors by providing them with useful international comparative information."

Source: http://www.worldbank.org/watsan/topics/uom_bench.html

Managers of the IBNET site stress that water utilities are only adopting benchmarking as a management tool once 'good management practices' are in place. The focus and discussion should therefore not be on the value and use of benchmarking in isolation, but on how to bring about effective management reform. It is readily apparent from the experience of the water supply and sanitation sector, that benchmarking cannot be used to drive or impose management reform. Rather, once utilities are pressurised by a national regulator, by international donors or by other drivers, to adopt 'better' or more effective management practices, then benchmarking becomes one of various management tools used to monitor and improve performance, (Gordon-Walker, personal communication, 2004). If this is the experience of the water supply and sanitation sector it is likely that the same lesson will hold true for the irrigation and drainage sector.

2.2 THE IRRIGATION AND DRAINAGE SECTOR

The first evidence of benchmarking, rather than performance assessment, being applied as a management process in the irrigation and drainage sector was its use by the Australian National Committee of the International Commission on Irrigation and Drainage (ANCID). They published a report in 1999 presenting performance data from 33 irrigation service providers, (ANCID, 1999). The report provides performance data but makes no comment on how these data have been used within the larger process of analysis and change management. Further annual reports have been produced by ANCID presenting an increasing number of performance indicators from more service providers. Discussion of these benchmarking data and comment on their role in driving change is provided at Section 3.4.

Shortly after the first Australian report on benchmarking was released, a joint initiative by the World Bank, ICID, FAO/IPTRID and IWMI was launched to promote benchmarking as a management tool which would support broader initiatives to reform management within the irrigation and drainage sector of many developing countries. Those agencies held roundtable discussions at the FAO in Rome in August 2000 attended by representatives from the listed agencies plus research establishments,

consultants and national governments. A concept note on benchmarking performance in the irrigation and drainage sector was prepared as an output from that meeting which formed the basis of "Guidelines for benchmarking performance in the irrigation and drainage sector" (Malano and Burton, 2001) published by IPTRID. The initiative was also promoted within ICID by the formation of Task Force No. 4 "Benchmarking of Irrigation and Drainage projects", under the Working Group on performance of irrigation and drainage systems. IWMI also proposed to develop and host a web-based, data processing and storage system allowing users to enter, process and view values of the performance indicators set out in the IPTRID guidelines. A site has subsequently been developed, referred to as the Online Irrigation Benchmarking Service (OIBS) and available at:

http://www.lk.iwmi.org:82/oibs/LoadBench.htm

The guidelines prepared by Malano and Burton (2001) – frequently referred to as the IPTRID guidelines – have become a key reference in the implementation of benchmarking in the irrigation and drainage sector. They identify six stages in the benchmarking process, viz.:

- Identification and planning
- Data collection
- Analysis
- Integration
- Action
- Monitoring and evaluation

It is striking to note that although the IPTRID guidelines identify these six stages, they only provide description of the first two. If the subsequent steps of analysis, the communication of information and findings to stakeholders, and the preparation and implementing of plans, are not carried through then there is little likelihood that performance measurement and reporting will lead to significant changes in management procedures and improvements in performance. Here again, the distinction between gathering benchmarking data and engaging in the larger process of analysis and implementing actions to drive change, is clear.

The IPTRID guidelines set out 33 recommended performance indicators or descriptors relating to:

System operation	11 indicators
Financial administration	8 indicators
Productive efficiency	8 indicators
Environmental management	6 indicators

The selection of these indicators was based on previous academic studies of the comparative performance of irrigation schemes, (Malano, 2004). They have been described as "simple and universally applicable", (Malano *et al.,* 2004b) and it was anticipated that they would be refined through application in different settings. However, as chapter 3 of this report makes clear, wherever countries have begun to evaluate benchmarking they have gone through their own extensive process of identifying key measures of performance, according to their own priorities and operating circumstances. As Section 2.1 illustrates, this process closely mirrors what has taken place in the water supply and sanitation sector where there is little agreement on a single universal set of performance indicators and definitions.

Irrigation and drainage agencies provide a service to farmers who are responsible for the final performance of an irrigated agricultural system which is normally defined in terms of the value of agricultural outputs. It is important to distinguish between the processes and outputs that are under the control of different players within that larger system. While an irrigation agency may provide irrigation and drainage services that contribute to agricultural productivity there are numerous other factors that influence this measure of performance. Thus, it may be inappropriate to judge an irrigation service provider on the basis of the levels of agricultural productivity achieved. However, a counter argument here is that measures of land and water productivity serve as a rapid and broad-based diagnostic tool. Where productivity is low, further diagnosis is required to determine whether the cause is due to poor irrigation and drainage management or to other factors.

The choice of what is an 'appropriate' indicator of performance will depend upon the priorities and responsibilities of the stakeholder carrying out the assessment. Thus, central government agencies, and wider, integrated development programmes where irrigation and drainage provision is only part of a larger programme, may focus on broader indicators of impact such as water or land productivity, to formulate policies on water allocation between competing sectors or to assess the returns on investment in the modernisation of infrastructure. However, this has more in common with programmes of monitoring and evaluation (M&E) than with benchmarking as a process of comparison, diagnosis of the causes of under-performance and planning to bring about improvements. In reality many practitioners see little to distinguish between these two management tools, other than the terms used.

2.2.1 A note on 'holistic' benchmarking

In seeking to combine the ideas behind metric, performance benchmarking - "What is the level of performance of this scheme in various key areas?" - and process benchmarking - "What are the processes and factors that result in this level of performance?" - The World Bank has promoted the concept of 'holistic benchmarking'. This combines the following procedures or tools:

a) Metric, performance benchmarking as described in the IPTRID guidelines.
b) A rapid diagnostic tool developed by the Irrigation Training and Research Center (ITRC) referred to as the Rapid Appraisal Process (RAP) (Burt, 2001).
c) A Scorecard process designed to capture the views of users of public utilities on aspects of service provision, (Balakrishnan and Lobo, 2002)

These tools have different objectives and different training and resource requirements for their effective application. Although the World Bank has sought to present them as a single package in various workshop and conference presentations (Gonzalez, 2002; Gonzalez and Kandiah, 2003) there is no evidence of the three tools being used together in the field. ITRC has combined the procedures of RAP and metric benchmarking in a single document but it is not clear to what extent the procedures genuinely complement each other. The RAP process is a diagnostic tool that can guide the selective improvement of the internal workings – hardware or management – of an irrigation system. The focus is quite clearly on planning investment in modernisation of water control infrastructure. To be effective, the ITRC diagnostic process needs to be applied by well-trained and experienced hydraulic engineers. It does not lend itself to regular application across a large number of schemes and it does not use comparison, either between schemes or over time, as the basis for identifying performance gaps and planning improvement. However, it may be used to good effect by a small team of specialists on selected schemes, which may have been identified as under-performing through a wider, routine benchmarking process. It relies on experienced users

recommending what the 'best practice' solutions might be to a given problem, but equally a 'conventional' benchmarking process requires a diagnostic and planning phase if it is to lead to change. The RAP and internal indicators can guide that diagnostic process, although their key focus is upon constraints imposed by infrastructure. In contrast to this, performance benchmarking focuses on management practices. Malano (2000), states clearly, "The objective of benchmarking is to find and implement best management practices for the organisation." The difference between the tools and approaches – RAP and performance benchmarking – reflects the difference between the modernisation of hardware (infrastructure and control systems) and the reform of management practices. Both types of intervention may be valid and may compliment each other, but they should not be confused or substituted for each other.

3. Country Experience

3.1 AUSTRALIA

Table 3 Irrigated area and management type – Australia

Parameter	Description						
Total area under irrigation	Approximately 2,500,000 ha						
Number of schemes and range of sizes							
	1997/98	**1998/99**	**1999/00**	**2000/01**	**2001/02**	**2002/03**	**2003/04**
Performance indicators used:	15	42	61	67	65	69	69
System operation	?	5	12	8	12	See note 1	See note 1
Environmental issues	?	5	13	25	14		
Business process	?	21	24	24	25		
Financial	?	11	12	10	14		
Number of schemes participating	33	46	47	32	40	66 [3]	66 [3]
Irrigated area benchmarked	N/a	1,187,034	1,225,860	N/a	N/a	540,000	950,000
Description of management type	The national Water Reform Framework, established in 1994, transferred irrigation and drainage districts out of state control. They now operate as private companies or user co-operatives. The states retain overall control of water resources but do not intervene in the management, operation and maintenance of schemes. There have been large reductions in staff numbers. Maintenance work is frequently out-sourced to contractors. Management boards are responsible to shareholders or farmers. Water is scarce and there is a strong environmental lobby.						
Availability of benchmarking data	Annual benchmarking reports have been published by ANCID since 1997/98 and are widely available. Some, commercially sensitive performance data is now only released to service providers that have signed a confidentially agreement. A single report covers all states in the country.						

Notes:

1. The 2002/03 and 2003/04 reports presents 69 indicators across six business areas:

Environmental aspects	28 indicators
Operational aspects	9 indicators
Financial aspects	9 indicators
Water entitlements & trading	8 indicators
Customers	9 indicators
Social aspects	6 indicators

2. 66 schemes provided basic, descriptive statistics for their systems but only 28 schemes provided published performance indicators and of these, 18 provided additional, confidential performance data.

3.1.1 Development of performance assessment and benchmarking procedures

Fundamental reform of the Australian irrigation industry began in 1994 with the establishment of the national Water Reform Framework by the Council of Australian Governments (COAG) – an intergovernmental forum of state governments. A consequence of that framework was the transfer of management of irrigation and drainage infrastructure from the public to the private sector or to user co-operatives. A National Water Initiative was launched by COAG in 2003. This aims to address over-allocation of water in river basins through the revision of water entitlements; take greater account of environmental flows and promote the expansion of water-markets between states. The Australian irrigation sector is therefore operating in a climate of change and pressure on the water resource base. Performance benchmarking is one of a number of actions taken by irrigation service providers in response to these wider drivers. Other management tools and reporting procedures adopted include annual environmental, financial and activity reports and business strategy documents. Irrigation service providers operate in a professional, commercial environment with minimal government subsidy or direct support, aiming to provide services on a financially and environmentally sustainable basis.

The benchmarking programme in Australia grew out of a project funded by the Land and Water Resources Research and Development Corporation (LWRRDC) in 1997 (LWRRDC, 1998). This was a response to the wider pressures to reform the irrigation sector and demonstrate more accountable resource management. The one-year study developed the scope and structure of a national benchmarking programme through collaboration with six irrigation providers in three states. The programme was then adopted by the Australian National Committee on Irrigation and Drainage (ANCID), an association of service providers representing their interests to government and other stakeholders. ANCID has no formal jurisdiction or regulatory powers so further development and implementation of benchmarking has occurred on a voluntary basis, although funding to meet the costs of data collection, processing and publication was provided by the federal government's Department of Agriculture, Fisheries and Forestry and Land and Water Australia. In the first three years, 1998 to 2001, annual funding was approximately US$ 17,000. The federal government has continued to provide financial support for the review and development aspects of the programme and more recently service providers have also contributed.

Table 3 shows the aspects of performance that are monitored under the programme. The number of performance indices used has increased each year, as stakeholders have wanted to see additional performance measures included. ANCID and participating water providers reviewed the benchmarking process between 2002 and 2003 and made significant changes to the publication of data. Many of the indicators relating to the financial aspects of business management, such as levels of cost recovery, assets to liabilities ratio, revenue to capital ratio, and others are now restricted to a confidential report available to the service providers that have signed a confidentiality agreement. These data are referred to as tier 3 indicators. Publicly reported data are now separated into 79 basic, descriptive statistics (Tier 1) and 69 performance indicators (Tier 2). Table 4 shows the distribution of data within subject areas under these two tiers.

Table 4 Business areas described and assessed in open access reporting in Australia

Tier 1 Statistics/descriptors		Tier 2 Performance indicators	
Business overview	19	Customers	9
Water supply system overview	17	Water access	8
Drainage system overview	18		
Use of water	16	Operational	9
Environment & social	1	Environment	28
Financial	8	Financial	9
		Social	6

The published data for tiers 1 and 2 are only broadly checked for outliers by ANCID before publication. However, the confidential, tier 3 data are reported as undergoing more detailed and rigorous analysis and reporting (Hydro Environmental, 2002).

The importance of the environmental lobby and environmental compliance is illustrated by the year on year increase in the number of environmental indices reported. Since the revision of the reporting procedures and establishment of confidential tier 3 data, 28 environmental performance indices make up 40% of publicly available performance information. The environmental indicators are listed in Table 5.

Table 5 Environmental performance indicators used by ANCID

Aspect	Sub-heading	Indicator
Sustainability of irrigation in the local landscape	Land and water resources management requirements in business operation	1. Is the business operating in accordance with a Land and Water Management Plan. 2. Is the business operating in accordance with an Environmental Management System (EMS)? 3. Is the business ISO 14001 accredited or progressing toward accreditation?
	Sustainable irrigation management practices	4. The proportion of farms which have a Whole Farm Plan. 5. The proportion of farms which have water recycling systems. 6. The proportion of water supplied to the farm gate which is recycled.
	Land Use Licences	7. The proportion of farms that have a site use licence. 8. The proportion of the irrigated area that is covered by a site use licence
	Management of the Hydrologic Cycle	9. The proportion of the area irrigated where the groundwater is within 2m of the natural surface in the summer months. 10. The indicative change in average depth to groundwater in summer over the last five years. 11. The proportion of the land areas in need of surface and sub-surface drainage respectively that is drained.
Water accounting	Metering of water supplied	12. The proportion of water delivered that is metered. 13. The proportion of irrigation customers that are metered. 14. The proportion of domestic and stock customers, who are not irrigators, that are metered. 15. The proportion of supply channel outfall / escape structures that are metered.
	Relative cost of water saved in 2001/2002	16. The cost of water saved through system distribution works relative to market value.
	Tracking the movement of traded water entitlements	17. The proportion of water entitlement that was temporarily transferred into, or out of, the business in the year reported. 18. The proportion of water entitlement that was permanently transferred into, or out of, the business in the year reported. 19. Whether the movement of water is geographically monitored using GIS or other equivalent means. 20. Whether the use of water is geographically monitored using GIS.

Table 5 Environmental performance indicators used by ANCID (continued)

Water salinity management	Salinity of water supplied	21. The median, peak and lowest salinity of water supplied to the business. 22. The median salinity of water supplied to customers in the year reported. 23. The change in the median salinity of the water supplied to the business over the last five years.
	Salinity of water discharged	24. The median salinity of drainage water leaving The area managed by The business. 25. The general change in salt load in water leaving the area covered by the business over the last 5 years.
	Salt balance	26. The amount of salt that entered the area serviced by the business in the last 12 months via the irrigation and groundwater system. 27. The difference between the amount of salt that entered and left the area serviced by the business in the last 12 months via the drainage and groundwater system?
Environmental focus of the business		28. The three key environmental issues impacting on the business in the last 12 months?

Many of the 69 tier 2 indicators agreed by the programme review use a simple YES or NO response to questions on financial practice, water access arrangements and customer service. At least 25 indicators (36%) are of this type and others are descriptors such as:

- The three key environmental issues impacting on the business in the last 12 months?
- What functions are part of the business: (water resource assessment and allocation, headworks management, irrigation water distribution, bulk water supply (urban & industrial), urban water distribution, recreation, stock and domestic water supply, surface drainage services and sub-surface drainage services)?
- How is the cost of providing recreational facilities met?

These qualitative questions, describing the business process, support the diagnosis of the causes of performance gaps that quantitative, output indicators might identify, precisely because they identify differences in management practices (Malano, 2000). The 79 basic descriptors may be compared with the 40 proposed in the IPTRID guidelines. None of the other benchmarking programmes have adopted such a large number of descriptive, process indicators.

The Australian programme uses a clearly defined 'business boundary' to define the scope of the benchmarking programme. The boundary excludes on-farm water use, and hence measures of land and water productivity, which are commonly reported in other programmes, are excluded from the Australian programme. The argument is made that the water provider business cannot control how water is used below the farm off-take and thus the performance of the service provider should not be assessed on these criteria.

3.1.2 Scheme comparisons, targets and norms

Schemes are only grouped by 'type' for the comparison of overall conveyance efficiency between headworks and customer turnout. Here they are grouped by carrier type into "Mainly natural channels", "Mainly channels" and "Mainly pipelines". Apart from this, the published reports do not attempt to group schemes to permit effective

comparison. Rather, it is left to individual users of the data to identify their own peer group for performance comparisons and performance gap analysis.

