



Medium Term Plan  
2007-2009



## Medium Term Plan 2007-2009

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# I. Acronyms and Abbreviations

ARI	Advanced Research Institute/s
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
AWM	Agricultural water management
CA	The Comprehensive Assessment of Water Management in Agriculture
CGIAR	Consultative Group on International Agricultural Research
CEMAGREF	Institut de recherche pour l'ingénierie de l'agriculture et de l'environnement (Agricultural and environmental engineering research)
CIMMYT	International Maize and Wheat Improvement Centre
CIFOR	Centre for International Forestry Research
CIP	Centro Internacional de la Papa (International Potato Center), Peru
CPWF	CGIAR Challenge Program on Water and Food
CREPA	Le Centre Régional pour l'Eau Potable et l' Assainissement à faible coût
CRS	Catholic Relief Services
CSIRO	Commonwealth Scientific and Research Organization, Australia
DWFE	Dialogue on Water, Food and the Environment
ECA	Europe and Central Asia
FARA	Forum for Agricultural Research in Africa
GEF	Global Environment Facility
GIAM	Global Irrigated Area Mapping
GIS	Geographic Information System
GOFU	Global Open Food and Agriculture University
GWP	Global Water Partnership
IAASTD	International Assessment on Agricultural Science and Technology for Development
ICAR	Indian Council of Agricultural Research
IBSRAM	International Board for Soil Research and Management
ICARDA	International Centre for Agricultural Research in the Dry Areas
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICID	International Commission on Irrigation and Drainage
ICIMOD	International Centre for Integrated Mountain Development
IDE	International Development Enterprises
IFAP	International Federation of Agricultural Producers
IFDC	International Fertilizer Development Centre
IHE	UNESCO-IHE Institute for Water Education
ILRI	International Livestock Research Institute
IPG	International Public Goods
IPTRID	International Program for Technology Research in Irrigation and Drainage
IRC	International Water and Sanitation Centre, The Netherlands
IRRI	International Rice Research Institute
ITC	International Institute for Geo-information Science and Earth Observation
IUCN	International Union for the Conservation of Nature and Natural Resources
IWRM	Integrated Water Resources Management
LULC	Land Use and Land Cover
MEDWET	Mediterranean Wetlands Initiative
MODIS	Moderate-Resolution Imaging Spectroradiometer
MTP	Medium Term Plan
NARES	National Agricultural Research and Extension System/s
NEPAD	The New Partnership for Africa's Development
NRM	Natural Resource Management
PODIUM	Policy Dialogue Model
RUAF	Resource Centre on Urban Agriculture and Food Security
RS	Remote sensing
SADC	Southern African Development Committee
SANDEC	Department of Water and Sanitation in Developing Countries at the Swiss Federal Institute for Environmental Science and Technology (EAWAG).
SEI	Stockholm Environment Institute, Boston
SIMA	System-wide Initiative on Malaria and Agriculture
SLP	System-wide Livestock Program
SWIM	System-Wide Initiative on Water Management
WAU	Wageningen Agricultural University
WASH	The Water, Sanitation and Hygiene for All Campaign
WASPA	Wastewater Agriculture and Sanitation for Poverty Alleviation
WATERSIM	Water, Agriculture, Technology Environment and Resources Simulation Model
WEAP	Water Evaluation and Assessment Planning
WWC	World Water Council
WWF	World Wildlife Fund
ZEF	The Center for Development Research, University of Bonn

# International Water Management Institute

## Medium Term Plan 2007-2009

### II. Cover Note

#### Overview

In early 2005, IWMI introduced a new research structure with supporting MTP projects, described in more detail in the 2006-2008 Medium Term Plan. Very briefly, this new structure involves an overarching **research framework** comprised of four key activities:

- € **Mapping water productivity:** To assess water (and land) productivity at the basin level for key crops, combinations of crops, complementary livestock/fishery enterprise outputs, specific livelihood strategies, and environmental uses and values. Assessments will also be performed at a spatially disaggregated level so as to analyze the key variables that explain the variations in water productivity (including soil/land degradation) across a basin. The key idea is not to suggest that water productivity is a solution, but rather a valuable framework for understanding the productive uses of land and water resources.
- € **Mapping water poverty:** To assess the spatial patterns of poverty and access of poor people to productive land and water resources throughout the basin. The basic idea is not to presume that increasing water productivity will alleviate poverty, but rather to identify the target group that could benefit from improved access to productive land and water resources.
- € **Analyzing high potential interventions:** To identify, assess, and develop interventions (e.g., technologies, practices, and institutions and policies) that can increase water and land productivity, enhance the access of the poor to productive water and land resources, and improve the sustainability of resource use.
- € **Assessing the impacts:** To assess the potential impacts of interventions on water and

land productivity, water poverty, livelihoods, health, and the sustainability of the resource base under different adoption scenarios, knowledge sharing models, and developments in exogenous variables. Such assessments for different interventions will be carried out both at the basin and sub-basin scales.

