

Impact Assessment of IWMI Research on Accounting for Water Use and Productivity
Prepared by Meredith Giordano and Regassa Namara
November 2003¹

Summary: In 1997 IWMI published a research report entitled Accounting for Water Use and Productivity. The paper, and the water account methodology developed and described therein, was in response to important weaknesses in existing water efficiency concepts and the need to develop a common framework to describe water use in a basin context. The 1997 research report was an outgrowth of IWMI's move towards basin scale analysis and has since spurred a wealth of publications by IWMI authors related to assessing water productivity.

Given the importance we saw in IWMI's contributions to water accounting and water productivity concepts, we were interested to measure the broader knowledge and application impacts from the research report and related methodology. We undertook several preliminary steps, described below, and hope to build on this initial study to assess the broader impacts of IWMI's water productivity research. Attached is a short description of the original research, the impact assessment steps completed to date and the proposed additional steps for further impact assessment.

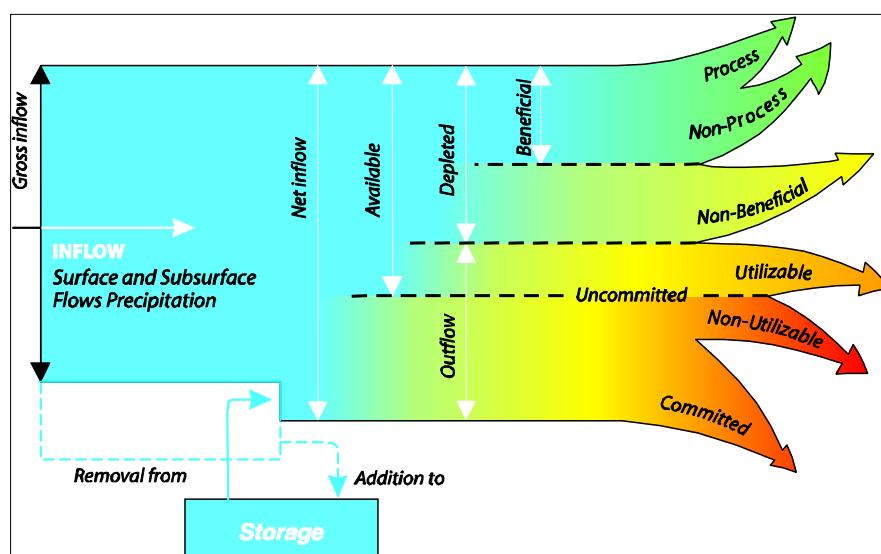
¹ This overview was originally prepared as background information for a presentation at IWMI's Annual Research Meeting and Board of Governors meeting in November 2003 to report on the progress of IWMI's impact assessment initiative.

**Impact Assessment of IWMI Contributions to Water Accounting and Water
Productivity Methodologies**
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Background

Effective water management strategies cannot be implemented without a clear knowledge of water resources. The IWMI's water accounting system is a methodology for accounting for the use, depletion and productivity of water resources. It provides a framework and common language for practitioners in different water resource fields to describe any water resource use and gives planners and policy makers a clear view of their options and the scientific information that is needed to effectively plan development and management efforts. The water accounting methodology is based on conservation of mass: the sum of inflows must equal the sum of the outflows plus any change in storage. It classifies water balance components into water use and productivity categories that reflect the consequences of human interventions into the hydrologic cycle and identifies all users of water in a basin including unplanned and often unacknowledged users, such as vegetation, and shows the amount of water used by each user and the amount of water available for further use (see Figure 1).

Figure 1: Water Accounting Schematic



From: Molden, D.J. 1997. *Accounting for Water Use and Productivity*. SWIM Paper 1. Colombo: IWMI.

IWMI's water accounting methodology was first described in IWMI SWIM Paper, #1, *Accounting for Water Use and Productivity* (Molden, 1997), and responded to a need to help identify opportunities for water savings and increasing water productivity at the basin scale. The concept built on the work of others at IWMI and elsewhere on water efficiency and water balance frameworks and was the product of the System-Wide Initiative on Water Management (SWIM 1) Water Accounting Project. The specific objectives of the paper, and the concepts it described, were to:

- Develop and formalize accounting standards for tracking water depletion within water basins.
- Develop, jointly with the major commodity centers, an accounting procedure for determining the status of, and measuring changes in, the sustainable output per unit of water effectively depleted by various crops.