The earlier annual reports, up until 2001/02, provide a brief commentary on each of the indicators, describing trends towards improvement in the industry as a whole. The most recent report for 2002/03 provides a summary for each of the six business areas but again, it is a summary of the business sector as a whole and aims to present the sector in a favourable light.

The report provides no guidance on the ranges where indicators may be expected to lie or what represents average or good performance. If performance targets are set, this is done by individual schemes in developing their own strategies for improvement. Annual workshops, held by ANCID, provide a forum for water providers to assess their relative performance and identify 'best' or 'improved' practice but the majority of performance analysis and diagnosis is done by individual management boards who may use the information to identify potential areas for improvement. The confidential, tier 3 indicators, may be monitored more closely and used to set targets, but these are not publicised beyond the management of individual schemes.

3.1.3 Discussion

The Australian benchmarking programme is characterised by strong commercial and environmental pressures bearing on the irrigation service providers. Schemes must operate as a financially viable business without subsidy from government and demonstrate that they are using water 'productively' and with due care for the environment. These drivers arise from the earlier reform of the water sector and the wider environmental lobby.

To date, while strongly supported by the Australian government, benchmarking has not been introduced or imposed by a central management agency. Rather, it has been adopted by the industry as a tool to improve management *and* as a means of demonstrating to other stakeholders that the irrigation sector is managing water productively and without negative impact on the environment.

The presentation made by Hydro Environmental, the company retained by ANCID to manage the collection and processing of performance data, at the 2004 International Forum on irrigation performance benchmarking in Aurangabad, identified the following 'achievements and benefits' of the programme:

Achievements:

- Ready access to information on irrigation in Australia.
- More consistent and objective information is available than in the past.
- Improved internal focus on total business performance.
- Some data providers have developed expanded, formal, internal benchmarking (including segmenting their businesses).
- Clearer understanding of factors influencing water delivery efficiency and workplace safety.
- Greater focus on continuous improvement.
- Water providers reflecting on the expectations of their businesses with respect to technology adoption and performance in the areas of economic, environmental and social measures.

Benefits:

- Increased level of data collection and monitoring, record keeping and analysis for internal comparison.
- Increased knowledge of the use of technology across the industry.
- Greater level of comfort to industry leaders who adopt innovative practices when they see others following their initiatives.
- Increased use of information for decision-making.
- Demonstrates that Australia's irrigation industry is still at the forefront of irrigation management nationally.
- Leads to changes in the way that data are collected and stored by irrigation water providers.
- Creates a more unified industry.
- Provides greater confidence in the data and avoids replication in data collection, hence, reducing overall costs. (Alexander and Potter, 2005)

The emphasis is on improving information availability and making better use of that information, but it remains difficult to document specific examples of improvement or change brought about through the benchmarking process.

3.2 CHINA

Table 6 Irrigated area and management type – China

Parameter	*Description*
Total area under irrigation	15,800,000 ha Large-scale schemes 14,700,000 ha Medium-scale schemes 20,000,000 ha Small-scale schemes 5,300,000 ha Other 55,800,000 ha Total
Number of schemes and range of sizes	Large-scale > 20,000 ha 402 Medium-scale 667 – 20,000 ha 5,289 Small-scale 66.7 – 667 ha - Other < 66.7 ha -
Number of schemes where benchmarking has been applied / piloted	8 Large schemes nationally; data from 1993 – 2003 Total area: 398,800 ha 10 schemes in Hubei Province; data from 1998 – 2003 Total area: 385,000 ha
Description of management type	Design, construction and ownership of infrastructure in large and medium-scale schemes are controlled by Central Government's Ministry of Water Resources (Department of Rural Water Management). Routine O&M fall under the control of provincial and county level Water Resources Bureaux. There are frequently several levels of bureaucracy involved in routine management. Increasingly, WUAs are taking responsibility for O&M, and therefore service delivery, for the area served by a branch canal.
Performance indicators proposed	System operation 4 Financial 6 Productivity 3 Total 13
Availability of benchmarking data	Only in very low circulation reports from pilot studies.

3.2.1 Development of performance assessment and benchmarking procedures

In 2001, two irrigation schemes, Zhanghe and Liuyuankou, in Hubei and Henan Provinces, were identified as schemes where the benchmarking process would be evaluated. A third scheme, Tieshan, in Hunan Province, was added in October 2002 when this DFID project established a collaborative partnership with the National Centre for Irrigation and Drainage Development (NCIDD). Data for three years (2000 to 2002) were collected from these schemes and performance indices calculated, following the definitions set out in the IPTRID guidelines. In April 2003, a workshop was held with the mangers of the three schemes, representatives of WUAs from two of the schemes and staff from the NCIDD. The workshop reviewed the experiences of data collection and calculation of performance indices from the schemes and identified the most relevant measures of performance from the point of view of national planners (Ministry of Water Resources) scheme managers and WUAs. A list of 'potentially valid' measures of performance was generated including many of the original IPTRID indicators and additional measures relating to the physical condition of infrastructure,

levels of investment, farm income, levels of staffing and the fraction of the command area under functioning WUAs. These potential indicators are listed in Table 7.

The indicators proposed by the Ministry of Water Resources underscore their strong interest in:

a) **Water saving** – diverting water from agriculture to other sectors and increasing the area irrigated with current allocations.
b) **Investment planning** – Describing the condition of infrastructure and the extent of command development as inputs for planning investments in improvement and modernisation programmes.
c) **Monitoring and evaluation** of the "water saving benefits" from investments. There was no indication of how this could be effectively quantified.

Table 7 Potential performance indicators identified at the initial workshop in China, April 2003

Proposed by central government – Ministry of Water Resources	Proposed by scheme managers	Proposed by WUAs
1. Water management: 1.1 Percent of total sustainable supply diverted by scheme. 1.2 Percent of total diversion used for irrigation. 1.3 Percent of design area actually irrigated. 1.4 Global water use efficiency. 1.5 Annual irrigation water supply per hectare.	**1. Water management:** 1.1 Total annual volume of irrigation water delivered 1.2 Total annual volume of irrigation water diverted/released at headworks. 1.3 Annual irrigation water supply per hectare. 1.4 Main system conveyance efficiency. 1.5 Annual relative irrigation supply. 1.6 Water delivery capacity.	**1. Water management:** 1.1 Annual irrigation water supply per hectare commanded by the WUA. 1.2 Annual irrigation water supply per hectare irrigated within the area of the WUA. 1.3 Main system conveyance efficiency. 1.4 Annual relative irrigation supply. 1.5 Ratio of design capacity to actual capacity of canal serving the WUA.
2. Condition and capacity of infrastructure: 2.1 Percent of the canals designed for lining with lining installed. 2.2 Percent of design area actually commanded. 2.3 Percent of infrastructure in 'good' condition. 2.4 Percent of command area with functioning drainage system	**2. Condition and capacity of infrastructure:** 2.1 Percent of design area actually commanded. 2.2 Percent of infrastructure in 'good' condition.	
Financial administration: 3.1 Percent of total revenue for water sales raised from irrigation. 3.2 Ratio of total revenues to total expenditures. tio of actual cost recovered to actual cost of supply.	**3. Financial administration:** 3.1 Cost recovery ratio 3.2 Maintenance cost to revenue ratio 3.3 Total MOM cost per unit area Total cost per person employed in I&D. Revenue collection performance Total number of staff engaged in I&D per unit command area. Average revenue per unit irrigation water delivered. Total MOM cost per unit irrigation water delivered.	**3. Financial administration:** 3.1 Cost recovery ratio 3.2 Total MOM cost unit area. 3.3 Total cost per person employed in I&D. 3.4 Revenue collection performance. 3.5 Total number of staff engaged in I&D per unit command area.
Efficiency of investments: 4.1 Investment per unit command area. 4.2 Water 'saved' per unit investment Productivity ($) of irrigation water. Decrease in irrigation duty.	**4. Productivity:** 4.1 Total gross annual agricultural production (tonnes)	

Table 7 Potential performance indicators identified at the initial workshop in China, April 2003 (continued)

Proposed by central government – Ministry of Water Resources	Proposed by scheme managers	Proposed by WUAs
Socio-economic: 5.1 Average farmer income. 5.2 Proportion of total planted area planted to grain crops. 5.3 Productivity ($) of land	**5. Environment:** 5.1 Electrical conductivity of irrigation supply and drainage water 5.2 Average depth to the water table.	
Staffing & management: 6.1 Irrigated area per employee 6.2 Length of canal per employee Gross revenue from irrigation per employee Percent of command area transferred to WUA management.	**6. Staffing and management** 6.1 Length of canal per employee 6.2 Number of administrative bodies or agencies involved in all aspects of MOM.	

The indicators selected by the scheme managers were drawn almost entirely from the IPTRID proposed list. However, they avoided most of the measures of productivity as they perceived it would be costly or time-consuming to obtain data on irrigated agricultural production and market prices. They also recognised that it would be impractical to routinely monitor chemical and biological water quality but saw the value of trying to measure changes in water salinity and groundwater depth. The representatives of WUAs focused more narrowly on aspects of water and financial management.

Table 8 Key performance measures selected for evaluation on 8 schemes, China

No	**Aspect and performance index**	**Conclusion of evaluation**	**Action**
	Water management (Operation)		
1	Annual irrigation supply / unit irrigated area	Value will vary widely due to crop type and climate.	**Recommend use**.
2	Annual water delivered / unit irrigated area	Takes account of the contribution of rainfall.	**Recommend use**.
3	Main system conveyance efficiency	Should indicate where conveyance losses are unacceptably high.	**Recommend use**.
4	Annual relative water supply		**Reject** in favour of (5).
5	Annual relative irrigation supply	Should indicate how well management adjusts for contribution from rain. Calculation of effective rainfall and CWR demands more data.	**Recommend use**.
6	Water delivery capacity		**Reject**
	Financial administration		
7	Cost recovery ratio		**Recommend use.**
8	Maintenance cost to revenue ratio		**Recommend use.**
9	Total MOM / unit irrigated area		**Recommend use.**
10	Total cost / person employed in water delivery	Can be difficult to differentiate staff roles in multi-purpose schemes	**Reject.**
11	Fee recovery ratio		**Recommend use.**
12	Total irrigated area managed / person	Can be low where overstaffing is a problem	**Recommend use.**.
13	Average revenue / m^3 irrigation delivered		**Recommend use.**
14	Total MOM cost / m^3 irrigation delivered	Value fluctuates too much over time due to varying rainfall amounts	**Reject**.
	Productivity		
15	Annual value of output / unit command area	The indictor should reflect higher cropping intensities.	**Recommend use.**
16	Annual value of output / unit irrigated area	Difficult to obtain data	**Reject.**
17	Annual value of output / m^3 irrigation delivered	Reflects the productivity of irrigation water delivered after conveyances losses.	**Recommend use.**
18	Annual value of output / m^3 irrigation supplied		**Reject** in favour of 17
19	Annual value of output / m^3 water supplied	Accounts for irrigation and rainfall and shows overall productivity from their combined use.	**Recommend use.**
20	Annual value of output / m^3 crop water demand	Difficult to interpret	**Reject.**
	Investment and infrastructure		
21	% finish canal system and structures	Limited data available. No clear conclusions drawn	.
22	% canals and structures in good condition		
23	Ratio if irrigation revenue to total revenue		
24	Ratio of total revenue to total expenditure		
25	Ratio of water charge to actual cost		
26	Length of canal managed / person		
27	Total irrigation revenue / employee in I&D		

Following the April 2003 workshop, the national benchmarking team from NCIDD agreed upon the revised list of priority performance measures shown in Table 8.
Many of the measures proposed by central government were dropped in favour of indicators that more closely resemble those set out in the IPTRID guidelines. Data for the 10 year period from 1993 to 2002 were collected from the three original schemes and five additional schemes to evaluate the ease of obtaining data and the behaviour of the indices in different types of scheme. Figure 2 shows the distribution of the schemes across China.

Taking account of the availability of data, the ease of calculation and interpretation of the indices and their sensitivity to factors such as rainfall and variable cropping intensity, a reduced set of 13 performance indices was identified. These performance indices were subsequently calculated for 30 schemes in Henan Province and 25 schemes in Hubei Province, using data from 1998 that had been gathered under a separate study for the modernisation and rehabilitation of large schemes. Most recently, data were gathered for this evaluation of performance benchmarking from a further 10 schemes in Hubei Province for the six year period 1998 to 2003. These larger data sets made it possible to group schemes within a single province according to their water source – reservoir-backed, or river diversion.

Figure 1 Location of schemes in China where performance data were obtained

The performance data from the ten Hubei schemes, together with the wider set of indicators calculated for the eight schemes across the country, were discussed by scheme managers from six of the Hubei schemes and senior staff from the Provincial Water Bureau at a workshop in Wuhan in November 2004. This was the first

opportunity for managers to see their own and others' data presented in a comparative format. Their discussion and reactions, together with the analysis of the national programme manager from NCIDD are summarised in Section 3.2.3.

3.2.2 Scheme comparisons, targets and norms

Table 11 shows the maximum and minimum average values reported from the eight schemes for the first 20 indicators listed in Table 8. The data illustrate the large variation that occurs in many of the indicators due to different climates, crop types, water sources and water availability. Clearly, the influence of these factors must be recognised so that dissimilar schemes are not directly compared.

Table 9 Range of indicator values reported from eight schemes spread across different agro-climatic zones in 8 different provinces of China

No.	Indicators	Maximum average value	Minimum average value	Factor of difference
	System Operation			
1	Annual irrigation water supply per unit irrigated area (m^3/ha)	29,023	1,997	14.5
2	Annual water delivery per unit irrigated area (m^3 / ha)	18,830	4,812	3.9
3	Main system water delivery efficiency	85%	41%	2.0
4	Annual relative water supply	210%	72%	2.9
5	Annual relative irrigation supply	267%	50%	5.3
6	Water delivery capacity	2.34	1.34	1.7
	Financial indicators			
7	Cost recovery ratio	136%	43%	3.2
8	Maintenance cost to revenue ratio	24%	8.5%	2.8
9	Total MOM cost per unit irrigated area (US$ / ha)	190	4	47.5
10	Total cost per person employed on water delivery (US$ / person)	1,745	600	2.9
11	Revenue collection performance	100%	67%	1.5
12	Total irrigated area managed per person (ha / person)	2,304	27	85
13	Average revenue per unit irrigation water delivery (US cents / m^3)	3.2	0.26	12.3
14	Total MOM cost per unit irrigation water delivery (US cents / m^3)	5	0.2	25
	Productive efficiency			
15	Output per unit command area (US$ / ha)	2,050	655	3.1
16	Output per unit irrigated area (US$ / ha)	1,230	600	2.0
17	Output per unit irrigation water delivery (US cent / m^3)	70	8	8.7
18	Output per unit irrigation water supply (US Cent / m^3)	60	4	15
19	Output per unit water supply (US Cent / m^3)	17	4	4.2
20	Output per unit crop water demand (US Cent / m^3)	14	8	1.7

The data in Figure 2 (a and b) illustrate that within a single province and with schemes grouped by their water source, there remains great variation between schemes in measures of both water and financial management.