This research framework is supported by four new MTP Projects:

- € **Basin Water Management (MTP Project 8):** This Project aims to provide a better understanding of the tradeoffs and options in agricultural water management at the basin scale and contribute to improved equity and productivity in water use through the development of appropriate tools and methodologies for analysis and management.
- € **Land, Water and Livelihoods (MTP Project 9):** This Project aims to identify and test high-potential interventions to conserve resources and increase land and water productivity for improved livelihoods, health and equity across the continuum of water management options, within integrated social-ecological landscapes.
- € **Agriculture, Water and Cities (MTP Project 10):** This Project aims to identify and test interventions for the rapidly growing sector of urban and peri-urban agriculture that take advantage of urban resources while protecting environmental and human health.
- € **Water Management and Environment (MTP Project 11):** This Project aims to identify and test interventions that safeguard the environment and associated delivery of ecosystem services vital to human well-being, while enhancing land and water resources management for agriculture.

With the introduction of the new research framework and MTP Projects in the 2006-2008 MTP, this

Medium Term Plan focuses on the implementation of this new structure by streamlining the Institute's project portfolio around the four new MTP Projects and strategically selecting the key research activities on which to concentrate in each of IWMI's focal regions and benchmark basins.

## Summary of 2005 Actual

- € In 2005, IWMI concentrated on implementing four key areas of its 2004-2008 Strategic Plan:
  - o **Refining the research agenda,**
  - o **Strengthening project management,**
  - o **Assessing IWMI impact, and**
  - o **Carrying forward the Knowledge Center Initiative.**
- € The early part of 2005 was focused on the **further development of the four new MTP projects** (MTP Projects 8-11) that emerged from the previous five MTP Projects. Apart from Project planning and development, significant progress was made in the implementation of the four new Projects. The MTP highlights a number of key outputs and outcomes evolved in 2005 from the new MTP Projects and their predecessors
- € In terms of **project management** the MTP highlights IWMI's progress in reducing the complexity the management of IWMI's research portfolio.
- € The MTP describes the progress made in completing two **impact assessment** studies, and more fundamentally, forging a new alliance with the WorldFish Center and CIFOR on NRM impact assessment.
- € Finally, the MTP highlights the key developments in IWMI's **knowledge center initiative** and the Institute's key knowledge roles: Knowledge Generation, Knowledge Sharing, Knowledge Brokerage, and Knowledge Application.

## Plans for 2006 and Highlights of the 2007 Research Portfolio

- € **Prioritizing and implementing the new MTP Projects in IWMI's regions and benchmark basins:** The Plans and Highlights of the 2006-2007 Research Portfolio section describes the recent regional research prioritization process and outcomes in terms of a more focused research matrix of thematic and regional priorities.
- € **The future of MTP Projects 12 and 13:** In this section, we also describe the conclusion of the IWMI MTP Project 12, the Comprehensive Assessment of Water Management in Agriculture (SWIM-2), and the future plans for MTP Project 13, the Systemwide Initiative on Malaria and Agriculture (SIMA).
- € **Research Collaboration:** As part of its Knowledge Center Initiative, IWMI is committed to strengthening and expanding its network of partners to enhance the four key knowledge roles. This section thus concludes with an update on IWMI's collaborative relationships with ARIs, NARES, International Organizations, CGIAR members, and Future Harvest Centers.

## Financial Highlights

Following a period of rapid growth from 2000 to 2003, we are now in the process of consolidation. In contrast with an average annual increase of 35 percent in funding over the period 2000-2003, growth over the period 2004-2005 has been more modest. IWMI's funding for core activities registered a 7 percent increase in 2004, a 14 percent increase in 2005, and a projected increase of 9 percent in 2006.

IWMI's financial position is stable and continues to improve. IWMI's total reserves at the end of 2005 are \$4.6 million, up from \$4.2 million in 2004, mainly due to a net surplus of \$0.4 million in 2005. The reserves are projected to increase to \$5.1 million by the end of 2006.