Following from the SWIM paper, the water accounting methodology has been applied and documented in several subsequent IWMI research reports, conference papers, and case studies on water productivity and related accounting measures (see Box 1).

BOX 1: Sample of IWMI Research Outputs on Water Productivity following Molden, 1997

Bhattarai M.; D. Pant ; and D. Molden. In review. Socio-Economics Impacts and Hydrological consequences of Intersectoral and Interbasin Water Transfer Decisions: Melamchi Water Transfer Project in Nepal. *Water Resources Research*.

Bhattarai M.; D. Pant, V. Mishra; Dovkota, Pun, R. N. Kayastha; and D. Molden. 2002. Integrated Development and Management of Water Resources for Productive and Equitable Use in the Indrawati River Basin, Nepal. *Working Paper No. 41*. Colombo, Sri Lanka: International Water Management Institute (IWMI).

Molden, D. J.; el Kady, M.; Zhu, Z. 1998. Use and productivity of Egypt's Nile water. In Burns, J. I.; Anderson, S. S. (Eds.), *Contemporary challenges for irrigation and drainage: Proceedings from the USCID 14th Technical Conference on Irrigation, Drainage and Flood Control*, Phoenix, Arizona, June 3-6, 1998. Denver, CO, USA: USCID. pp.99-116.

Molden, D.J. and Sakthivadivel, R. 1999. Water Accounting to Assess Use and Productivity of Water. *Water Resources Development* 15 (1&2): 55-72.

R. Sakthivadivel and D. J. Molden. 1999. Accounting for Water Use and Productivity: Examples from India and Sri Lanka. In *Benchmarking Irrigation System Performance Using Water Measurement and Water Balances: Proceedings from the 1999 USCID Water Management Conference*.

van Eijk, Anneka and David Molden, R. Sakthivadivel. 1999. "Water Uses in the Kirindi Oya Sub-Basin," in (eds. Bakker, M and R. Barker, R. Meinzen-Dick, K. Flemming) *Multiple Uses of Water in Irrigated Areas: A Case Study from Sri Lanka*. International Water Management Institute, Colombo, Sri Lanka

Molden, D., Sakthivadivel, R., and M. Samad. 2001. Accounting for changes in water use and the need to institutional adaptation. In Abernethy, C. (ed.) *Intersectoral Management of River Basins*, ed. Charles Abernethy. Colombo: IWMI.

Molden, D., Sakthivadivel, R., and Zaigham Habib. 2001. Basin-level use and productivity of water: examples from South-Asia, *IWMI Research Report No. 49*.

Peranginangin, Natalia; Ramaswamy Sakthivadivel; Norman R. Scott; Eloise Kendy and Tammo S. Steenhuis. Water accounting for conjunctive groundwater/surface water management: case of the Singkarak Ombilin River Basin, Indonesia 2003. *Journal of Hydrology*, Vol. 292, p. 1-22.

Renwick, Mary E. 2001. IWMI Research Report 51: Valuing Water in Irrigated Agriculture and Reservoir Fisheries: A Multiple Use Irrigation System. IWMI: Sri Lanka.

Sakthivadivel, R. and D. Molden. 2002. Linking Water Accounting Analysis to Institutions: Synthesis of Five Country Studies. In Bruns, B., Bandaragoda, D.J. and Samad, M. (Eds.) *Integrated Water-Resources Management in a River-Basin Context*. Colombo: IWMI.