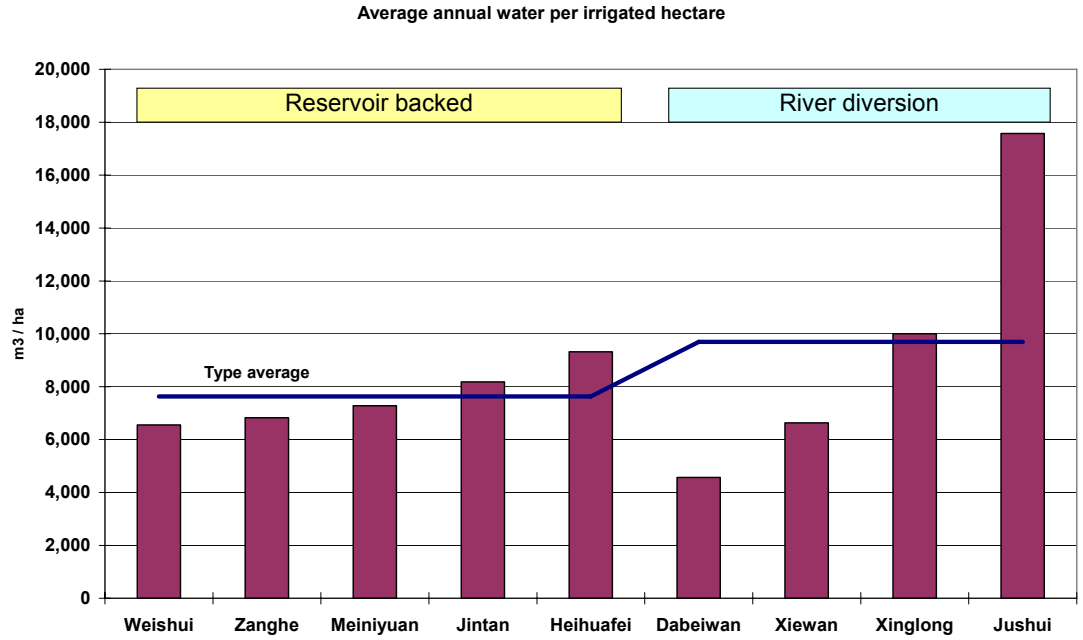

Figure 2a Variation in volumes of irrigation water delivered to nine schemes in Hubei Province (Average values between 1998 - 2003)

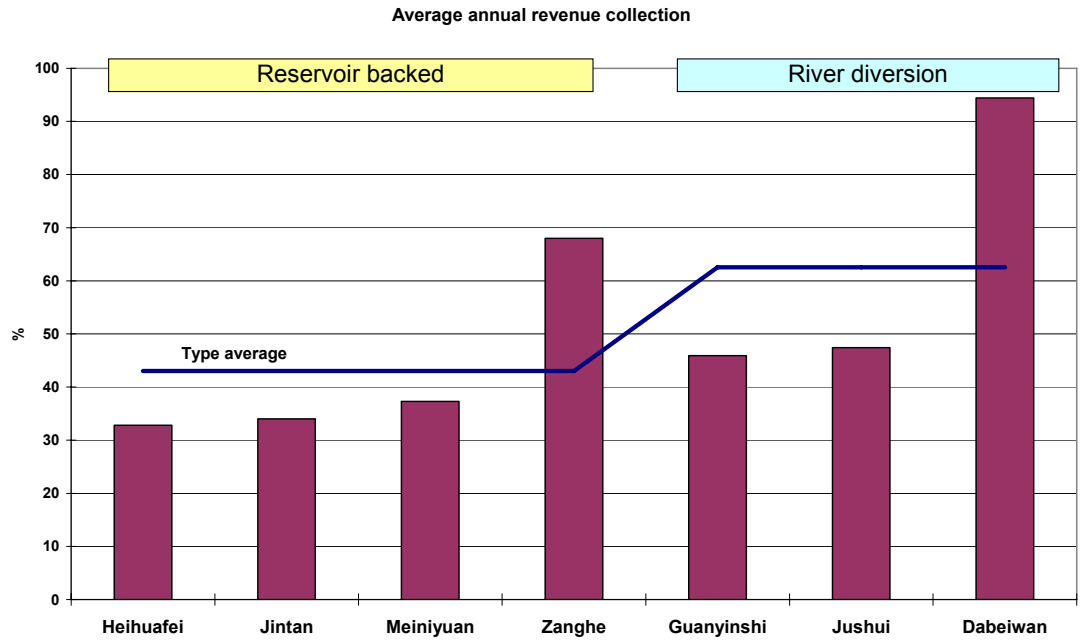

Figure 2b Variation in revenue collection performance amongst seven schemes in Hubei Province (Average values between 1998 - 2003)

Whilst the managers from Hubei Province were interested to see the variations that exist between schemes in many aspects of performance, they felt it was unreasonable to attempt to distinguish between 'unavoidable' variation due to fixed, scheme characteristics and variations that result from factors that managers can control. The view was that any broadly applied target or benchmark value would fail to account for the individual circumstances of schemes and would consequently be ignored by managers. There was a strong consensus that rather than making comparisons between schemes or defining targets or norms for 'similar' schemes – with the problems of classification that that entails – it would be more effective and acceptable to define targets for performance improvement on a scheme by scheme basis. It was put forward that scheme managers, province bureau staff and an external 'expert' would agree those targets.

3.2.3 Discussion

Despite the large number of schemes for which performance data have been collated, the benchmarking initiative in China is still at an evaluation phase. There has not yet been a programme to train scheme managers and province staff. Rather, in a similar way to Mexico, a small, national research group has done data collection and the calculation of performance indices.

Considerable effort has gone into the selection of performance measures, taking account of the availability of reliable data, the interpretation of the indicator and its behaviour under different conditions. Some account has also been taken of the interests and objectives of different management groups – WUAs, scheme managers, province bureau and central government – but the present set of 13 performance measures may be changed, or added to, if benchmarking is piloted across one or a number of provinces. As the process is used its potential value and benefits to different stakeholders will become clearer. This, in turn, may lead to a re-definition of what the 'key' performance criteria are.

The research team within NCIDD identified several institutional and technical constraints that may limit the wide-scale adoption of benchmarking as a management tool. The institutional constraints are:

- Competition and lack of co-operation between the different tiers of management that oversee the irrigation sector. The central Ministry of Water Resources (MoWR) manages and funds all rehabilitation and improvement works, but routine operation and maintenance are controlled by scheme managers, with the oversight of county and province level water bureaux.
- Data are held by different agencies. Rainfall data are held by the meteorology department and must be purchased from them. Agricultural yields and market price data must be purchased from the county statistic bureaux but at this level there is no differentiation between irrigated and rainfed crops. The costs and work required to assemble these data are a disincentive to assessing performance.
- Central and provincial governments see water scarcity as an important driver to raise water productivity and transfer water away from the agricultural sector. However, scheme managers have no incentive to pursue these objectives unless they can benefit from higher revenues earned from the sale of water to other sectors. Where such sales are not possible, the scheme manager is more likely to ensure that the water needs of scheme farmers are fully, or generously, met; there is no incentive to restrict supply or strive for increased water productivity.

Where managers have a clear incentive to improve an aspect of performance, benchmarking may be used as a tool to assist in that process. At present the MoWR is motivated to reduce costs, modernise infrastructure and transfer water out of agriculture but the ministry perceives these drivers more clearly than the managers of individual schemes. The NCIDD team suggests that the benchmarking process might be promoted at scheme level by linking its use to the allocation of funds for modernisation. However, unless scheme managers have genuine incentives to work for performance improvements, their application of benchmarking may be no more than the supply of data to provincial or national databases where targets might be set and monitored. Thus, the process of performance gap analysis and intervention may be applied at province or national level rather than amongst scheme managers.
Technical constraints to performance monitoring and the wider benchmarking process include:

- On most schemes there is very limited data collection on water management and irrigated crop area.
- Few schemes use computers routinely for data processing and storage.
- Very few schemes have access to the Internet, so data exchange must rely on the physical transfer of material between centres.
- Measured parameters and units are often poorly defined. Thus, some river diversion schemes have no design command area defined and multi-purpose schemes do not maintain separate accounts for the operation and maintenance of irrigation infrastructure. Furthermore, terms used in some of the performance indicators were misunderstood or 're-interpreted' by respondents.

None of these constraints is insurmountable, but it will require investment in training and on-going funding of staff within the provincial water resources bureaux who can validate and process performance data, agree the definition of performance targets and ensure the effective exchange of information between schemes. In a first, rapid, estimate of possible resource costs to establish and maintain an effective benchmarking programme across all 402 large-scale schemes in the country (16 million ha), NCIDD suggest that the cost could be as much as US$ 2.8 million per year, equivalent to US cents 17 / ha.

In the short term, it is more likely that performance assessment and some elements of the benchmarking process will continue to be promoted and evaluated in Hubei and Henan Provinces covering 62 large-scale schemes.

3.3 MAHARASHTRA, INDIA

Table 10 Irrigated area and management type - Maharashtra

Parameter	*Description*
Total area utilised	1,212,000 ha Major schemes 000 ha Medium-scale schemes 288,000 ha Minor schemes 1,748,000 ha Total
Number of schemes and range of sizes	Major > 10,000 ha 52 Medium 2,000 – 10,000 ha 206 Minor < 2,402
Number of schemes where benchmarking has been applied / piloted. [Areas show potential, rather than utilised]	For the agricultural year 2002/03 performance data were obtained from: 49 Major schemes (1,995,200 ha) Medium schemes (541,000 ha) 63 Minor schemes (33,800 ha) 254 2,570,000 ha
Description of management type	Currently the state Irrigation Department is responsible for the operation and maintenance of the greater part of the irrigated area within the state. State Policy is to transfer O&M responsibility to WUAs, and on paper there are now 264,000 ha transferred. The state ID still operates and maintains the main canals, delivering water to the associations. The water sector is presently undergoing considerable reform. A new (2003) Water Resources Regulatory Act has just been approved by the state legislature. Management is strongly hierarchical. Senior ID staff at state level have considerable influence and oversight passing through chief engineers and superintending engineers at regional and Circle office level.
Performance indicators used [1]	System operation 1 Equity of distribution 1 Productivity 2 Financial 5 Environmental aspects 1 Infrastructure development 1 Total 11
Availability of benchmarking data	Reports published and publicly available for 2001/02 and 2002/03

1. The number of indicators reported has varied slightly each year (See Table 13)

3.3.1 Development of performance assessment and benchmarking procedures

The Government of Maharashtra (2003), in the Benchmarking Report for 2001/02, prepared by the Irrigation Department, reports that data on the following aspects of performance have been collected and compared against targets for the past 25 years:

1. Potential irrigation area created and utilised – Total irrigated area by season and for the year.
2. Water use 'efficiency' – A measure of the area irrigated per million cubic metres released.
3. Recovery of water charges – Data on the assessment and recovery of fees for irrigation and other water uses.
4. Crop yields
5. Socio-economic surveys – conducted once every five years

The same report implies that these data have not been effectively used to identify opportunities for improvement or to bring about change. It is not clear how targets are agreed – whether they are specific to a scheme, or other area, or apply across the whole state. Nor is it clear what priority was given to the feedback of results to water users and Irrigation Department staff at different levels of management responsibility. Thus, data were collated and recorded but it is not clear if they were used widely to inform and drive management actions.

In recent years, an annual 'Irrigation Status Report' has been published – a single report that compiles and summarises information on these five aspects of performance at the state level. The benchmarking report for 2001/02 suggests that this practice has increased transparency between different stakeholder groups and made staff more accountable to their superiors. The recent adoption of benchmarking procedures on a wider scale builds upon this reporting process.

In February 2002, a national workshop on "Benchmarking of Irrigation Systems" was held in Hyderabad, attended by representatives from the states of Maharashtra, Orissa, Andhra Pradesh, Bihar, Rajasthan, Tamil Nadu and Haryana. The objective was to raise awareness of performance benchmarking as a management tool amongst senior secretaries and other high office holders at state level.

Table 11 Indicators used over the period 2000 to 2003, in Maharashtra

Indicators piloted on six schemes, reported up to 2000/01	Indicators used in first annual report up to 2001/02	Indicators used in second annual report up to 2002/03
System operation • Annual irrigation supply m^3/ha • Equity: head/middle/tail • Water use in Rabi season ha/Mm^3 • No. of farmers benefiting	• Annual irrigation supply m3/ha	• Annual irrigation supply m3/ha • Equity: head/middle/tail
Agricultural productivity • Output per irrigated ha Rs/ha • Output per m3 irrigation water Rs/m3	• Output per irrigated ha Rs/ha • Output per m3 irrigation water Rs/m3	• Output per irrigated ha Rs/ha • Output per m3 irrigation water Rs/m3
Financial administration • Cost recovery ratio • Actual O&M costs / ha • Revenue / m3 supplied • Mandays for O&M / ha • Actual O&M costs / m^3 supplied	• Cost recovery ratio • Actual O&M costs / ha • Revenue / m3 supplied • Maintenance cost : revenue • Mandays for O&M / ha • Actual O&M costs / m3 supplied	• Cost recovery ratio • Actual O&M costs / ha • Revenue / m3 supplied • Mandays for O&M / ha • Actual O&M costs / m3 supplied

Table 11 Indicators used over the period 2000 to 2003, in Maharashtra (continued)

Indicators piloted on six schemes, reported up to 2000/01	Indicators used in first annual report up to 2001 / 02	Indicators used in second annual report up to 2002/03
Environmental aspects • Land damage index • Change in average groundwater depth	• Land damage index	• Land damage index
Infrastructure development • No. of wells in command area • Annual area irrigated		• Potential utilised and created
Total number of indicators 15	10	11

That workshop proposed the use of 56 performance indicators – a combination of the 33 indicators proposed in the IPTRID Benchmarking Guidelines (Malano and Burton, 2001) and 23 indicators defined by the Indian National Committee on Irrigation and Drainage. The Maharashtra Irrigation Department has selected a much smaller number of measures on the basis of available data and the key aspects of performance that they wish to monitor and improve. These are shown in column 1 of Table 11. In the following two years, there has been some revision of the indicators used in the light of feedback from field staff involved in the collection of data and the evaluation of performance. However, the number of indicators used has remained small and focused.

Four of the aspects monitored – operation, agricultural productivity, financial administration and environmental impact – are included in the IPTRID benchmarking guidelines (Malano and Burton 2001). The fifth aspect, the extent to which potential irrigated area is actually used, is an indicator of how well past investment in infrastructure is being exploited.

Among the eleven performance measures presently reported or discussed, senior field staff report that the indices of primary concern to them are:

- Annual irrigation supply (m^3/ha)
- Equity of distribution
- Cost recovery ratio
- Fee recovery ratio

Annual irrigation supply

The measure of annual irrigation supply (m^3/ha) is regarded as a measure of water use efficiency. With increasing competition for water, a larger proportion of the available supply is being allocated to municipal and industrial use, with a consequent reduction in the volume available for agriculture. To maintain the same area under irrigation requires a reduction in the volume allocated per hectare. Where the allocation of water for agriculture remains undiminished, managers are encouraged to increase the area served within a season or to reduce releases in the kharif and rabi seasons to make more water available in the hot, summer season.

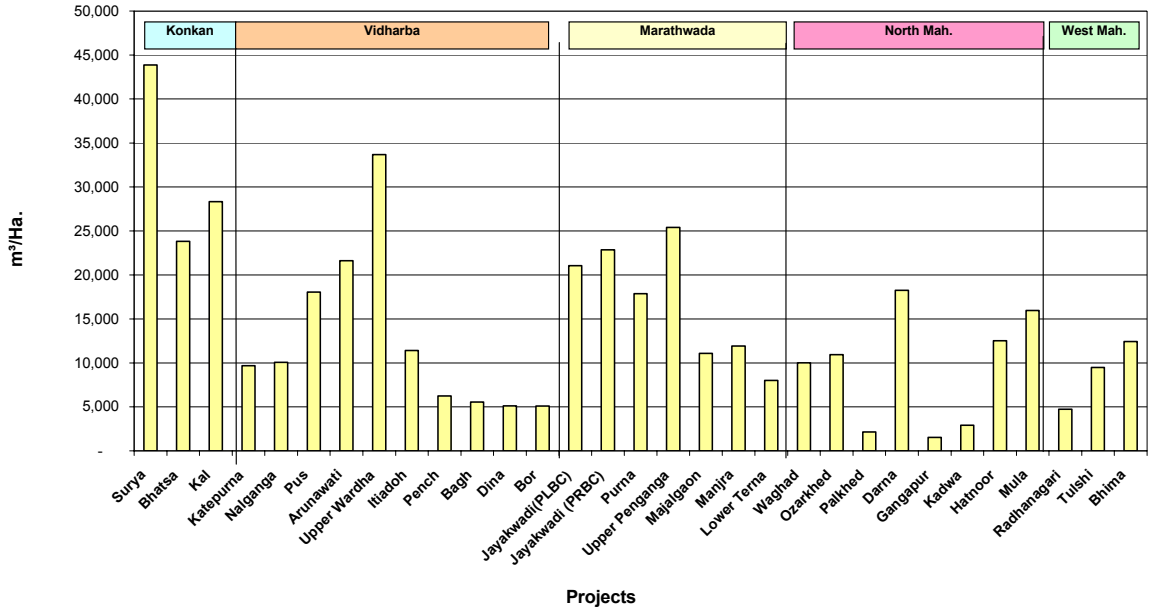

Figure 3 Annual irrigation supply on major schemes. Average of 4 years' data, 1997/98 – 2000/01 (m^3/ha), Maharashtra State

By reducing the annual irrigation supply per hectare, water productivity (Rs/m^3) should improve, assuming yields and prices do not change. Clearly, if irrigation supply per hectare falls below a certain threshold, crop yields will begin to decrease and there may be no improvement in water productivity. If the total volume of water for irrigation remains constant but is spread over a larger area, then the ratio of utilised to potential area should improve, together with water productivity.