# International Water Management Institute

## Medium Term Plan 2007-2009

### III. MTP Overview

#### 1. INTRODUCTION

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- € **Analyzing high potential interventions:** To identify, assess, and develop interventions (e.g., technologies, practices, and institutions and policies) that can increase water and land productivity, enhance the access of the poor to productive water and land resources, and improve the sustainability of resource use.
- € **Assessing the impacts:** To assess the potential impacts of interventions on water and land productivity, water poverty, livelihoods, health, and the sustainability of the resource

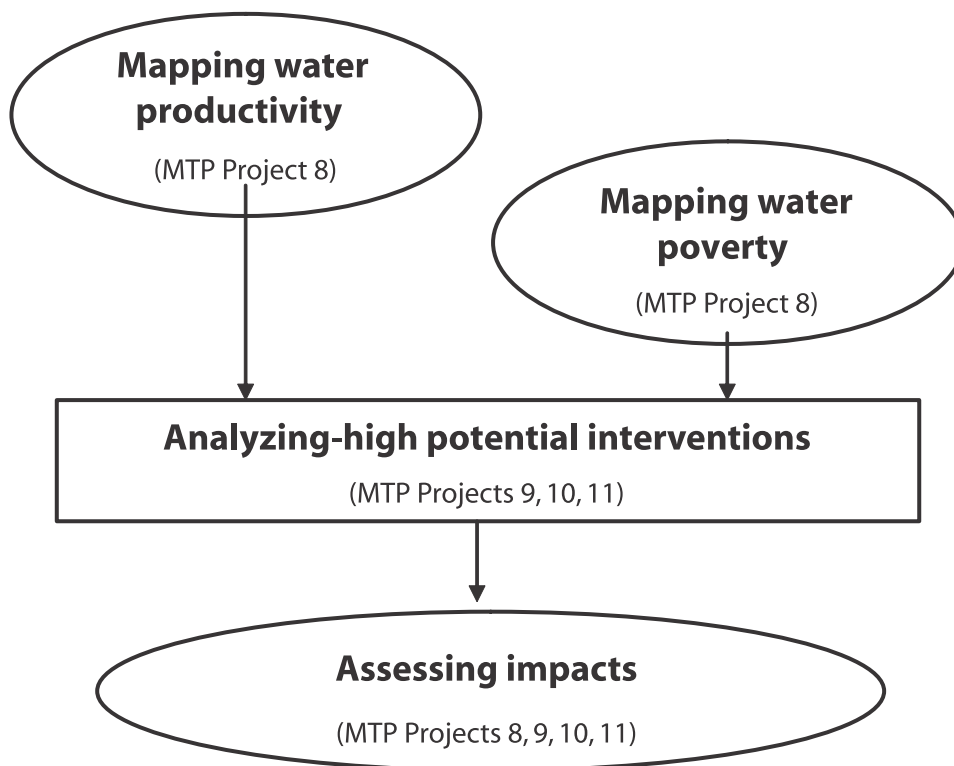
base under different adoption scenarios, knowledge sharing models, and developments in exogenous variables. Such assessments for different interventions will be carried out both at the basin and sub-basin scales.

This research framework is supported by four new MTP Projects (see also Figure 1):

- € **Basin Water Management (MTP Project 8):** This Project aims to provide a better understanding of the tradeoffs and options in agricultural water management at the basin scale and contribute to improved equity and productivity in water use through the development of appropriate tools and methodologies for analysis and management.
- € **Land, Water and Livelihoods (MTP Project 9):** This Project aims to identify and test high-potential interventions to conserve resources and increase land and water productivity for improved livelihoods, health and equity across the continuum of water management options, within integrated social-ecological landscapes.
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- € **Water Management and Environment (MTP Project 11):** This Project aims to identify and test interventions that safeguard the environment and associated delivery of ecosystem services vital to human well-being, while enhancing land and water resources management for agriculture.

With the introduction of the new research framework and MTP Projects in 2005, IWMI is now focusing on the implementation of this new structure, streamlining the project portfolio around

FIGURE 1.  
IWMI Research: A New Conceptual Framework



the four new MTP Projects, and strategically selecting the key research activities on which to concentrate in each of IWMI's focal regions and benchmark basins.<sup>1</sup>

**Part I** of this MTP begins with a brief description of the context for IWMI's overall research agenda and the background for the 2005 programmatic revisions. We then summarize the key messages from IWMI's 2004-2008 Strategic Plan and the progress made in 2005 in its implementation through IWMI's new research framework, supporting project management structure, and the impact assessment and knowledge center initiatives. The plans for 2006 and highlights of the 2007 Project Portfolio follow.