Impact Assessment Methodology

Drawing from IWMI's intermediary impact typology (see Annex 1), the purpose of this impact assessment study is to determine the extent to which the original SWIM #1 paper and subsequent IWMI studies have:

1. Raised awareness
2. Changed perceptions
3. Been successfully applied and/or adapted in practice

The tools selected to test and measure the above intermediary impacts are:

1. Bibliometric assessments
2. Website downloads
3. Structured questionnaire survey

Steps completed to date and initial results:

Bibliometric Assessment: Using the Web of Science we examined the citation history of the SWIM 1 paper (Molden, 1997) for the years 1999-2002 with the following results:

Year	Total # of Citations	Source	2003 impact factors	Average ISI impact factor
2002	6	<ul style="list-style-type: none">○ <i>Science in China Series (Earth Sciences)</i> (1)○ <i>Journal of Irrigation and Drainage Engineering</i> (1)○ <i>Irrigation Science</i> (1)○ <i>Hydrological Processes</i> (1)○ <i>Agricultural Water Management</i> (2)	<ul style="list-style-type: none">○ 0.38○ 0.66○ 0.57○ 0.68○ 0.35	<ul style="list-style-type: none">○ 0.43○ 0.29○ 0.54○ 0.61○ 0.34
2001	3	<ul style="list-style-type: none">○ <i>Agricultural Water Management</i> (2)○ <i>Regulated Rivers—Research and Management</i> (1)	<ul style="list-style-type: none">○ 0.35○ 0.65	<ul style="list-style-type: none">○ 0.34○ 0.81
2000	6	<ul style="list-style-type: none">○ <i>Journal of Hydrology</i> (1)○ <i>Irrigation Science</i> (1)○ <i>Agricultural Water Management</i> (3)○ <i>Science in China Series (Earth Sciences)</i> (1)	<ul style="list-style-type: none">○ 0.96○ 0.57○ 0.35○ 0.38	<ul style="list-style-type: none">○ 0.77○ 0.54○ 0.34○ 0.43
1999	1	<ul style="list-style-type: none">○ <i>Irrigation Science</i> (1)	<ul style="list-style-type: none">○ 0.57	<ul style="list-style-type: none">○ 0.54

For reference purposes, a rough estimate drawn from the results of an in-depth bibliometric study at IFPRI (Pardey and Christian, 2002) suggests an average of 4 citations per article from comparable social science/policy related research organizations.

In addition to the Web of Science analysis, we were also able to document 28 grey literature citations for the years 1997-2003 as well as 47 citations referenced in *Google Scholar*. It is important to note, however, that many of these citations come from other IWMI or IWMI-authored publications. A more detailed analysis is needed to disaggregate the citations.

Website downloads: Over the period January 2002-2003, nearly five years after its publication, the SWIM #1 (Molden, 1997) paper remained one of the 10 ten downloaded

papers with between 146 and 560 downloads monthly. A more detailed analysis is needed to identify the organizational and geographical distribution of the downloads.

Structured Questionnaire: In September 2003, we sent out a short email survey (see Annex 2) to 27 non-IWMI researchers and practitioners who had approached IWMI at some point about the water accounting methodology. The individuals surveyed represented National Agricultural Research Extension Institutes, US Universities, other CG Centers, and US and European research and consulting organizations. We received a total of 15 responses (55%). The basic questions asked in the survey were:

- How the respondent learned about the Water Accounting Methodology?
- What was the respondent's impression of the methodology?
- Did the respondent use the methodology and if so how (in its current form or a modified form) and for what purpose?
- Had the respondent recommended the methodology to others or was he/she aware of other publications applying the methodology?

Some of the key findings from the survey are as follows:

- 5 respondents had used the methodology in current form and 7 in a modified form.
- Respondents had produced 44 research publications (journal articles/theses) that utilized the methodology (either intact or modified version)
- 3 models had been developed that utilized the methodology
- Respondents were aware of additional 31 other theses/journal articles that had applied the methodology
- Respondents had recommended the methodology to another 64 individuals and 21 institutions

Conclusions: While this was only a preliminary assessment, the results provide an initial indication of the knowledge and application impacts of IWMI's work on water accounting and productivity. This is evident not only from the bibliometric and website survey, but perhaps most importantly from the results of the questionnaire survey. This assessment was carried out as a means to test a range of relatively simple mechanisms to understand the direction and degree of research impact in general and of IWMI's work on water productivity specifically. For IWMI, the results of the research have not only informed the institute about the impacts of a particular research area, but have also helped to shape future impact planning and assessment. Further work is needed to develop a full picture of IWMI's impact in this particular area, but the initial results presented here provide a positive indication of the gains in awareness and application resulting from IWMI's research on water productivity and accounting.