Figure 3, taken from the 2003 report, illustrates the large variation that exists between major schemes both within and between regions. Konkan is the western, coastal region of Maharashtra with an average annual rainfall of about 3100mm. The dominant crop is paddy rice, which accounts for the high application duties of about 25,000 m^3/ha. However, the annual average duty of over 43,000 m^3/ha on the Surya scheme is excessively high.

Figure 3 shows that there is great variation in the annual irrigation supply between schemes in all five regions. Factors such as crop type, cropping intensity, annual rainfall, and soil type will influence the required annual irrigation supply and meaningful comparison between schemes can only be made when schemes that are similar with regard to each of these characteristics are compared. Grouping schemes only by geographic region is not an adequate basis for comparison.

Equity of distribution

The measure of equity of water supply between head, middle and tail portions of a scheme stands out as an attempt to monitor, and potentially redress, the typical inequity that exists in the level of service provided to users in different areas of a scheme. The scheme area is divided into thirds according to chainage along the main canal and for each third a ratio equivalent to the annual cropping intensity in that third, is reported:

$$\frac{\text{Annual area irrigated}}{\text{Irrigable area within that } \frac{1}{3}}$$

Comparison of the annual cropping intensity across the three sections provides a measure of the equity of water supply across the command area. Figure 4 presents data for major schemes aggregated to the level of administrative Circle. The figure illustrates that there is substantial variation between Circles with CADA Aurangabad showing the greatest degree of inequity between head and tail reaches.

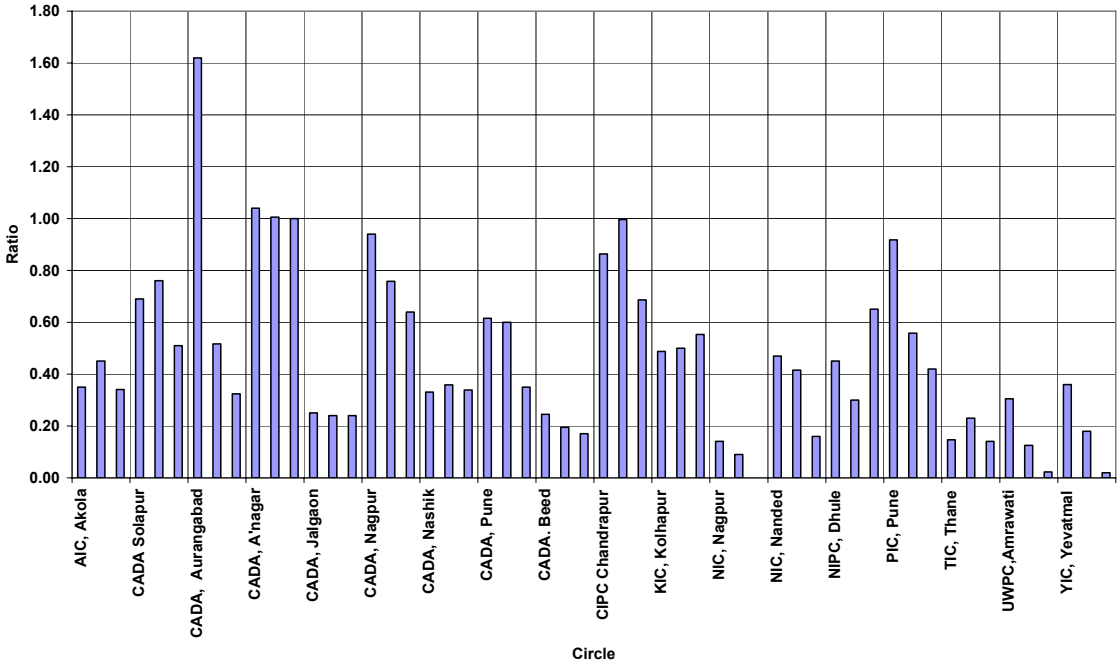

Figure 4 Ratio of actual to potential irrigated area in head, middle and tail sections as a measure of equity. Average data from 1997 – 2002 for Circles

Cost recovery ratio

This is the ratio of income from irrigation fees to the actual annual expenditure (cost) on operation, maintenance and management. The indicator is widely used as a measure of the financial sustainability of a scheme but the data must be interpreted with care. Figure 5 shows 10 major schemes with average annual cost recovery ratios greater than unity. These are listed in Table 12 with information on the percentage of water supplied for irrigation and non-irrigation consumption. The scheme with the highest average cost recovery ratio, Ganagapur, supplies only 1% of its releases to non-agricultural production, suggesting that there is a need to understand more fully the factors contributing to the very marked variation in cost recovery.

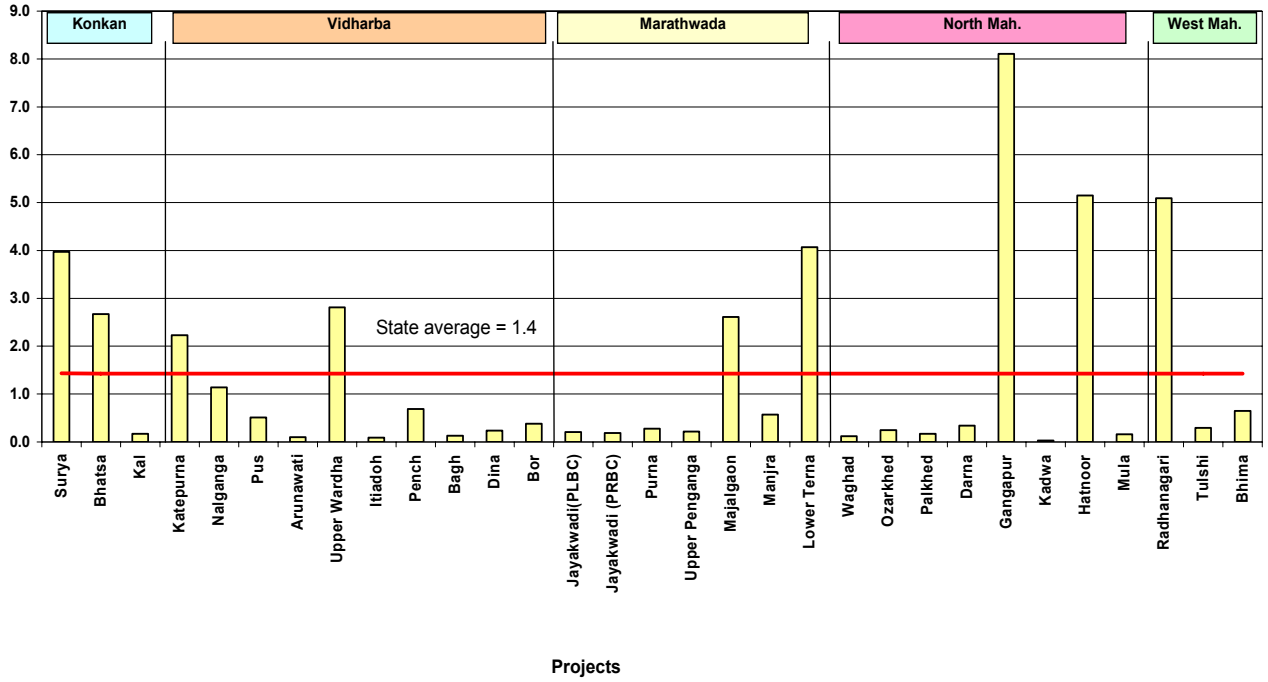

Figure 5 Cost recovery ratios of major schemes. Average of 4 year's data

Table 12 Major schemes in Maharashtra State with an average annual cost recovery ratio greater than unity

Scheme	Annual Cost recovery ratio. (Average of 4 years)	% of water supplied for non-irrigation use
Gangapur	8.1	1%
Hatnoor	5.2	15%
Radhanagari	5.1	10%
Lower Terna	4.1	19%
Surya	4.0	38%
Upper Warda	2.8	23%
Bhatsa	2.7	66%
Majalgaon	2.6	4%
Katepurna	2.2	34%
Nalganga	1.1	5%

The danger of using the cost recovery ratio as a measure of sustainability is that the value may be high as a consequence of inadequate expenditure on management, operation and maintenance (MOM). In the medium term this does not lead to a sustainable scheme, as deferred maintenance will accumulate and the level of service delivered to users may be poor. A better measure of cost recovery and sustainability is:

$$\frac{\text{Annual irrigation revenue}}{\textbf{Required} \text{ MOM costs}}$$

Neither the IPTRID guidelines, nor any of the agencies included in this study, make this distinction between required and actual expenditures.

Fee recovery ratio

Although it has been acknowledged that this aspect of financial management should be monitored, the measure has not yet been included in the set of annually reported performance measures.

3.3.2 Scheme comparisons, targets and norms

The effective use of performance data within the benchmarking process, to identify good practice and drive change, will involve several levels of management. At the state level, the permanent secretary reviews the performance of the superintending engineers responsible for the Circles during routine quarterly meetings. There is a danger that by aggregating scheme data up to a Circle 'average', unusually high or low indicator values of individual schemes, that may reflect particularly good or poor performance, may be masked. The Circles are expected to carry out analysis of individual schemes but if this analysis and diagnosis is lost then useful learning and insight may not be effectively transferred from Circle to Circle. In theory, as superintending engineers draw the attention of executive and deputy engineers at division and sub-division level to the importance of service delivery in general and to specific measures of performance, the benchmarking process will begin to promote change and improvement. That process will take time to become established and will need the continuing support of the Department from the highest level.

In the Benchmarking report for the year ending 2002/03 (Government of Maharashtra, 2004) a state-level performance target has been proposed for each of the eleven performance indicators, for major, medium and minor schemes. Targets for major schemes and the number of Circles where the aggregate of major schemes exceed them, are listed in Table 13.

Table 13 Target values for levels of performance set in the benchmarking report 2004, Maharashtra

Indicator	Target value	State average	Number of Circles exceeding the target value [1]
System operation			
Irrigation supply m^3/ ha	7,692	10,1496	4
Equity head/middle/tail	< 5% variation	26%	3
Agricultural productivity			
Rs / ha	35,000 (US$ 770)	24,684 (US$ 550)	4
Rs / m^3	4.5 (US cents 10)	2.19 (US cents 5)	3
Financial administration			
Cost recovery ratio	1	1.37	6
Total O&M / ha Rs ($)	700 (US$ 15.5)	1,292 (US$ 28.7)	2
Revenue / m^3 Rs ($)	0.34 (US cent 0.75)	0.32 (US cent 0.71)	2
Total O&M cost / m^3 Rs ($)	0.25 (US cent 0.55)	0.12 (US cent 0.27)	17
Mandays for O&M / ha	3	4.48	6
Environmental aspects			
Land damage index	0	1.5%	-
Infrastructure developed			
Potential created and used	70%	42%	5

1. Indicates that a Circle is exceeding the level of performance indicated by the target, based on average performance over the past five years.

The report recognises that a single target value, applied to all Circles, is a "simplification" which overlooks the influence of physical and technical characteristics of schemes. It accepts that individual Circles may need to set their own targets, provided these can be justified at state level. Some of the measures of financial administration lend themselves to a single target that may apply across the state, although engineers charged with maintaining particularly old infrastructure may challenge this assertion. The target for expenditure on operation and maintenance is an example of a target based on state level standards of 250 Rs/ ha (US$ 5.5/ha) for maintenance and 350 Rs/ ha (US$ 7.7 /ha), for staff and operations costs, giving a target of 700 Rs/ ha. Setting a *maximum* level of annual expenditure on system O&M appears unusual; the usual concern is for under-spending on necessary maintenance activities. The apparent anomaly is explained by the need to identify, and in the future reduce, the excessive cost of sustaining a large, and frequently under-utilised, unskilled labour force (Converted Regular Temporary labour). Whilst this is a priority need, the concern remains that by calling for a maximum expenditure on O&M, under-spending on maintenance will be implicitly endorsed. One means of overcoming this is to set separate targets for expenditure on management /administration, operations and maintenance, which is the practice adopted in Mexico.

Figure 6 shows the range of expenditure on O&M on major schemes amongst the Circles. Fourteen of the Circles exceed the target expenditure. To move from simple performance assessment to a benchmarking process it will be important to diagnose the causes of the variation in expenditures between Circles, identify those factors which can be improved in the high spending Circles and implement measures to bring about those improvements.

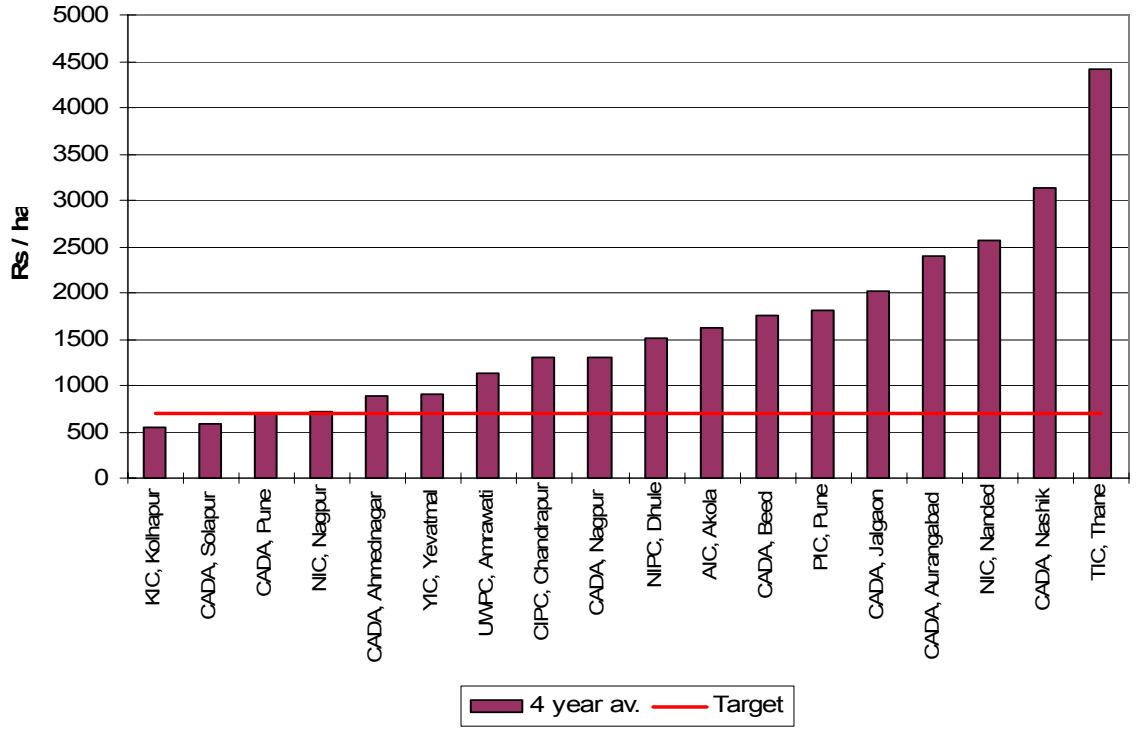

Figure 6 Average expenditure on O&M /ha on major schemes compared with a target of 700 Rs/ha, Maharashtra State

In addition to defining target values, the 2004 report defines ranges for each indicator, making it possible to class a Circle as Fair, Moderate, Good or Very Good with respect to each measure. It remains to be seen how the superintending engineers responsible for each Circle will respond to these targets and classes. The targets may need to be refined according to the characteristics of individual schemes or Circles but if they are widely accepted this will be an important step forward in the application of benchmarking through the definition of "benchmark" values. Maharashtra State appears to be taking a lead in applying targets and performance ranges.

3.3.3 Scaling up and sustaining the programme

Further resources will be required to establish and sustain a benchmarking programme that embraces all 52 major, 206 medium and 2,402 minor schemes within the state. Staff at various levels require training to ensure consistency in data collection and processing. For benchmarking to be effective, staff need to see a value or benefit in improving the performance of the schemes for which they have responsibility; there needs to be 'buy-in' to the process by those who must carry it out, which, in turn, requires training and explanation. In addition, there needs to be an overseeing body that will:

a) Provide the detailed definitions of performance measures and ensure they are understood and applied.
b) Agree the basis on which schemes should be grouped so that meaningful comparisons can be made and best practices identified and transferred.
c) Define benchmark standards (targets) for key aspects of performance, which may vary between different groups of schemes.
d) Validate data to ensure that reported levels of performance provide a true picture of what is taking place on the ground.
e) Ensure that there is effective diagnosis of the issues that contribute either to 'best practice' or to under-performance, leading to the implementation of plans that promote wider adoption of best practice and change the practices contributing to under-performance. It will be important to avoid the creation of a 'culture of blame' associated with the reporting of performance and the analysis of 'under-performance' at any level. Such a culture only provides incentives to falsify data and promotes little interest in the identification of constraints and planning to overcome them.