As part of this latter section, we describe the conclusion of the IWMI MTP Project 12, the Comprehensive Assessment of Water Management in Agriculture (SWIM-2), and the future plans for MTP Project 13, the Systemwide Initiative on Malaria and Agriculture (SIMA). Part I concludes with an overview of the new developments in IWMI's collaborative arrangements, a brief description of recent and planned program reviews and a summary of the Center's financial indicators. **Part II** presents the Project narratives and logframes for each of IWMI's four MTP Projects, and **Part III** provides the 2007-2009 financial plan for the Institute.

<sup>1</sup>As described in more detail below, the benchmark basins serve as IWMI's primary research sites and field laboratories.

## 2. RESEARCH CONTEXT: “BEYOND MORE CROP PER DROP”

In 2006, IWMI will be publishing a book entitled “More Crop per Drop: Rethinking the Research Paradigm,” which synthesizes the research results of the Institute over the past decade.<sup>2</sup> The second chapter of the book reflects on the evolution of thought over the past decade on agricultural water and land management, in particular on the ‘more crop per drop’ paradigm. The chapter describes the concepts introduced by IWMI in the mid-to-late 1990s, the influence of this research as well as its limitations, which in turn led to the introduction of the new research framework in 2005, described above. Given the importance of IWMI’s past research efforts in the design of the new research framework, we present below an extract from this chapter of the synthesis book.

### Background

In 1996, David Seckler, (Seckler, 1996) then recently appointed Director General of IWMI with a mandate to re-focus the research agenda of the institute, published the first IWMI Research Report. This brief note of about 10 pages contained many of the basic ideas that have come to characterize what has been coined the IWMI approach to water for agriculture. It was in essence a research agenda around the following three ideas:

- 1) **basin focus:** as the degree to which the available renewable water resources in a river basin approaches the maximum, and competition among users increases, the appropriate focus for water management is the basin level, not the field, farm or even irrigation system level; this basin concept is closely linked to the idea of open, closing and closed basins – where a basin is defined as closed when there is no usable water leaving the basin;
- 2) **recycling:** many of the water savings achieved at field level may only capture water that would otherwise have been re-used

downstream; these are not real water savings, where additional supplies become usable for an additional use (“wet” water savings), but they are simply a re-allocation of water from downstream to upstream users (“dry” water savings); with this idea comes a focus on the fate of water through recycling and re-use;

- 3) **crop water productivity:** rather than focusing on the potentially misleading idea of increasing irrigation efficiency, the focus should be on increasing water productivity<sup>3</sup> – in essence the output produced per unit of water consumed – and with this phrase “more crop per drop” was associated.

These ideas formed the core of the IWMI research agenda in the period 1996-2000 and culminated in the key publication on water productivity of Kijne et al. eds. (2003).

### Key Results from IWMI Research 1996-2000

IWMI’s focus on the basin level is closely linked to the question of water scarcity. In all but the driest areas of the world, the water-related development effort in agriculture has been focused on investments in infrastructure to make water available to meet the rising demands, i.e. a “supply focus”. Among water professionals, the discussion since about the 1980s is increasingly focused on approaches to managing demands to live within the means of finite supplies. IWMI argued that there are different stages in water resources development that are closely correlated to the share of usable water supplies in a basin that has already been developed. These are “development”, “utilization” and “reallocation” (see figure 1). IWMI therefore argued that the nature of water resources management changes with the degree of water resources development in a basin. The bottom line is that when basins are closed or closing, and water becomes scarce, additional investment in water infrastructure only shifts water from one user to another; it does not produce additional water (when aggregated at basin level).