References

Molden, D.J. 1997. Accounting for Water Use and Productivity. SWIM Paper 1. Colombo: IWMI

Pardey, P.G. and J.E. Christian. 2002. The Production and Diffusion of Policy Knowledge: A Bibliometric Evaluation of the International Food Policy Research Institute. Impact Assessment Discussion Paper #14. Washington, DC: IFPRI.

Annex 1: IWMI IMPACT TYPOLOGY

Ultimately, IWMI hopes that its projects and programs will have a lasting and global impact on water and land management for the benefit of food production, livelihoods and nature. Beyond the conceptual level, however, it is unrealistic to expect that impacts at this level could be easily measured or attributed. Thus, while maintaining a vision towards the broader spatial and temporal impacts of our projects and programs, we have designed a typology outlining the intermediary impacts that the institute, together with its partners, can reasonably anticipate, track and measure.

<u>Expected Intermediary Impacts of IWMI's Research Agenda</u>	<u>Vehicle to achieve impact</u>	<u>Sample Indicators</u>	<u>Sample Measurement Tools</u>
Raised Awareness of New Research	<ul style="list-style-type: none"> • Scientific publications of IWMI research • Publications in popular press, brochures videos, posters • Public availability of datasets • Public availability of literature reviews • Synthesis of IWMI and non-IWMI research • IWMI participation in conferences/committees/ forums • Advising of MSc/PhD students 	<ul style="list-style-type: none"> • # of citations of IWMI publications • # of downloads / requests • # of requests for IWMI staff to actively participate in workshops, conferences, committees, forums • # of students supervised through IWMI research 	<ul style="list-style-type: none"> • Bibliometric assessments • Website statistics • IWMI official project records • IWMI capacity building program records
Application of New Knowledge	<ul style="list-style-type: none"> • Scientific publications of IWMI's research (including methodologies and approaches) • Collaboration with NARES/NGOs 	<ul style="list-style-type: none"> • # of citations of IWMI publications • # of requests for information/data • Evidence of application of research by int'l/national research, development, and extension systems (e.g., # of NARES reports drawing from IWMI research) • incorporation into curricula 	<ul style="list-style-type: none"> • Bibliometric assessments • IWMI official project records • Interviews • Questionnaires • Observations

<u>Expected Intermediary Impacts of IWMI's Research Agenda</u>	<u>Vehicle to achieve impact</u>	<u>Sample Indicators</u>	<u>Sample Measurement Tools</u>
Employment of Improved Tools, Technologies, Techniques	<ul style="list-style-type: none"> • Development and dissemination of new, user-friendly DSS, maps, models • Development and/or dissemination of technical interventions / practices • Related demonstrations / training 	<ul style="list-style-type: none"> • # of downloads / registration of and/or requests for IWMI tools • Evidence of integration of tools into national research programs • Evidence of usage by int'l/national research, development, and extension systems • incorporation into curricula • change in practice / behavior 	<ul style="list-style-type: none"> • Website statistics • Interviews • Questionnaires • Observations
Employment of Improved Policies/Institutions	<ul style="list-style-type: none"> • Policy Briefings • IWMI participation in policy-related committees/forums • Policy Roundtables • Advisory meetings with policymakers and resource managers • Promotion of formal/informal institutional frameworks 	<ul style="list-style-type: none"> • # of downloads (of Policy Briefing materials) • # of requests for information / advice • requests for participation in panels / forums • evidence that policy / institutional recommendations taken into consideration by relevant decision-making bodies (e.g., placed on policy agenda) • adoption of policy / institutional advice • creation and maintenance of institutions beyond project period • change in practice / behavior 	<ul style="list-style-type: none"> • Website statistics • Observations • Interviews • Policy dialogue monitoring