Work has already been carried out through the Water And Land Management Institute (WALMI) in Aurangabad to train staff in the role and purpose of metric performance benchmarking and in the practical aspects of data collection and indicator definition. Work has also been done to define initial, state-wide performance targets with the recognition that these will need to be refined for different types of scheme. This work on targets, together with the co-ordination, preparation and publication of the state level reports, has been carried out by a small staff at the Water Resources Development Centre. The resources required to scale up and sustain the programme as an effective management tool, used at the various levels of administration within the state, have not been quantified but much of the work to date has been absorbed into routine management procedures such that additional costs have been kept to a minimum.

3.3.4 Discussion

Publication of scheme or Circle level performance data for two years running, in the public domain, is evidence that the initial steps of a benchmarking process, namely

planning, data collection and *presentation* are in place. The recent definition of benchmark values or targets provides a basis for effective *analysis* and identification of the causes of different levels of performance. Discussion with superintending engineers suggests that the analysis of performance data is leading them to bring about change in the schemes under their control to improve performance. It is not yet possible to provide documentary evidence of "planning – action – change" driven by the benchmarking process, but the indications are that these more difficult steps of the process are being taken seriously. It is also premature to judge whether such changes will lead to qualitative or quantitative improvements in service as perceived by irrigators.

The following aspects of the benchmarking process in Maharashtra merit specific comment:

a) Ownership of the process

The benchmarking process has been owned and promoted by the permanent secretary responsible for command area development. Training has been provided to staff at all levels of the administration. This has not only focused on the mechanics of what data to collect and how to report performance indices but has also encouraged senior staff to carry out the analysis of the factors within their control that result in differences in performance. Through this training, the concepts of benchmarking to monitor and improve performance and service delivery are being assimilated by a large number of managers. They, in turn, are aware that staff at the highest level are focused on aspects of scheme performance that can be influenced by their management and thus they are looking at the outcomes and how performance can be influenced. It is likely that ownership and 'championing' of the benchmarking process by senior management, who have power to effect change, is a key precondition for effective benchmarking.

b) What is driving the process?

The use of benchmarking as a management tool is part of a broader awareness of the need for reform within the sector. Benchmarking is not driving reform in the sector. Rather, the willingness to use the benchmarking process to examine scheme management and levels of performance is fuelled by more fundamental changes occurring within the culture of the Irrigation Department and the public sector in general. There is a shift away from a focus on the construction of new infrastructure – creating irrigation potential – towards a focus on exploiting that potential through better management of the systems. Furthermore, in common with irrigation in many parts of the world, there is increasing competition for water from the municipal and industrial sectors and growing reluctance on the part of the state government to continue subsidising the O&M costs of schemes. This is forcing the Irrigation Department to improve the productivity of water, reduce costs and improve levels of cost recovery. Hence, water and financial management are identified as the priority aspects of performance on which to focus.

c) Selection of performance measures

In common with almost all agencies that are aiming to benchmark their irrigation management, Maharashtra State has gone through a process of selecting performance indices that are pragmatic and suited to their priority needs. They have moved away from any 'standard set' of performance measures – either those listed at the Indian national workshop in Hyderabad or those set out in the IPTRID guidelines for benchmarking. At present, they have no effective measure of the seasonal match between irrigation supply and crop demand nor any indicator that indicates the delivery of an agreed level of service, such as a specified water entitlement. However, the index of the equity of water distribution between head, middle and tail reaches of a scheme is

a useful proxy measure of the relative level of service delivered to users in different parts of a scheme. This index has not been adopted by other irrigation service providers so far.

d) Grouping schemes for effective performance comparison

Direct comparison between Circles and the use of a single, state-level target for any performance measure may not always be helpful, as the physical and agronomic factors that influence many of the performance outcomes will often override the effects of any managerial factors. Thus, there remains the need to group schemes, or Circles, with similar physical and agronomic characteristics. One obvious basis for such grouping would be the nine agro-climatic zones within the State. If schemes and Circles are not grouped there is a concern that where analysis of the factors influencing performance is carried out it may not go beyond the identification of factors such as soil or crop type.

Much of the useful diagnosis of the factors leading to differences in performance will need to occur at lower levels of administration, involving staff who are most aware of management practices and the factors that constrain or enhance performance outcomes. Such analysis and discussion between managers is occurring but the outcomes are not recorded in the formal annual report.

e) The present range of performance

There is a very large variation in the levels of performance recorded for each of the 11 performance measures. Table 14 illustrates this range based on five year average values reported for the 18 Circles with major schemes.

Table 14 Variations in performance values based on 5 year average figures for major schemes, aggregated to Circle level

Indicator	Lowest value	Highest value	Factor difference
System operation			
Irrigation supply m^3/ ha	6,003	50,336	8.4
Equity head/middle/tail	1% variation	130% variation	130
Agricultural productivity			
Rs / ha	8,089 (US$ 180)	87,295 (US$ 1,940)	10.8
Rs / m^3	0.44 (US cents 1)	9.01 (US cents 20)	20
Financial administration			
Cost recovery ratio	0.09	5.67	63
Total O&M / ha (Rs / US$)	587 (US$ 13)	3,136 (US$ 70)	5.3
Revenue / m^3 (Rs / (US$))	0.01 (US cent 0.02)	0.67 (US cent 1.5)	67
Total O&M cost / m^3 (Rs / (US$))	0.03 (US cent 0.07)	0.25 (US cent 0.55)	8.3
Mandays for O&M / ha	0.2	18	90
Environmental aspects			
Land damage index	0	3%	-
Infrastructure developed			
Potential created and used	10%	85%	8.5

3.4 MEXICO

Table 15 Irrigated area and management type – Mexico

Parameter	*Description*
Total area under irrigation	3,400,000 ha formal irrigation districts 2,900,000 ha smaller irrigation units 6,300,000 ha Total
Number of schemes and range of sizes	83 districts Largest: 233,000 ha Smallest: 750 ha 40,000 irrigation units
Number of schemes where benchmarking has been applied.	2 Districts Total area: 330,000 ha
Description of management type	Management transferred to user associations. Associations set charges and deliver irrigation to users. Government agency retains oversight of the associations' budget management and controls operation of dams and some major canals.
Performance indicators used [1]	System operation 6 Maintenance 2 Modernisation 5 Financial 5 Transparency of management 3 Total 21
Availability of benchmarking data	Only in low circulation reports.

1. Proposed under the PEBIC project and piloted in 2001/02

3.4.1 Development of performance assessment and benchmarking procedures

Since 1998 the National Water Commission (Comisión Nacional del Agua, CNA) of Mexico, working with the Mexican Institute of Water Technology, (Instituto Mexicano de Tecnología del Agua, IMTA) has evaluated three separate initiatives based on the collection and analysis of a wide range of performance data.

SINHDR

The first, and largest of these is the Sistema de Información Hidroagrícola para Distritos de Riego – SINHDR (Hydro-agricultural Information System for Irrigation Districts). This annual monitoring programme captured a total of 93 descriptors and ratios, summarised in Table 16.

Table 16 Variables, descriptors and performance indicators held in the SINDHR system, Mexico

Key aspect	Number of descriptors or ratios held
Land area, land productivity & extent of in-field modernisation	20
Water management, water prices and productivity	20
Expenditure on maintenance, rehab and modernisation	32
Numbers of staff and water users	14
Infrastructure and equipment	7

The primary purpose behind the development of this data collection and processing system was to provide central CNA managers with relatively reliable and annually updated data, allowing them to monitor, evaluate and report upon existing investment programmes and plan future actions. Data collection was carried out at a national level from 1998 to 2001, capturing data at the level of user associations, or 'Modulos' (Modules). All data were processed and held at national level with no opportunity for the modules or irrigation districts to compare their performance with others. It was not considered by CNA to be a benchmarking process and there was no incentive or facility for local managers to share their data and make comparisons – there was a one-way flow of data up to the central agency.

PEBIC

Based on the experience gained from the collection of data and calculation of performance indices within SINDHR, CNA and IMTA identified a reduced number of 21 performance indicators selected on the basis of their ease of calculation and validation and their value as a measure of management performance. Thus, they used data normally held by modules that could be fairly readily cross-checked for accuracy. These indices are summarised in Table 17.

Table 17 Aspects and measures of performance used in PEBIC, Mexico

Aspect and performance index	Units
1 Operation	
1.1 Compliance with seasonal, allocated volume	%
1.2 Conveyance efficiency	%
1.3 Net output per unit irrigated area	Mex $ / ha
1.4 Production per unit irrigated area	Tonne / ha
1.5 Net output per unit irrigation delivery	Mex $ / m^3
1.6 Production per unit irrigation delivery	Tonne / m^3
2 Maintenance	
2.1 Variation from target expenditure	% [a]
2.2 Expenditure on maintenance	Mex $ / ha
3 Modernisation	
3.1 Expenditure on modernisation	Mex $ / m^2
3.2 Cumulative area with modernised infrastructure	Ha
3.3 Proportion of staff trained in modern technologies	%
3.4 Proportion of income from irrigation fees spent training	%
3.5 Percentage of staff identified as having training needs that have been trained	%
4 Financial Administration	
4.1 Ratio of required to actual income	%
4.2 Fee recovery ratio	%
4.3 Actual price of irrigation	Mex $ / '000 m^3
4.4 Allocation of budget between administration, operation and maintenance	%
4.5 Proportion of required fee paid to CNA	%
5 Transparency of management	
5.1 Proportion of defined user meetings actually held	%
5.2 Proportion of module members attending meetings	%
5.3 Transparency in the election of committee members	% [b]

a. Ratio of actual total maintenance expenditure to a target figure defined in the concession document drawn up at the time of transferring management to the module.

b. Defined through a checklist of 6 questions relating to elections. The percentage indicates the fraction of positive responses.

These performance indices were pilot-tested on eight irrigation districts, comprising 34 modules, in administrative region VI, in the north east of Mexico, based on data for the single agricultural year (two seasons) 2001/02. This was referred to as the Programme for Evaluation Based on Performance Indices (Programa de Evaluación Basada en Indicadores de Calidad, PEBIC). The pilot-testing sought to evaluate the ease of obtaining and validating data. It also evaluated a system of point allocation and weighting for the different performance measures allowing a single 'performance score' to be derived for an individual module or district. Whilst these methods were shown to be feasible, the pilot programme made little attempt to feed the performance data back to the districts and modules involved or to diagnose the causes of variations in levels of performance. The results for each district were discussed with CNA and module staff from that district but there was no effective forum for effective debate and comparison between districts, or even to analyse the variations in performance between modules in a single district.

Benchmarking

The benchmarking initiative, as summarised in the IPTRID guidelines, has been evaluated on two irrigation districts in the north west of Mexico. It was applied in the Rio Yaqui District by an independent consultant, funded by IPTRID and working with IMTA in early 2002, using data for the agricultural year 2000/01. The entire district covers 227,000 ha divided into 42 modules, but performance data were collected and presented for 5 modules and the federation that operates the main canal system. A second report was prepared by IMTA in November 2002 presenting data for the same modules for the year 2001/02. This application used the performance indicators and their definitions set out by Malano and Burton (2001) in the IPTRID guidelines and presented data for 27 of those indicators. Data were not available for environmental performance indicators relating to the biological and chemical quality of irrigation and drainage water.

Neither of the reports provides analysis of the factors leading to differences in performance – they present benchmarking data but no evidence of the wider benchmarking process with data used by the modules as a basis for discussion, analysis and management planning.

Under the present DFID KAR project, HR Wallingford worked with IMTA staff to evaluate the benchmarking procedure on the Rio Mayo irrigation district. This is a scheme of about 97,000 ha operated by 16 modules and a federation – the Sociedad de Responsibilidad Limitada (SRL) – overseeing the main canal and drainage systems and water distribution to the modules. The evaluation used the smaller number of performance measures listed in Table 18, which were considered to be of greater importance and relevance to the management teams in the modules. Data were collected for the five agricultural years from 1998/99 to 2002/03.

Table 18 Aspects of performance evaluated on Rio Mayo district, Mexico

Aspect and performance index	Units
1. Operation	
Net depth applied	mm
Conveyance efficiency	%
2. Productivity	
Gross water productivity	Mex $ / m^3
Gross land productivity	Mex $ / ha
3. Financial administration	
Income per ha from fees	Mex $ / ha
Allocation of budget between administration, operation and maintenance	%

These aspects of performance were analysed and reported back to a meeting of the management teams of the modules and the SRL in a workshop with a view to promoting discussion and diagnosis of the causes of variation between the modules and over time. The following key issues were identified in that meeting:

1) It was a novel experience for the staff to engage in open discussion and diagnosis of such data.
2) There was a strong tendency to put forward justifications for a given level of performance but less willingness to try and identify issues where changes might be made to improve performance.
3) Table 19 lists the key factors that were put forward as the causes of variation in levels of performance. The modules argued that there was limited scope for them to influence performance – the attitude was that they were constrained by what they had.

Table 19 Issues identified by modules as the key factors influencing relative performance, Rio Mayo, Mexico

Operation – depth applied conveyance efficiency	Land and water productivity	Financial administration
Crop selection – some modules have larger areas of water demanding crops. Soil type – modules on sandy soils adjacent to the river course report higher water duties and lower conveyance efficiencies. Compacting of irrigated areas in some modules – water shortage and outward migration of landowners reduces total area irrigated. Modules supplying water to a single contiguous land area show higher conveyance efficiency. Attitude of field labour – modules report variation in attitude and skills of field irrigators partly influenced by the method of payment (per hour or per hectare irrigated). This affects water duties.	There are significant differences between modules in the amount of land planted to high value horticultural crops – primarily potatoes. This is the primary cause of differences in land and water productivity. The consensus view is that the differences are due to differential access to credit, different attitudes to risk and access to limited markets. It was not considered to reflect any differences in the level of irrigation service in different parts of the scheme.	Modules suggested that variation in soil type and the contribution of farmers' direct labour in channel maintenance in some modules, influenced the percentage spent on maintenance. There was agreement that some modules could benefit from better training of their administration staff to manage budgets.

3.4.2 Scheme comparisons, targets and norms

Mexico has a great diversity of climate and consequent variation in irrigated agricultural systems. Almost every one of the performance indices based on the SINHDR database reflects this variation in the range of values they present. Figures 7 is an example of such variation relating to irrigation duty. The figure shows the average annual water duty recorded in the 13 administrative regions into which CNA divides the country. A fourteenth column shows the overall, national average.

To permit an irrigation district, or a module within a district, to judge its performance in any aspect, locally valid norms or standards must be defined. This requires the definition of an appropriate basis by which to group and define comparable schemes. Despite the availability of a large amount of data in the SINHDR database for the period 1998 to 2001, neither CNA nor IMTA have initiated the work required to define appropriate standards. If regional norms are not defined modules should at least be able to compare their performance with other modules within the same district.

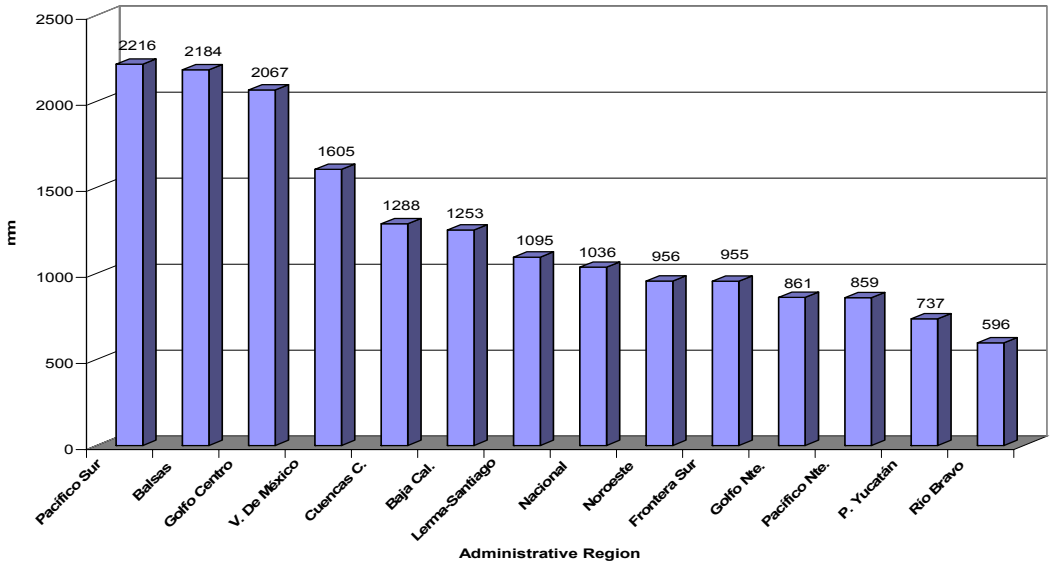

Figure 7 Average gross irrigation depth applied in each administrative region (1998/99), Mexico

3.4.3 Discussion

The development of database software and data collection exercises, represented by the national SINHDR and pilot PEBIC programmes, are major programmes of work. They have brought together large amounts of data at the national level and represent a refinement process, moving from the collection of 93 variables to a smaller set of 21 performance indicators. However, these programmes have the following characteristics that limit their role as a benchmarking tool:

a) There is little evidence that local or regional managers are engaged except in the initial data collection process. There is no mechanism whereby managers could

readily access the data of their peers, as the movement of data was from the field, up the hierarchy, to the national level where it was processed and retained.

b) There is no programme in place to publish or disseminate the performance data. Data for the first year when the SINDHR programme was applied (1998/99) were made available to CNA's national offices in a low circulation report. This presented the data in graphical format without interpretation or analysis.
c) The PEBIC pilot did involve module mangers and regional CNA staff in the selection and definition of performance indices and staff from the modules and districts were involved in checking the accuracy of their own data. However, there was no opportunity for managers to review the larger data set or analyse the causes of variations in performance.