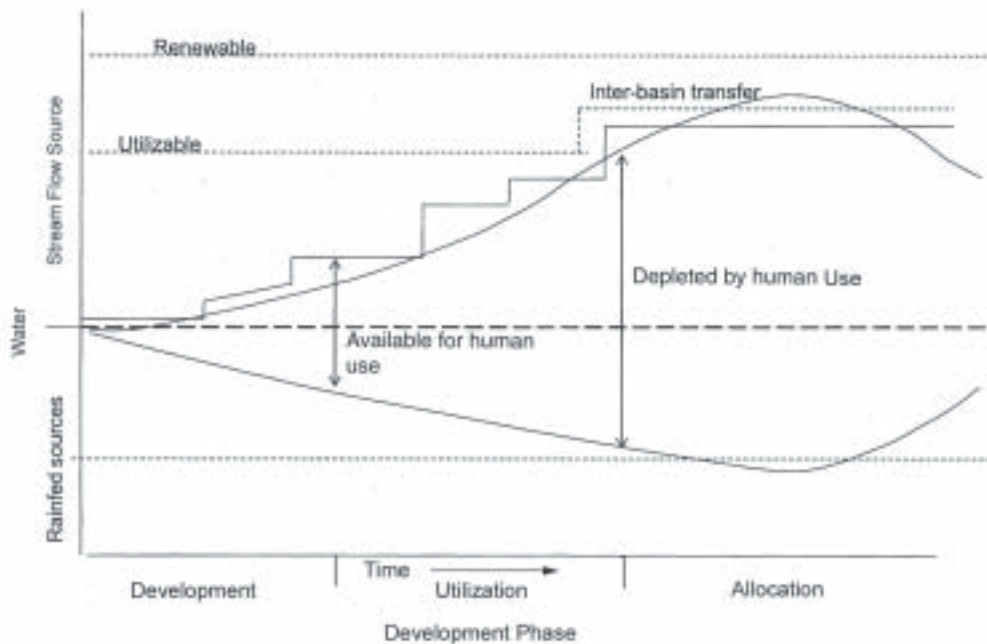
<sup>2</sup> Giordano, Rijsberman, Saleth (eds). 2006 Forthcoming. ‘More Crop per Drop’ Revisiting a Research Paradigm: Results and Synthesis of IWMI Research, 1996-2004. London: IWA Publishing.

<sup>3</sup> While IWMI authors use “water productivity” consistently, other authors also use “water use efficiency” (e.g. Wallace, 2000) to denote the same concept of output over water consumed—in contrast to the various definitions of “irrigation efficiency” that all indicate the share of water “used” as a percentage of the total applied—suggesting that the remainder is “lost” (while it is often re-used).



FIGURE 1:

Phases of river basin development (Fig. 2.1 in Molden et al, 2005, p.22)



The primary conclusion of IWMI's work in the 1996-2000 period, aimed to increase awareness of impending water scarcity:

*“one-third of the population lives in regions that have absolute water scarcity, in the sense that they do not have sufficient water resources to meet their agricultural, domestic, industrial and environmental needs in the year 2025...an additional 500 million people live in regions of severe economic scarcity; they have a sufficient amount of potential water resources to meet their 2025 needs, but they will have to more than double their present utilization of these resources through large, expensive and possibly environmentally destructive development projects...”*

Among water professionals, there has been much talk of a “global water crisis” for several decades. Many would take the second World Water Forum, in the year 2000, as the moment where over 120 ministers, over 5000 stakeholder representatives and water professionals, and over 600 journalists definitively put water on the map as a “major issue” (HRH the Prince of Orange and Rijsberman, 2000).

IWMI was a key contributor to this process, and the “basic IWMI scenario” was published as the IWMI contribution to the World Water Vision. The major

findings and recommendations contained in this scenario were:

1. The world's primary water supply will need to increase by 22 percent to meet the needs of all sectors in 2025.
2. Seventeen percent more irrigation water will be needed for the world to feed itself in 2025.
3. Nearly one-third of the populations of developing countries in 2025, some 2.7 billion people, will live in regions of severe water scarcity.
4. The global community must invest in research to improve crop water productivity (crop per drop).
5. New water infrastructure will have to be developed to meet future food requirements.
6. Groundwater reserves will be increasingly depleted in large areas of the world.
7. Salinization of soils, compounded in many cases by increasingly saline or poisoned groundwater, will seriously affect land that has been highly productive in recent decades.
8. The people most affected by growing water scarcity will continue to be the poor, especially the rural poor; and among the poor people, women and children will suffer most.

9. Better use of water in several large internationally shared river basins can contribute significantly to achieving food security and reducing poverty in developing countries.

Seckler believed the solution to the water scarcity issues was to improve crop water productivity in irrigated agriculture as much as possible but that further development of water supplies for irrigation to meet future food demands was inevitable and would require the widely-cited “17% of additional water for irrigation by 2025”. He did not believe in the potential to improve water productivity in rainfed agriculture significantly. The assumed low growth in water productivity in rainfed agriculture in the “basic IWMI scenario” is a key factor in the relatively high estimate of 17 percent growth in irrigation water demands.