<u>Expected Intermediary Impacts of IWMI's Research Agenda</u>	<u>Vehicle to achieve impact</u>	<u>Sample Indicators</u>	<u>Sample Measurement Tools</u>
Enhanced Capacity	<ul style="list-style-type: none"> • Project involvement (field staff, NARES partners, IWMI staff) • NARES/NGO Partnership Program • Visiting Scientist Program • Training (in-house/external) • Training publications/videos • PhD Scholarship Program • Postdoc Fellowship Program • Internships • Policy Roundtables 	<ul style="list-style-type: none"> • # of beneficiaries of IWMI's capacity building programs (by gender and nationality) • NARES partners play more active role in regional / int'l research and research networks • Personnel performance indicators (e.g., promotions) for both IWMI and partner staff • theses completed • Postdoc publication record • changed knowledge / perceptions / practices 	<ul style="list-style-type: none"> • IWMI official project documents • Human resources data • IWMI capacity building program records • Pre/Post project/training evaluations • Questionnaire
Strengthened Partnerships	<ul style="list-style-type: none"> • Collaborative projects • Collaborative publications • NARES/NGO network development • National Consultative Meetings • Participation in editorial boards, steering committees, global/regional programs 	<ul style="list-style-type: none"> • # of co-authored outputs • frequency of collaboration • level of shared financial commitment between IWMI and its partners • # of consultative meetings • # of national/regional/global networks involve in 	<ul style="list-style-type: none"> • Bibliometric assessment • IWMI official project documents • Questionnaire • Interviews
Improved Livelihoods (within project location)	<ul style="list-style-type: none"> • Direct intervention • Partnership with implementing agency (e.g., through NARES/NGO Partnership Program) 	<ul style="list-style-type: none"> • Adoption rates (by gender and socio-economic status) • changed perceptions / practices (by gender and socio-economic status) • Level of livelihood improvement, e.g., yields, income, health (by gender and socio-economic status) 	<ul style="list-style-type: none"> • With/Without studies • Pre/Post project evaluations • Interviews • Observations • Official statistics

Annex 2: Structured Questionnaire Survey

Dear _____:

The International Water Management Institute (IWMI) is currently conducting an impact assessment study of its Water Accounting Methodology as described in IWMI's SWIM Publication 1, *Accounting for Water Use and Productivity*, authored by David J. Molden. This assessment is one of several ex-post impact studies we are conducting as part of IWMI's larger impact assessment initiative. Through these impact studies we endeavor to better measure, track and learn from the outcomes and impacts of our research activities.

As we received some initial feedback or requests for information from you concerning the Water Accounting Methodology, we wanted to ask your assistance in this particular impact study by completing the attached questionnaire. The questionnaire is designed to solicit feedback on how the methodology has been received and applied by other research institutes, universities and water management practitioners. We have also included questions on a related research product—the PODIUM model—and ask for your comments if you are familiar with and/or have used this product as well. Your candid comments will be very helpful to us as we gauge the impact of this particular research project and assess how we can further improve our research and related dissemination activities in the future.

We would appreciate it if you could take the time to complete this electronic questionnaire and return it to Mrs. Shalini Kumaresan (s.kumaresan@cgiar.org) by **17 October 2003**. We estimate that the questionnaire should not take more than five minutes to complete. However, we recognize that this is an additional request of your time and completely understand if you are unable to respond by the 17th.

Thank you very much for your assistance. We look forward to hearing from you.

Sincerely,

Meredith Giordano
Research Coordinator
International Water Management Institute

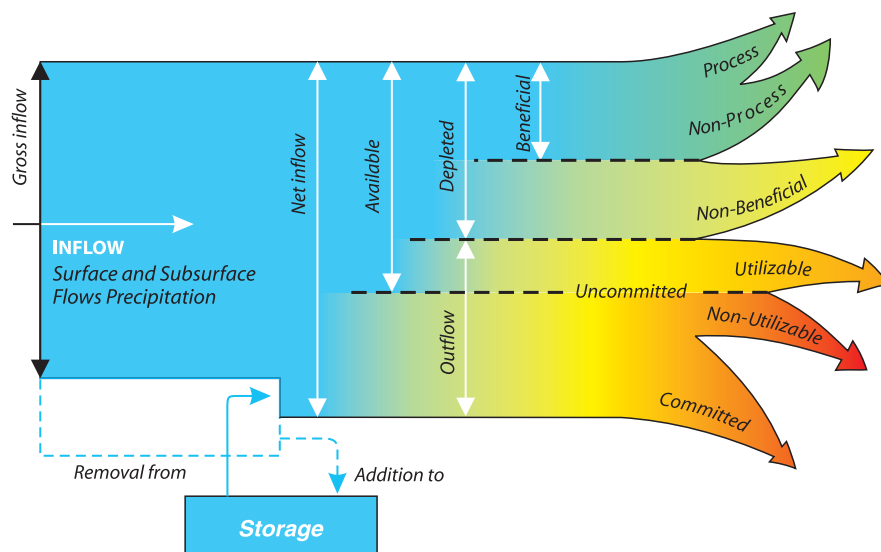
Introduction:

As part of a new impact assessment initiative, IWMI is conducting a series of pilot studies to gauge not only the impact of particular research activities, but to also assess more broadly how the institute might better plan for, track and measure the impact of IWMI's projects and programs. This questionnaire is designed to obtain feedback from professionals who are familiar with and/or have applied IWMI's Water Accounting Methodology and a related research product to which this methodology has contributed (i.e., the PODIUM model--see <http://www.iwmi.cgiar.org/tools/index.htm#Indicators> for full description). Your responses to the questions below will help us better assess not only how the water accounting methodology has been received and applied, but also how we can achieve greater impact from IWMI's research activities in general.

To answer the questions, please use the space provided and/or tick the relevant box. We realize that not all questions will apply to you, so please skip those questions that are not relevant. We would appreciate it if you could return the completed questionnaire to Mrs. Shalini Kumaresan (s.kumaresan@cgiar.org) by **October 17, 2003**. If you would like to receive the results of this impact assessment study once it is completed, please let us know by responding to question 5 below.

Please know that individual responses to the questionnaire will be kept confidential and will not be shared with any of the staff involved in the development of the aforementioned research products. The results of this questionnaire will only be used in the aggregate and not attributed to any specific individual.

Thank you very much.



From: Molden, D.J. 1997. *Accounting for Water Use and Productivity*. SWIM Paper 1. Colombo: IWMI.

1. General information

1.1 Family Name:

1.2 Middle Initial:

1.3 First Name:

1.4 Sex: Male ☐ Female ☐

1.5 Name and Address of your Institution:

.....
.....
.....
.....
.....

1.6 Year of Birth: 19....

1.7 Academic degrees obtained:

Degrees	Area of specialization
BSc	
MSc	
PhD	

1.8 Current position:.....

1.9 Length of time in current position:

2. Knowledge of IWMI Methodologies/Models

2.1 When did you first learn about the following product(s)?

	Water Accounting	PODIUM
Year		

2.2 Through what forum did you first learn of these products?

Sources	Water Accounting	PODIUM
IWMI Research/SWIM Report		
Journal article		
Conference Proceedings		
IWMI Internet site		
Other Internet source		
Workshops/meetings/seminar		
Personal communication		
Other (please specify)		

3. Use of IWMI Methodologies/Models

3.1 Were you satisfied with the products in their existing form?

	Yes	No	N/A
Water Accounting			
PODIUM			

3.2 Have you applied either of the products in their existing form?

	Yes	No	N/A
Water Accounting			
PODIUM			

3.3 Have you applied either of the products in a modified form?

	Yes	No	N/A
Water Accounting			
PODIUM			

3.4 At which scale(s) did you apply the products (*check all that apply*) ?

	Field	Irrigation System	Basin
Water Accounting			
PODIUM			

3.5 Who were the intended beneficiaries of your application (*check all that apply*)?

	Water Accounting	PODIUM
Students		
Researchers		
System Designers		
Resource Managers		
Policy Makers		
Others (please specify)		

3.6 Indicate the number of different research outputs (if any) you have completed
or
are working on that utilize the products (*check all that apply*).

Output Category	Water Accounting	PODIUM
Journal articles		
Papers in workshop/conference proceedings		
Models		
Student Theses		
Other (please specify)		

4. Dissemination

4.1 Have you recommended either of these products for others to use?

	Yes	No	N/A
Water Accounting			
PODIUM			

4.2 If yes, to approximately how many persons and institutions?

Persons.....

Institutions.....

4.3 Are you aware of other publications or student theses/dissertations that have applied these products?

	Yes	No
Water Accounting		
PODIUM		

4.4 If yes, how many?

Student theses/dissertation.....

Other publications.....

5. Please indicate with a check mark if you would like to receive a copy of the results of

this impact study. ☐

Thank you very much for your cooperation!