The evaluation of the IPTRID benchmarking process, at least amongst the 16 modules of Rio Mayo, did present the performance data to module managers. By highlighting areas of variation in performance, discussion of the underlying causes was achieved. However, it was not possible to identify specific 'good practice' that led to better performance, nor was it possible to identify specific actions that might address under-performance.

The recent, larger programmes of performance data collection have not attempted to promote performance comparisons and analysis at any level. Rather, work has focused on the collection and storage of data and on the issues relating to the validation of data. It may be argued that because modules and districts have failed to see any benefit from the submission of data to a remote agency, they have given little attention to checking its consistency and accuracy.

The transfer of responsibility for O&M to the modules means that CNA no longer has automatic access to the data sets required to evaluate performance. Furthermore, although CNA retains a genuine interest in promoting improved performance at district and module level, it does not consider it a priority to invest the human and financial resources required to launch and sustain a programme of benchmarking amongst the 457 modules on 82 irrigation districts.

The absence of a strong, national champion for performance benchmarking has led to a confusion between benchmarking and national requirements for the monitoring and evaluation of investment programmes. Where this project piloted benchmarking by engaging 16 module managers, there was enthusiasm for the opportunity to compare and discuss data but no evidence that managers saw sufficient benefits from the process to adopt it as part of their management.

3.5 SRI LANKA

Table 20 Irrigated area and management type – Sri Lanka

Parameter	*Description*
Total area under irrigation	390,000 ha Major and medium schemes)0 ha Minor schemes)0 ha Total
Scheme sizes	Major > 800 ha Medium 80 - 800 ha Minor < 80 ha
Number of schemes where benchmarking has been applied / piloted.	Baseline data reported for 95 schemes > 400 ha
Description of management type	The Irrigation Department, Mahaweli Authority and Provincial councils have responsibility for the operation and maintenance of all medium and major schemes. Minor schemes are managed by the users. WUAs exist on some of the larger schemes but their area of responsibility is limited to management below branch canal level. All important management decisions are taken by ID staff with some farmer consultation in pre-seasonal planning meetings. The Irrigation Department retains a strong hierarchical structure and has a dominant influence over levels of scheme performance.
Performance indicators used	Annual cropping intensity 1 Length of irrigation season 1 Seasonal irrigation duty 1 Seasonal water duty 1 Total 4
Availability of benchmarking data	Unpublished reports and memos circulated within the Irrigation Department.

3.5.1 Development of performance assessment and benchmarking procedures

The performance assessment, or benchmarking, programme in Sri Lanka is an example of a programme driven by a single, influential individual. Formal, on-going performance assessment and diagnosis on a wide scale began in 1997 with the appointment of H. M. Jayatillake as Deputy Director of Irrigation, responsible for the Irrigation Management Branch, within the central offices of the Department[2]. His use of a small number of key indicators to evaluate performance, diagnose the factors influencing performance and then recommend changes in agronomic and water management practices, pre-dates the launch of the performance benchmarking initiative by the World Bank, ICID and others.

The programme uses just four indicators relating to the seasonal management of water:

1. Annual cropping intensity = Total area irrigated and harvested over two growing seasons
   Total scheme command area

[2] This material is based on personal communication with Jayatillake and his paper of 2004

2. Length of irrigation season (days) = Time from start of first water issue to end of last issue.

3. Seasonal irrigation duty (depth) = Total volume of irrigation water supplied at headworks
   Area irrigated during the season

4. Seasonal water duty (Depth) - as for indicator 3 but including the contribution of effective rainfall.

   These four indicators were selected on the basis of:
   - Availability of data
   - Ease of use and interpretation by managers
   - Need to measure seasonal rather than annual performance
   - Potential for making interventions leading to improvement

This last point suggests that the performance assessment programme aimed to quantify the current situation in aspects that were known to be weak, in order to justify a prepared set of interventions. The programme is very focused and excludes any measurement of financial management, land or water productivity or the effects of irrigation on the environment.

Average annual cropping intensities were calculated for the five year period from 1993/94 to 1997/98 for 95 schemes with command areas greater than 400 ha. These data are shown in Figure 8.

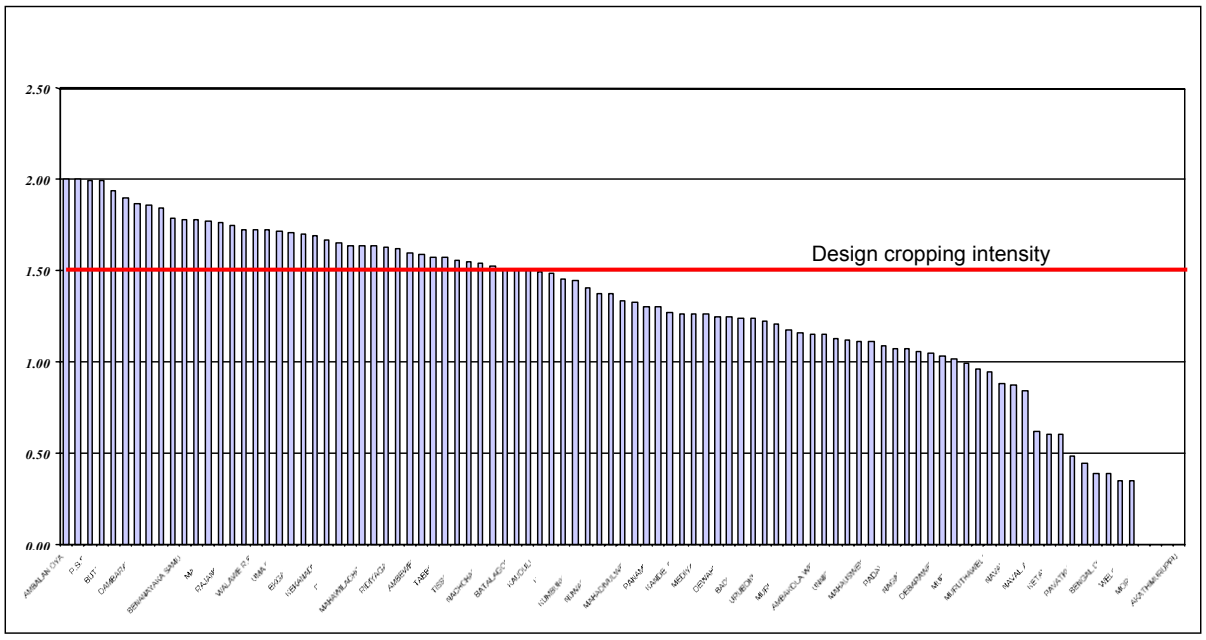

Figure 8 Average annual cropping intensities (1994 – 98) for major schemes over 400 ha in Sri Lanka

Using the nationally adopted, annual cropping intensity of 1.5, assumed for scheme design and the calculation of future cost and benefit streams, the 95 schemes were classified into those falling above and below this cropping intensity.

Seasonal data sets have also been assembled for irrigation duties for 53 schemes. Figure 9 shows the very large range of duties reported. The lower values below 2 ft (600mm) probably reflect calculation errors (possibly based on mis-reporting of the irrigated area) rather than genuinely low duties.

It is difficult to identify how the ranges in performance level shown in figures 8 and 9 lead to the fundamental interventions proposed by the Irrigation Department aimed at reducing seasonal irrigation duties and increasing the volume of water carried over in storage between the Maha season (north-east monsoon) and Yala (south-west monsoon).

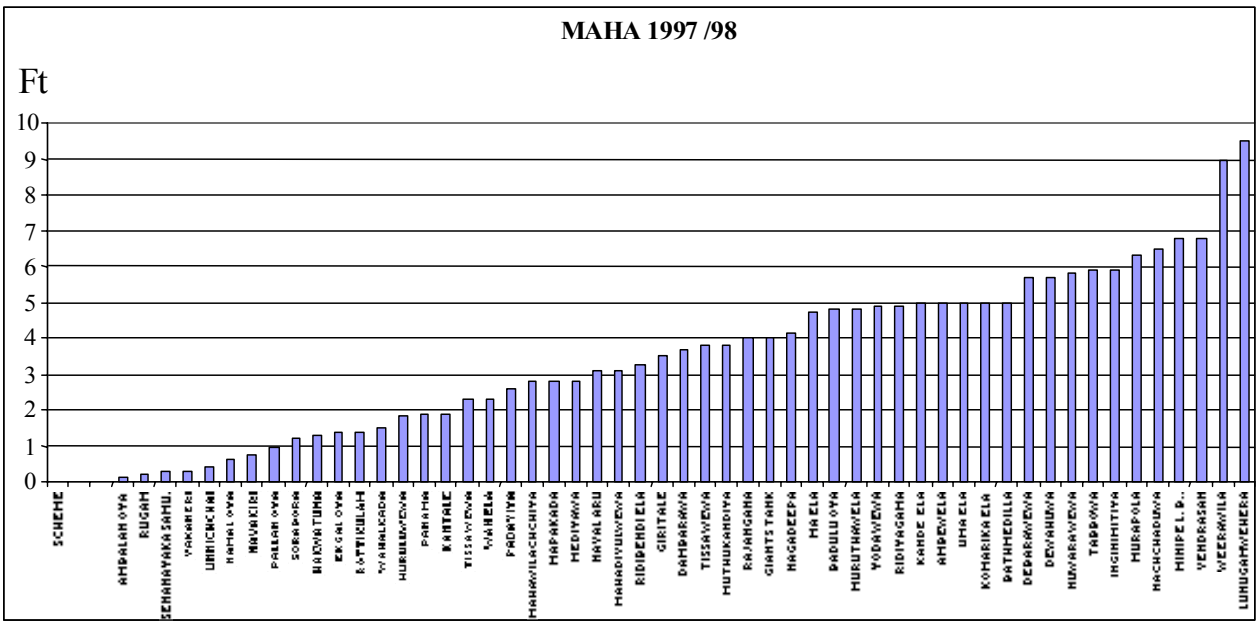

Figure 9 Irrigation duty (feet) reported from 53 schemes for Maha season 1997/98

The proposed interventions are:

1. Promote the use of shorter duration rice varieties replacing 120 –135 day varieties with 105-day varieties.
2. Reduce the length of issue period for both seasons to between 126 to 133 days.

Reduction of the length of the issue period is greatly facilitated by the adoption shorter duration varieties but there is some scope to reduce the season length through better pre-season planning and tighter adherence to agreed schedules. The Agriculture Department has traditionally recommended longer duration varieties on the basis that these are higher yielding than short duration varieties. However, the Irrigation Department has successfully demonstrated that the short duration varieties can give equal yields when grown at lower altitudes, with higher daytime temperatures, and most irrigated areas are in warmer areas than the plant breeding stations. The Agriculture Department has accepted that the benefits of water saving and consequent increased annual cropping

intensity outweigh any yield benefits associated with the long duration varieties, and are therefore now producing and recommending seed for the short duration rice varieties.

The switch toward short duration varieties and tighter control of the seasonal release periods are important changes which should lead to an increasing number of schemes regularly achieving annual cropping intensities above 1.5. However, it is difficult to argue that it is the process of benchmarking – comparison with peers and identification of best practice – that has led to these recommendations being made. (See 'Discussion' below).

3.5.2 Scheme comparisons, targets and norms

An informal procedure, referred to as the identification of 'sore thumbs', is in place where regional mangers may be asked to account for poor performance in any of the monitored areas, at regional and national planning workshops. However, the process is informal and the only incentive to improve performance is the desire to be recognised by peers as 'doing well'.

Presently, schemes are only grouped by administrative region. There is no attempt to group on the basis of climate, degree of water scarcity, soil type or other characteristic. These factors may often be cited as the cause of differing levels of performance within a region but this diminishes the opportunity for the effective comparison of similar schemes and the identification of transferable 'good practice'.

A number of target values or ranges are used implicitly in the interpretation of performance data and managers and farmers agree the intended first and last issue dates, and therefore season length, at the pre-season planning meeting. However, there are frequently pressures brought to bear by farmers and local politicians to extend the actual season duration, and it is not clear how adherence to an agreed pre-season target is monitored. The target annual cropping intensity of 1.5 is a general target value that has been used to identify schemes described as having 'high water potential', (Jayatillake, 2004). These are schemes considered to offer higher levels of land and water productivity which are now candidates for higher levels of capital investment under the Granary Area Programme. This is an example of performance assessment used as a basis for investment planning rather than as a tool for improving management through the identification and promotion of good practices.

3.5.3 Discussion

The baseline performance assessment that was carried out displays a broad range of levels of performance. However, the recommendations for intervention do not appear to be based on existing 'good practice' identified through performance comparisons and the diagnosis of current 'best practice'. Rather, the recommendations propose changes to the selection of crop varieties and water management which could be applied on all schemes. The Sri Lanka programme may therefore be better described as performance assessment or diagnostic analysis, rather than a programme of performance benchmarking, which implies comparison with and learning from an external organisation or competitor (Malano and Burton, 2001). In practical terms, the difference is small and the outcome of either diagnostic analysis or benchmarking is to bring about an improvement in performance, based on a better understanding of present practice and identification of possible avenues for improvement. The distinctions between metric and diagnostic benchmarking and the more general, performance assessment, are often difficult to delineate. Whilst academics can write at length on the

apparent differences it may be more important, at a practical level, to recognise and encourage managers who are measuring, diagnosing and acting to improve selected aspects of performance. Whether the process adopted conforms to benchmarking, diagnostic analysis or performance assessment is entirely secondary.

Other salient features of the performance assessment, or benchmarking, programme in Sri Lanka are:

Performance measurements are restricted to four indicators relating to water and crop management. The programme does not consider financial management of schemes, environmental factors or productivity, measured as the financial return to land and water use. This appears to reflect well-defined objectives of the programme manager who has focused on the gathering and presentation of performance data to support clearly defined, agronomic and water management interventions. Other aspects of scheme performance are presumably not considered to have the same priority and thus they are not yet being measured and brought back to the attention of scheme mangers.

The programme appears to have been established and sustained by the work of a single, well placed 'champion'. Few, if any, additional resources have been used to train staff or publish data in a format that is widely distributed. A consequence of this is that the process and the management 'culture' that it promotes may not be widely adopted by the Irrigation Department.

To reflect performance differences between the two separate seasons in every year, and to allow better diagnosis of carryover effects between seasons, the Sri Lanka programme monitors and reports performance on a seasonal rather than annual basis.

4. Lessons arising

This Section draws primarily on the information set out in Section 3 but some of the analysis is supported by reference to presentations and discussions which took place at the international forum on irrigation performance benchmarking, held in Aurangabad, Maharashtra on 19th –20th January 2005.

Table 21 provides a summary of the benchmarking programmes from the five countries, or states, reviewed in Section 3.