### **Influence of the “More Crop per Drop” Ideas**

The ideas IWMI developed and promoted—often referred to as the “more crop per drop” paradigm—have been very influential. A key conclusion drawn at the second World Water Forum in the key policy document discussed there, the World Water Vision, was that the nature of water scarcity, for the world as a whole, is not that the world is running out of water, but that we are managing it so badly that many people and the environment already suffer. The Global Water Partnership concluded that “*on the one hand, the fundamental fear of food shortages encourages ever greater use of water resources for agriculture. On the other, there is a need to divert water from irrigated food production to other users and to protect the resource and the ecosystem. Many believe this conflict is one of the most critical problems to be tackled in the early 21<sup>st</sup> century*” (GWP, 2000, p58). In the same year, the UN Secretary General, in his report to the Millennium Conference, concluded that “*We need a Blue Revolution in agriculture that focuses on increasing productivity per unit of water—“more crop per drop”*” (Annan, 2000).

IWMI used the same arguments, and the growing support for them in academic as well as policy circles, to initiate three linked, major international initiatives:

- € the Dialogue on Water, Food and Environment;
- € the CGIAR system-wide Comprehensive

Assessment of Water Management for Agriculture; and

- € the CGIAR Challenge Program on Water and Food.

Ten key stakeholders in the water, agriculture and environment areas joined hands to form a strategic alliance—known as the Dialogue on Water, Food and the Environment (DWFE)—to help bridge the chasm between agriculture and environmental communities over the way water should be managed and developed. These organizations ranged from UN agencies (FAO, UNEP, WHO) to associations of farmers (IFAP), irrigation engineers (ICID), environmental organizations (IUCN, WWF), water umbrella organizations (GWP, WWC) and water research institutes (IWMI, representing the CGIAR). IWMI provided the chair of the Dialogue Consortium and hosted the Secretariat. The Dialogue was organized around three main (groups of) activities:

cross-sectoral dialogues at national and basin levels, organized by, for example, (the national committees/members/associations/offices of) ICID, IUCN, IFAP, GWP, and WWF;

a “knowledge-base” of credible and authoritative information—acceptable to both agricultural and environmental communities—largely based on linking and adding to knowledge available in the CGIAR, FAO, etc.; and

local-action activities that aimed to provide an information exchange and best-practice identification platform, linking thousands of local, NGO and bilateral projects and activities into the formal knowledge base(s).

The Comprehensive Assessment for Water Management in Agriculture (SWIM-2) was developed in parallel with the Dialogue. It is an effort that has brought together at least 300 researchers for an assessment in the tradition of the international assessments on ozone or climate change. The assessment is co-sponsored by the CGIAR, FAO and the Ramsar Convention on Wetlands. It is also positioned as the major water-input for the new International Assessment on Agricultural Science and Technology for Development (IAASTD). While the major findings of SWIM-2 will be formally disseminated in 2006, a number of key findings are already beginning to shape the nature of water and land management research. For example, SWIM-2

has made important contributions to understanding the environmental consequences of irrigated agriculture through the development of a global framework for assessing environmental flow requirements and analyzing the negative *and* positive externalities associated with an irrigated landscape. Additionally, SWIM-2 has contributed to a greater understanding of irrigation and poverty and is making significant strides in assessing key options to change the “more food = more water” equation, including opportunities to increase water productivity of irrigated and rainfed systems.

In October 2001, at the CGIAR annual meeting, IWMI called for a major new CGIAR program to address the water crisis through agricultural research. It argued that to solve a major part of “the world water crisis”, the challenge is to grow more food with less water - decreasing water use in agriculture to meet environmental goals and other human needs, yet growing enough food, and improving livelihoods of the poor. IWMI estimated that over 25 years, a 60 percent increase in water productivity on irrigated lands, and 30 percent on rainfed lands would be required as a major step in the right direction (see Table 1). This also marked the occasion

where IWMI started arguing for a broader interpretation of water productivity than “more crop per drop” alone. Water productivity, it said, needs to be understood in the widest possible sense—including crop yields, fisheries, ecosystem services and direct social benefits such as to health. The challenge for the CGIAR was to catalyze effective and efficient improvements of water productivity in a way that is pro-poor, gender-equitable and environmentally sustainable.