Table 21 Summary characteristics of five country studies

Country	Total irrigated area (ha)	Number of schemes benchmarked	Indicators measured										Performance data published?	Stage of adoption
			Operational	Financial	Productivity	Customer	Water entitlement	Social	Environmental	Infrastructure	Transparency	Total		
Australia	2,500,000	66	9	9	-	9	8	6	28	-	-	69	Yes	Mainstream
China	15,800,000	18	4	6	3	-	-	-	-	-	-	13	No	Pilot evaluation
Maharashtra	1,748,000	254	2	5	2	-	-	-	1	1	-	11	Yes	Mainstream
Mexico	3,400,000	2	4	5	2	-	-	-	-	7	3	21	No	Pilot evaluation
Sri Lanka	560,000	95	4	-	-	-	-	-	-	-	-	4	No	Narrow adoption

4.1 THE OBJECTIVES OF BENCHMARKING

The report of the ICID's Task Force on benchmarking (Malano *et al*., 2004a) states that, "The overall aim of benchmarking is to improve the performance of an organisation as measured against it mission and objectives". However, it remains the exception, rather than the rule, to find an irrigation service provider that can provide a concise statement of its mission and objectives. While most irrigation agencies have a 'general sense' of what they are mandated to do, this is seldom translated into a set of objectives or targets that are recognised and accepted by different levels of management within the organisation.

Although irrigation service providers may not be able to clearly state their mission or objectives, there is a consensus, amongst senior staff, that there is a need to 'improve performance'. This normally relates to improving the productivity of resources such as water, land, past investment in infrastructure or the annual budget allocated for operation and maintenance. This need to 'improve performance' was reflected in the presentations made at the Aurangabad forum and underpins the interest shown in performance benchmarking. Table 22 summarises the specific drivers leading to the adoption of benchmarking and the objectives that benchmarking might realise, as identified in six country presentations made at the forum.

Increasing water scarcity is a common driver cited in four of the six presentations and those same four presentations identify 'increasing productivity', of land or water, as an objective of benchmarking. However, these are high level objectives, applying to the irrigated agricultural sector as a whole and of interest to national planners and policy makers. They may not be the primary objectives of scheme level managers who may be more concerned to satisfy farmers' demands, minimise farmers' complaints and manage their limited budgets to best overall effect.

Australia stands out amongst the countries reviewed in not having a hierarchical and bureaucratic management structure. (Mexico has taken some steps away from public sector, hierarchical management, but management of the main canal system often remains with the state agency and the benchmarking programme has been driven by the central administration and a research institute – CNA / IMTA). It is significant that the Australian programme, which has been shaped directly by scheme level managers responsible for water service delivery, excludes measures of water and land productivity, but includes numerous indicators that describe the business process and customer service in detail.

Table 22 Drivers and objectives of benchmarking identified by country representatives at the International forum, Aurangabad, India

Country	Drivers	Objectives
Australia	• Need to defend the industry's position and current water entitlements • Need to have good data and demonstrate good management practice	• Permit providers to gauge their own performance and raise awareness of industry developments
China	• Serious water scarcity • Poor quality and deteriorated infrastructure • Need to raise levels of rural income	• Increase water productivity allowing transfer to other sectors • Obtain better data at national level • Use data to plan investments in modernisation
Egypt	• Increasing water scarcity • Need to improve cost recovery	• Increase agricultural production • Reduce the amount of water waste • Providing sustainable system maintenance • Achieving good standards of drainage water quality • Sustain soil fertility
Maharashtra	• Increasing water scarcity • Need to monitor and balance revenue and expenditure	• Obtain better data for management • Raise agricultural productivity • Improve equity in water distribution
Malaysia	• Competition for water resources • Need to increase food production	• Increase productivity • Raise yields
Mexico	• Water scarcity • Need to promote more effective management	• Obtain data sets to plan and monitor investments in modernisation • Increase water productivity
Sri Lanka	• Increasing water scarcity • Need to reduce reliance on rice imports, i.e. increase national rice production	• Identify performance trends • Identify causes of under-performance • Establish performance assessment as a routine practice

Where national level planners shape the benchmarking programme the outcome will reflect their interests and objectives rather than those of scheme managers. If there is

sufficient overlap of drivers and objectives, scheme managers may actively engage in data collection, comparative performance analysis, diagnosis and the planning of change. However, in countries such as China, Sri Lanka and Mexico, the benchmarking process has remained confined to a small national group. This may be because insufficient time has elapsed to allow the programme to move from pilot evaluation to widespread adoption by scheme managers. However, it may also be that there is little overlap between the drivers acting on national planners and managers and those acting on scheme level managers and their staff. Where this is the case, benchmarking will remain a tool of the national planers that formulate it, with little effective adoption by scheme managers.

It is therefore vital that the objectives of a benchmarking process are clear from the outset. The different drivers and objectives that exist at different levels in a management hierarchy must be recognised and it must be clear which levels of management are expected to engage in and use the benchmarking process. There may be a need to rationalise or clarify the drivers that managers at different levels are responding to, but this must precede the effective introduction of benchmarking. Benchmarking itself can only assist managers to respond to drivers, it cannot determine what the drivers and consequent objectives are.

4.2 SERVICE DELIVERY AND FARMER INVOLVEMENT

Malano and van Hofwegen (1999), Burt and Styles (1999), and Murray-Rust and Snellen (1993), argue that the level of service delivered to a farmer is best defined in terms of the adequacy, reliability, equity and flexibility of the supply. For any irrigation system, physical and institutional factors determine the level of service that it is practical to deliver. Physical factors include the design and condition of the irrigation infrastructure, the available water resources and the presence of sediment in the water supply. Institutional factors include how well water entitlements are defined, the organisational structures responsible for operation and maintenance of systems at different levels and the competence and motivation of field staff. These aspects of service delivery are well understood and documented but it remains unusual to find irrigation service providers in the public sector that have consulted with farmers and quantified the level of service that can be delivered and against which they can be judged.

The lack of clearly defined levels of service is apparent in the selection of performance indicators used in the benchmarking programmes reviewed in this study. The IPTRID benchmarking guidelines make frequent reference to the potential contribution of performance benchmarking in improving the level of service provision but the list of performance indicators proposed include only one measure of the adequacy of supply – the annual relative water supply.

Amongst the countries reviewed, Australia gathers the largest amount of data relating to service delivery and customer satisfaction. Table 23 lists the types of data reported. Much of the data describe how different systems define water entitlements or levels of service but some quantitative data, indicating whether agreed standards have been met, are also included. It is an assumption amongst the Australian irrigation service providers, and their customers, that these aspects of service delivery and customer satisfaction will be defined and monitored. None of the other country programmes are so comprehensive in their assessment of service delivery. Several include no reference to the adequacy, reliability, equity or flexibility of supply, either because the

measurement of these attributes is technically demanding or more fundamentally, because there is no formal agreement on what the level of service should be.

Mexico is the only other country that includes a measure of compliance in delivering the seasonally allocated volume, where that volume is known and monitored by both the user module and the service provider. However, the mechanism by which a seasonal water entitlement is defined derives from the larger process of reform and legislation in the water sector. The benchmarking process simply monitors compliance with agreed practice. Maharashtra is unique in reporting an equity index between head, middle and tail portions of systems. However, as yet there is no formal agreement between the state Irrigation Department and farmers or farmer groups over what is a minimum, acceptable level of equity.

Table 23 Indicators of levels of service delivery and customer satisfaction used by ANCID

Water entitlements and trading
1. Water entitlement – lists the elements included in the entitlement, for example: Entitlement volumetrically defined Entitlement includes definition of pressure r flow rate Entitlement includes definition of water quality
2. System reliability: Fraction of the entitlement classified as 'high reliability' Percent of years when high and low reliability entitlement is delivered Mean annual proportion of the entitlement actually delivered.
Customer service
1. The roles played by customers in management of the business, for example: Organisation Business Plans Business management Setting of charges Irrigation Supply Operational Plans Drainage Strategies Environmental Management Strategies Land and Water Management Strategies
2. Are customer service standards documented?
3. List the elements included in the standard of service agreement, for example: Water ordering frequency and procedures Timing of delivery relative to order placement Delivery flow rates Delivery water quality Water pressure / head at the farm gate Supply Interruptions Customer information / feedback
4. Does the business have ISO 9001 accreditation?
5. Proportion of customers in different types of ordering system On demand On demand with ordering Etc
6. Minimum expected time between order and delivery
7. Proportion of order delivered by agreed date
8. Does the Business have a formalised customer complaints process?
9. Does the Business carry out customer satisfaction surveys?

This raises the issue of the degree of awareness and involvement of irrigators in performance benchmarking. Three out of four discussion groups at the Aurangabad forum considered the question,

"Is it appropriate and practical to involve farmers in any part of the benchmarking process?"

All three concluded that farmer involvement is desirable and one proposed the inclusion of a questionnaire to gauge the level of farmer satisfaction with the irrigation service. While this may be a useful, interim measure it ought not substitute for the definition of attributes of service such as water entitlement and the reliability of supply at the point of delivery to a user or user association. At present, with performance benchmarking only recently established, it is too soon to comment on the practicality and benefits of ensuring farmer involvement in the benchmarking process. The World Bank's earlier proposal for 'Holistic benchmarking' included the use of user score cards to assess the satisfaction of customers, but this has not been widely pursued or integrated within the metric performance benchmarking initiative. Efforts may be better spent ensuring the active participation of system managers, who are the intended beneficiaries of benchmarking as a management tool.

4.3 SELECTING BENCHMARKING INDICATORS

Section 2.1 of this report described some of the indicators used by different groups and agencies in the water supply and sanitation sector and highlighted the conclusion drawn by the World Bank that: " it is difficult to agree on a universal set of indicators and their detailed definitions", and that, "the usefulness of an indicator, and its likelihood to be monitored, varies across countries". This study indicates that the same conclusions apply in the irrigation and drainage sector.

Whilst international researchers and academics are keen to see a uniform set of performance measures applied across a range of countries and system types, national agencies see less value in such international performance benchmarking. Where they see the potential value of benchmarking they are keen to apply it within their own national setting, taking account of their specific drivers and objectives (see Section 4.1).

Table 21 shows that there is considerable consensus in the aspects of performance that are measured and in some of the individual indicators used, but the details of indicator definition frequently vary between countries. At this time, national agencies are still working to ensure that the definition of indicators is consistent at the national level. Rightly or wrongly, they have little interest in ensuring international consistency, even when they are dealing with the same concept.

In all five countries reviewed, the selection of performance indicators has evolved over time and remains fluid, as the users gain experience with the collection, analysis and diagnosis of the data. Both Australia and Maharashtra, where the process has been mainstreamed, have made annual changes to the number of indicators used and the format of their publication.

Australia is unusual in its reporting of a large number of indicators, many of which are process descriptors. Other countries have so far given little attention to the accurate and consistent description of schemes in a way that facilitates the comparison of like with like or the identification of practices that enhance performance when compared with

peers. This may develop as the process matures. The present trend is to narrow down the number of performance indicators reported, monitoring those for which data are readily available and which are consistent with the priority concerns and objectives of senior, national managers.

4.4 ENSURING DATA QUALITY

Ensuring that the definition of parameters is consistent and that data submitted are accurate is essential for a benchmarking programme to gain credibility. Without accurate data, the diagnosis of apparently 'good performance' will quickly reveal errors in the underlying data and published data will be ignored. Discussion of this issue at the Aurangabad Forum concluded that a virtuous cycle could be established in this regard. Where the transparency of data sets is ensured and data are effectively distributed amongst managers, the accuracy of data is likely to improve, as those submitting it will self-check. Where staff know that the data they are collecting or processing are used to make decisions they may take greater care. However, this does not avoid the need for considerable resource input when a programme is established. Consultation is required to agree the accurate definition of parameters. Wide-scale training is then needed to ensure that the definitions are understood by all those involved. Where a programme attempts to manage data from several hundred schemes or WUAs a substantial training programme is required, which should go beyond the definition of individual parameters to explain the objectives of the benchmarking process and its application.

In all the countries reviewed, an external institution, consultant or group of staff within a government ministry, has been given the responsibility of establishing and overseeing the evaluation and promotion of the benchmarking programme. Staff in those groups have normally spent many hours checking data sets and contacting schemes to verify or re-calculate data. If the benchmarking process becomes established and used effectively this need to review how data have been derived should diminish, but it is an important and unavoidable start-up cost.

Several participants at the Aurangabad Forum commented on the desirability of automating data collection, either through the use of an Internet based system or using standardised data collection templates distributed on disk. The concern was also raised that flow measurement structures may require repair and re-calibration, given the renewed interest in water management data. Even before the benchmarking process begins to promote change through the identification and emulation of 'best practice', this concern to improve the accuracy of water management and other data could be considered as a beneficial spin-off of the initiative.

4.5 SELECTING PEER GROUPS FOR EFFECTIVE PERFORMANCE COMPARISON

Classification of irrigation schemes is not a simple task. Classification based on a single characteristic such as size or the method of water control and scheduling, is often used, but a wider framework that draws together the range of factors that influence the performance of an irrigation scheme is not widely available. Makin and Moulden (unpublished) describe a classification system developed within the International Water Management Institute, that classifies schemes with respect to six aspects. This is summarised in Box 2.

Box 2 Characteristics of schemes used in IWMI's simplified classification

Aspect	Proposed types			
Climate	Dry/intermediate	Dry/wet	Intermediate/wet	
Water source	Reservoir	Groundwater	Conjunctive	
Size	Medium	Large		
Service type	Semi on-demand	Supply		
Crop	Rice/diversified	Diversified		
Management	Agency/farmer	Farmer		

The classification has not been tested rigorously but it demonstrates the large number of different types of scheme that can be described. These six aspects and their 'types' create 1,296 possible categories of scheme, leaving aside consideration of soil type, age and density of infrastructure, and many other physical and institutional factors. Many of the categories will exist in theory rather than practice but it remains clear that numerous different factors can interact to determine both the actual and potential levels of performance. On this basis it can be argued that every irrigation scheme is unique – a position which is endorsed by the ICID Task force on benchmarking (Malano *et al,* 2004a). However, although no two schemes are identical, pragmatism suggests that it is normally possible, within an area, to group schemes according to the dominant parameters that influence a given aspect of performance, such that useful lessons can be drawn from comparisons made between them. This recognises that the membership of a 'peer group' of similar schemes may vary according to the aspect of performance considered.

While it may be difficult to defend a given grouping of schemes for comparison using rigorous, quantitative criteria, 'pragmatic classification' grouping broadly similar schemes should be possible.

4.6 SETTING PERFORMANCE TARGETS

For the majority of performance measures, the setting of a benchmark target is only meaningful once schemes that have similar characteristics with regard to that aspect of performance are grouped together. Applying a single target value or range across different types of scheme runs the risk of bringing the target, and possibly the wider benchmarking process, into disrepute.

Table 24 illustrates that amongst the five country programmes reviewed there is very little use of agreed performance targets and little work done at a national programme level to permit schemes to be grouped pragmatically such that meaningful performance comparisons can be made.

Table 24 Use of performance targets and groups for scheme comparison

Country/State	Use of performance targets	Schemes grouped for comparison
Australia	None	Grouped by 'carrier type' for comparison of conveyance efficiency. No other grouping in the published, national report.
China	None to date but may consider setting on a scheme-by-scheme basis.	Concluded that inter-scheme comparison may be misleading and prefer to compare individual schemes with their past performance.
Maharashtra	Yes. Targets defined with ranges.	Single target values applied uniformly to all schemes. Schemes grouped by administrative Circle for data presentation.
Mexico	Limited	Schemes grouped by administrative area
Sri Lanka	Limited	Schemes grouped by administrative area

Maharashtra is the only programme that has proposed performance targets for all of the 11 performance indicators presently monitored. However, schemes have only been grouped on the basis of administrative areas. The weakness, or potential danger, of applying a single value across the wide range of system types that exist within the state has already been commented upon (See 3.3.2) and this is recognised by those implementing the programme.

CNA, Mexico, does have approximate target values for the distribution of a module's income between operation, maintenance and administration. Their guidelines are that modules should spend no more than 35% of their income on operations, less than 15% on administration and at least 50% on maintenance. These general targets cannot take account of individual scheme characteristics such as those that are heavily reliant on groundwater pumping, where operating costs will inevitably be higher. Nevertheless, the figures provide a point of reference, around which discussion and diagnosis can take place. Similar target values or ranges have not been proposed for any other performance indices within the Mexican programme.

In Sri Lanka, an annual cropping intensity of 1.5 has been used to classify schemes as having a high or low water productivity, but this has been applied without reference to other factors such as water availability, soil type or crop type.

In these three examples, Maharashtra, Mexico and Sri Lanka, targets have been defined by senior management or the group overseeing the collection and analysis of performance data. In Maharashtra the targets are published in the annual benchmarking report which is widely circulated but in Mexico and Sri Lanka the targets are not widely promoted amongst managers. The Australian programme, managed by the independent consultant, Hydro Environmental, has not defined performance benchmarks for any aspect of performance, or gone beyond a very simple grouping of schemes by carrier type. In their view, the selection of comparable schemes and the definition of a performance target to move towards, is the responsibility of individual management teams. China's evaluation of benchmarking has initially concluded that comparisons between any schemes may be misleading, on the basis that each scheme is unique. They conclude that future performance targets should be agreed for each scheme based on a diagnosis of past performance. However, such diagnosis implies a perception of what level of performance a scheme is capable of delivering, which is most likely based on knowledge of other, similar schemes.

In summary, the process of defining groups of comparable schemes and identify and updating realistic performance targets appropriate to those groups, can, at best, be described as being in the earliest stages of development. If target values are fixed, applied globally over different types of scheme and not regularly reviewed they will be counterproductive or at best, ignored. But if they are used effectively, the mutual agreement of target levels of performance, which help to quantify 'best practice', should improve the effectiveness of the benchmarking process. For some indices of performance, if no point of reference, or benchmark, is defined it becomes difficult to judge if a reported level of performance is good, moderate or poor.

4.7 PRE-CONDITIONS FOR EFFECTIVE BENCHMARKING

Performance benchmarking within the irrigation and drainage sector is still at the stage of evaluation or early implementation in all the countries reviewed. It is therefore too soon to set out a definitive list of the conditions that must be met before the procedure can contribute to improving performance, but the following conditions are already emerging.

1. Malano *et al,* (2004a) state that the benchmarking process will only be applied where managers, "embrace the goal of pursuing best management practices within a service oriented management system". The same authors state that this implies a focus on the quality and cost-effectiveness of service delivery. Section 4.2 of this report indicates that service delivery is generally poorly defined. Users must rely on a qualitative assessment of the service they receive and in traditional, public sector systems, managers may regard themselves as having little accountability to the water users. Furthermore, there are few incentives to pursue 'best' and often more demanding, management practices. The reform of these traditional systems and cultures requires fundamental changes in operational practices, funding mechanisms and systems of reward, accountability and promotion. The benchmarking process can be used to highlight the aspects of performance where change is necessary and possible but the establishment of a management culture where managers *want* to improve and *can* implement change must precede this.

2. Where irrigation remains in the public sector, the benchmarking process must be understood and vigorously supported by one or more senior managers, able to oversee the process during its development, evaluation and early implementation. The benchmarking programmes in Maharashtra, Sri Lanka and Malaysia provide examples of this national ownership and championing. Nevertheless, if the programmes are to be sustainable, ownership must extend beyond one or two senior managers. This is achieved when scheme managers and their staff are trained in the use of performance benchmarking and gain an individual interest in performance assessment, comparison with peers and the identification and adoption of improved practice. Such training has taken place in Maharashtra and Malaysia but there appears to have been less active 'rolling out' of the process as a routine management tool in Sri Lanka.

3. There must be effective feedback and exchange of performance data between scheme managers and the body charged with collating and processing the data. Publication of the performance data, and its distribution, in a format that is widely available to all interested parties, can play an important role in achieving effective information exchange. The two programmes which can be considered to have 'mainstreamed' the benchmarking process – Maharashtra and Australia – both publish the results. By contrast, the Mexican programme exemplifies a one way

flow of data from modules up to a small, central team that processes and retains the information.

The Australian programme has seen a need to keep some commercial, business management information, confidential, restricting its circulation to members of a group who have signed a confidentiality agreement, but within this group, information exchange is assured.

The publication of performance data must not be regarded as the end point of the benchmarking process. The data are only useful to the extent that they allow comparative analysis to take place, leading to the identification and emulation of good practice.

5. Conclusions

Defining the process and its purpose
The active promotion of benchmarking by the donor community as an effective management tool has occasionally led to the situation where any data collection and analysis is now described as benchmarking. At times the term has been used interchangeably with monitoring and evaluation and some stakeholders have been keen to include more and more indicators under the umbrella of benchmarking. The danger of this is that the focus on comparative analysis and the identification and adoption of good or 'best' practice is lost in the pursuit of goals such as post project economic appraisal and the justification of past investment programmes. The promotion of 'Holistic benchmarking', combining the Rapid Appraisal Process (RAP) of Burt (2001) and the use of score cards to assess users' perceptions of service provision has also distracted from the objective performance benchmarking, namely, performance comparison between schemes or over time to identify and emulate best management practices. The RAP and user score cards are entirely valid tools but their aim is not to facilitate the regular evaluation of management practice.

Establishing the process
Achieving the widespread and routine use of metric performance benchmarking within an irrigation agency is a slow and evolutionary process, rather than something that can be introduced and adopted in a single step. According to Malano *et al* (2004b) the first of the six steps of the benchmarking process, (See Section 2.2) 'Identification and Planning', requires the identification of:

- The purpose, drivers and desired outputs of the benchmarking process
- The key stakeholders
- The critical success factors in influencing performance
- Which processes are to be benchmarked
- What is performance benchmarked against
- The indicators of performance
- Data requirements and how data will be collected and processed

All the country studies show that to even partially address these issues can take between one and two years. An iterative process then continues beyond that, which may refine the selection of the key measures of performance and the way that data and information are processed and exchanged. Section 4.1 reported that the drivers and objectives of managers at different levels within a bureaucratic hierarchy will not necessarily be the same. As a consequence, identification of the overriding purpose, drivers and outputs of the process may only become clear, or be agreed upon, over a period of time. An initial period, possibly of one or two seasons' duration and including the processing of historic data, is required for the process to 'bed down' and its value to different stakeholders to become apparent.

This report concurs with the ICID task force report (Malano *et al*, 2004a) in their conclusion that performance benchmarking should be regarded as a continuously evolving practice and that its application in the irrigation and drainage sector is still in its infancy.

***What has been achieved*?**
The benchmarking initiative, promoted by the World Bank, FAO/IPTRID, ICID and IWMI, has contributed in moving the concepts of performance assessment and measurement beyond the academic and research community and into the thinking and culture of national agencies charged with the management of irrigation and drainage infrastructure.

Given that the integration of performance benchmarking into routine management practice is an evolutionary process it is still early to look for clear evidence of good management practices being identified or significant under-performance being remedied. Nevertheless, the benchmarking process has drawn attention to the very large variation in levels of performance that can be found on adjacent schemes, relating to almost all aspects of management. Figures 5 and 6 and Tables 9 and 14 provide examples of this variation. The quantification and wider circulation of such data has highlighted where actions need to be taken – even if the implementation of change is still awaited.

Examples of this include the recognition of the high costs associated with maintaining so called converted regular temporary (CRT) labour on the pay roll of the Irrigation Department in Maharashtra, which inflates operation and maintenance costs and man-days per unit area. The broader, diagnostic analysis of system management in Sri Lanka has demonstrated the potential to shorten the season duration through the use of short duration rice varieties and stricter control of the first and last water release dates, and action has been taken to implement these changes.

In Mexico, comparison of land and water productivity between modules showed a 3½ fold variation in water productivity between US cents 15 and 53 / m^3, arising primarily from the different crops grown in different areas, which in turn reflected different attitudes to risk on the part of growers. This is not an aspect of performance under the control of irrigation managers but the results were of great interest to the farmers who sit on the boards of the associations. A reluctance to focus on the variation in income per irrigated hectare suggest that issues of management transparency must first be addressed before benchmarking will be willingly embraced at the module level.

More generally, the concern remains that the process may not lead to interventions and improvements in management but will simply document current practice. Where data flow only from the field to a central processing group, without the facility for effective information exchange and comparison between peers, it is unlikely that the full, cyclic process of benchmarking, which includes diagnosis of the causes of under-performance and their correction, will occur. The identification of good or 'best' management practice, diagnosis of under-performance and planning of interventions, cannot be done by an isolated, central group. It must be owned and implemented by the managers who have responsibility for scheme performance.

Benchmarking and management reform
It is important to clarify what is meant by 'management reform'. Frequently, this refers to moving away from publicly funded agencies that have limited unaccountability for their use of financial and water resources, towards management systems that can demonstrate that they manage water, land and infrastructure such that the resource base is not damaged or depleted and that operation, maintenance and replacement costs are recouped from irrigators. To achieve such change frequently requires fundamental restructuring of agencies operating in the public sector with long established practices. Australia and Mexico have both passed through such a period of change. In Australia,

this was set in motion through the national Water Reform Framework, established in 1994, which transferred irrigation and drainage districts out of state control into the private sector or into the management of user co-operatives. In Mexico, government support of the agricultural sector was radically cut back in the late 1980's and early 1990's as the government sought membership of GATT and the NAFTA. This resulted in:

- Reduction or removal of direct and indirect subsidies to agricultural production
- Closure or privatisation of public sector input supply and crop marketing bodies
- Reform of the constitution to permit sale of land by *ejidatarios* – Members of communities farming land allocated to them by the state in the early 1900's
- Reform of the national water law to clarify water rights and promote water markets
- Transfer of public Irrigation Districts (3.6 million hectares) to user associations

The state of Maharashtra has drafted a new state water policy that will create a new water resources regulatory authority, which will put the definition of water entitlements and cost recovery through water tariffs on a much more transparent and quantitative footing.

Performance benchmarking is a management tool that can assist managers or regulatory authorities to better understand the systems that they are managing and to bring about improvements, where they are motivated to do so. However, the motivation, or driver, that will prompt a manager to use benchmarking as management tool must come from wider institutional changes. These will often include the definition of minimum, agreed, levels of service and the establishment of mechanisms and a culture where irrigation service providers and irrigators are accountable for their actions.

Performance benchmarking will not, in isolation, bring about the reform of the irrigation and drainage sector that is often spoken of (see, for example, the World Bank-Netherlands Water Partnership program, Window on Reforming Irrigation and Drainage Institutions, (BNWPP, 2005)). However, other, far reaching, institutional changes are leading to a growing awareness of the need to quantify performance and account for the way that resources are used. The benchmarking process, when properly applied, can quantify performance against agreed criteria, promote the emulation of good management practice and deliver greater accountability through the publication of performance information.

Next steps

There is a danger that the focus of resources on performance assessment and benchmarking that accompanied the launch of the benchmarking initiative, may dwindle as the interest of the international agencies moves to other issues. This would be unfortunate and it should not be assumed that the benchmarking initiative has proved unsuccessful or unproductive.

It is less that four years since the IPTRID guidelines for benchmarking were published and the benchmarking programmes reviewed in this report, plus other programmes in Malaysia and Egypt, indicate that countries have invested considerable intellectual resources in identifying their own priorities for performance assessment and improvement and have evaluated benchmarking, at least on a pilot basis. Maharashtra has mainstreamed the procedure, applying it across 254 schemes, publishing the results and more importantly, using performance data routinely to review management practices. The Australian programme reflects a much more commercially oriented group of service providers but those providers see a value in the process, are putting

financial resources to sustain it and have adopted confidentiality agreements to permit the sharing and comparison of commercially sensitive information.

Other countries may require further support to move from pilot evaluation to more general application with wider publication and exchange of performance data amongst managers. Those agencies that contributed to the performance benchmarking initiative should recognise that its adoption and use is an evolutionary process rather than something that is switched on instantly. Where possible, they should continue to use their resources and influence to clarify the use of performance benchmarking as a routine management tool and encourage its evaluation and adoption.

6. References

Alegre H., Hirner W., Melo Baptista J., and Parena R. 2000. *Performance indicators for water supply services. Manual of best practice*. IWA Publishing, London.

Alegre H., Hirner W., Melo Baptista J., Parena R., Cubillo F., Cabrera E. and Maos R. 2002. *The IWA systems of performance indicators for urban water services.* Paper presented at a workshop on Views and experience gained through implementing the IWA performance indicators system. IWA World congress 2002, Melbourne, Australia.

Alexander P. and Potter M. 2005. *The Australian perspective*. PowerPoint presentation made at International Forum on performance benchmarking in the irrigation sector – evaluating progress. Water and Land Management Institute, Aurangabad, India. 19–20th January 2005.

Australian National Committee on Irrigation and Drainage (ANCID), 1999. *Australian Irrigation Water Provider Benchmarking Report*. ANCID, Melbourne.

Australian National Committee on Irrigation and Drainage, (ANCID) 2001. *Australian Irrigation Water Provider, Benchmarking report for 1999/2000.* Published by Goldburn-Murray Water, Victoria

Balakrishnan S. and Lobo A. 2002. *Towards user report cards on irrigation services: Learning from a pilot project in India*. Public Affairs Centre, Bangalore, India.

BNWPP 2005. World Bank-Netherlands Water Partnership program, Window on Reforming Irrigation and Drainage Institutions.
Web site at: http://www-esd.worldbank.org/bnwpp/index.cfm?display=main&Item=7

Bos R., Burton M. and Molden D. 2005. *Guidelines for irrigation and drainage performance assessment.* ICID (in preparation)

Burt C. and Styles S. 1999. *Modern water Control and Management Practices in Irrigation. Impact on Performance.* Water Report No. 19. FAO, Rome.

Burt C. 2001. *Rapid Appraisal Process (RAP) and Benchmarking. Explanation and tools.* Irrigation and Training Research Centre Report No. R 01-008. California Polytechnic State University, San Luis Obispo, USA.

Burton M. Molden D. and Skutsch J. 2000. *Benchmarking irrigation and drainage system performance, position paper.* Paper presented at a workshop on Performance Indicators and Benchmarking, 3-4 August 2000, at FAO Rome.

Camp, R.C. 1989. *Benchmarking.* American Society for Quality Control, Quality Press,
Milwaukee, Wisconsin, USA.

Gonzalez F. 2002. *Holistic Benchmarking for Irrigation and Drainage*. Paper presented at a workshop on Holistic benchmarking in the Irrigation and Drainage Sector: The way forward; widening and strengthen partnerships. May 9th 2002, at the World Bank, Washington.

Gonzalez F. and Kandiah A. 2003. *Emerging experiences of benchmarking in the irrigation and drainage sector.* Paper presented at a workshop on Holistic Benchmarking in the Irrigation and Drainage sector, March 6-7 2003 at the World Bank, Washington.

Government of Maharashtra, 2003. *Benchmarking of irrigation projects in Maharashtra, 2001/02.* Report prepared by the Irrigation Department.

Government of Maharashtra, 2004. *Benchmarking of irrigation projects in Maharashtra, 2002/03.* Report prepared by the Irrigation Department.

Hydro Environmental 2002. *Australian National committee on Irrigation and Drainage, Benchmarking of irrigation water providers. Outcome of indicator review*. Unpublished report, Hydro Environmental Pty Ltd, East Hawthorn, Victoria, Australia.

Jayatillake H M 2004. *Application of performance assessment and benchmarking to help improve irrigation system performance in Sri Lanka*. Irrigation and Drainage, 53 185-193

Larson M., Parena R., Smeets E. and Troquet I. 2002. *Process benchmarking in the water industry – towards a worldwide approach*. IWA Publishing, London.

Makin I and Molden D. (No Date). *The IWMI irrigation classification system*. Unpublished draft Paper, IWMI, Sri Lanka.

Malano H and van Hofwegen, P. 1999. *Management of Irrigation and Drainage systems, a Service Approach*, IHE Monograph 3.

Malano H. 2000. *Benchmarking irrigation and drainage performance: a case study in Australia.* Paper presented to the working group on Performance indicators and Benchmarking, FAO, Rome. 3rd – 4th August 2000.

Malano H and Burton M. 2001. *Guidelines for benchmarking performance in the irrigation and drainage sector*. Knowledge Synthesis Report No. 5. International Programme for Technology and Research in Irrigation and Drainage IPTRID. FAO, Rome.

Malano H.2004. *Benchmarking in the irrigation and drainage sector*. Position Paper. ICID, Task Force 4, New Delhi, India. August 2004.

Malano H., Hungspreug S., Plantey J., Bos M.G., Vlotman W.F., Molden D. and Burton M. 2004a. *Benchmarking of irrigation and drainage projects.* Report of the ICID Task Force No. 4. ICID, New Delhi India.

Malano H., Burton M. and Makin I. 2004b. *Benchmarking performance in the irrigation and drainage sector: a tool for change.* Irrigation and Drainage. 53 (2) 119 – 133.

Mills S. 2002. *Irrigation benchmarking – the Australian model*. Paper presented at a workshop on Holistic benchmarking in the Irrigation and Drainage Sector: The way forward; widening and strengthen partnerships. May 9th 2002, at the World Bank, Washington.

Public Sector Benchmarking Service (PSBS), 2005.
http://www.benchmarking.gov.uk/default1.asp

Water Utilities Partnership (WUP) 2001. SPBNET.Africa. *Report of Performance indicators*. African water supply and sanitation utilities 2001. WRc Swindon, UK