The CGIAR approved a first phase—one year inception and five years of research—of the CGIAR Challenge Program on Water and Food (CPWF) one year later, in October 2002. The program currently has a target budget of some US\$80M for that first phase. In 2005, the CPWF is implementing over 30 projects for a total of some US\$60M in nine river basins: the Andes<sup>4</sup>, Indo-Gangetic, Kharkhe, Limpopo, Mekong, Nile, Sao Francisco, Volta, and the Yellow.

We estimate that together these two research programs—SWIM-2 and CPWF—have now engaged the participation of over a thousand scientists—and have thus become the flagship programs for research on water, agriculture and development.

TABLE 1.

**Water productivity and cereal yield growth rates for a scenario meeting goals of food and environmental security (Source: Rijsberman, Molden 2001)**

Growth Rates	Irrigated	Rainfed
Recent Annual Growth in Cereal Yield	1.0%	0.5%
<u>Business as Usual Scenario*</u>		
Annual Growth in Cereal Yield	1.0%	0.5%
Annual Growth in Water Productivity	0.6%	0.5%
Total Growth in Water Productivity (25 years)	20 %	15 %
<u>Food and Environmental Security Scenario*</u>		
Annual Growth in Cereal Yield	1.3%	1.0%
Annual Growth in Water Productivity	1.8%	1.2%
Total Growth in Water Productivity (25 years)	60 %	30 %

\* The Business-as-Usual Scenario forecasts an increase in water resources withdrawn for agriculture by 12-17% from 2000 to 2025. The Food-and-Environmental-Security Scenario would reduce the total withdrawal for agriculture by 10% for the period 2000-2025.

<sup>4</sup> A grouping of smaller basins in the Andean region.

## Limitations of the “More Crop per Drop” Paradigm

The IWMI work emphasizing “more-crop-per-drop” as outlined above has undoubtedly been influential but it also has a number of limitations that can be summarized as follows:

1. It underplays the importance of water quality; the emphasis on potential re-use of the fraction of the water that is not consumed appears to suggest that such re-use can take place without a cost while virtually all water withdrawal and application leads inevitably to at least some quality degradation (salinization and other pollution) and costs energy.
2. The crop-per-drop concept does not accommodate the non-crop water outputs, fisheries and environmental services to the other multiple values water serves (from domestic water use to livestock watering). The implication is that while at farm or field level the focus on crop water productivity can often be justified, at larger scales a broader definition of water productivity is needed that incorporates all values associated with water use. Only such a broader definition will serve the management of water across the many uses within a basin.
3. The implicit emphasis on irrigation of crops through renewable water resources, i.e. the part of the water cycle that runs off into rivers and recharges groundwater (also called blue water) tends to underplay the importance of the other 60 percent of the hydrological cycle that is stored as soil moisture (the so-called green water). Through the growing importance of groundwater irrigation, small scale irrigation, rainwater harvesting and supplemental irrigation, the once sharp boundaries between rainfed and irrigated agriculture have largely disappeared. This requires a new, unified approach that looks at the whole hydrological cycle and at water management for agriculture across the rainfed-irrigated spectrum.
4. Increasing water productivity is no more than a means to an end. One key objective is the reduction of poverty and hunger. While increasing water (and land) productivity may well be a key factor to alleviate poverty in

livelihoods that are strongly dependent on the access to productive land and water resources, it cannot be said that improving water productivity will by definition have a positive impact on poverty alleviation since access to resources (and distribution of any net benefits) plays a determining role in the final poverty alleviation impact.

5. Similarly, another—often linked—objective is the sustainable use of natural resources, i.e. the arrest or rehabilitation of resource overuse (groundwater depletion) and degradation (soil erosion or salinization). Increasing water productivity is unlikely to halt over-use of water locally, as it is likely to increase the profitability of the farmer whose productivity has increased—encouraging increased, rather than decreased resource use. On a larger scale, assuming that the total demand for a given good or service remains constant, increased productivity in one location ought to displace water use with a lower productivity elsewhere. But, such a spatial reallocation, though good from a productivity perspective, may not necessarily increase the sustainability of water and land resource use in the basin or sub-basin where the productivity has increased.

## Addressing the Limitations

In the period 2000-2005 IWMI introduced five new themes:

1. Agricultural Water Management
2. Sustainable Land and Water Management
3. Groundwater Management
4. Water Resources Institutions and Policies
5. Water, Health and Environment

These five themes addressed a number of the limitations discussed above as follows:

1. The balance between water for food and water for nature has become the core issue on the agenda, and IWMI has re-focused its research around the so-called water-food-environment nexus.
2. The linkages between water and land, salinization and soil degradation, water and land quality, nutrient cycling, and re-use of wastewater in peri-urban agriculture have become a central focus of IWMI’s work.

3. The improvement of water productivity across the entire blue-green, rainfed-irrigated, surface-groundwater spectrum has become the norm in the work of the institute. This has also led to a re-assessment of the potential to improve water productivity in rainfed agriculture.
4. The assessment of the impact of water productivity on the alleviation of poverty and hunger has become a central theme in IWMI's work as well.

IWMI's thematic structure was further tightened in 2005 through the introduction of four new themes, supported by a refined research framework (see section V):

1. Basin Water Management: *understanding water productivity*;
2. Land, Water and Livelihoods: *improving livelihoods for the rural poor*;
3. Agriculture, Water and Cities: *making an asset out of wastewater*; and
4. Water Management and Environment: *balancing water for food and nature*.

### 3. PROGRAM DISCUSSION

#### A. Summary of IWMI's Strategic Plan 2004-2008

Following Board approval in early 2004 of IWMI's new Strategic Plan 2004-2008, we are now fully engaged in the implementation of this Plan. As noted in IWMI's 2006-2008 MTP, this new Strategic Plan emphasizes three key messages.

First, after a period of explosive growth in offices, staff, and new initiatives as well as drastic changes in IWMI's business processes, the coming years are expected to be characterized by "**consolidation**" of **the advances made**. The Plan thus builds on the changes set in motion during the past three years as part of the 2000-2005 Strategic Plan and highlights several priority actions including:

- € Continued development of the **research agenda**
- € Further development of the **Benchmark Basin concept**
- € **Completion of the Comprehensive Assessment** of Water Management in Agriculture (SWIM-2)

Second, while consolidating its research program and change management process, IWMI has set an ambitious goal for itself to become the **leading international knowledge center on the water-food-environment nexus**. To achieve this goal, IWMI must explicitly develop and value all key knowledge roles that complement and enhance IWMI's primary role of research, or knowledge generation, and address these roles through more effective strategies. The four key knowledge roles on which IWMI and its partners are concentrating are as follows:

- € Knowledge Generation
- € Knowledge Sharing
- € Knowledge Brokerage
- € Knowledge Application

This approach recognizes that knowledge generation is a necessary but insufficient condition for IWMI to achieve broader scale impact and to build capacity in the South. We therefore incorporate elements of knowledge sharing and knowledge brokerage directly into our research programs and work together with appropriate development partners to put the knowledge IWMI generates directly into the hands of potential users (i.e., knowledge application). More details are provided on IWMI's Knowledge Center Initiative in Section B, 2005 Program Achievements.

Finally, during the 2000-2005 Strategic Plan IWMI endeavored to change the culture of the organization. IWMI now strives to make the core characteristic of IWMI's culture explicit and widely shared among all staff. IWMI's culture is guided by a set of overarching core values, i.e. **Excellence, Impact Orientation, Team Work, Knowledge Sharing, and Respect for Diversity**. To put the theory of these values into practice, the new Strategic Plan focuses on actions to further promote:

- € **Impact** of our research and other knowledge roles.
- € **Performance** of every part of the organization, research and non-research.
- € **Service** as the key feature of the non-research part of the organization.

This MTP concentrates on progress made in several of these areas, including the implementation of IWMI's new **research framework**, further develop-

ment of the **Benchmark Basin concept** and completion of the **Comprehensive Assessment of Water Management in Agriculture** (SWIM 2); progress in IWMI's **Knowledge Center Initiative**, and steps taken to further the Institute's **impact culture**.

## B. 2005 Program Achievements

To carry forward IWMI's Strategic Plan, IWMI focused on four areas in 2005, as noted in the 2006-2008 MTP:

- 1) Refining the research agenda
- 2) Strengthening project management
- 3) Assessing IWMI's Impact
- 4) Carrying forward the Knowledge Center Initiative

While the main focus was on implementing the new research framework, significant progress was made on all four areas above. We provide below some examples of 2005 achievements in these four areas.

### 1) Refining the research agenda

The early part of 2005 was focused on the further development of the four new MTP projects (MTP Projects 8-11) that emerged from the previous five MTP Projects (see Table 1). The results of this effort were elaborated in the MTP 2006-2008.

Following the comments from the Science Council, IWMI's MTP Project Leaders have made further refinements to the Projects, in particular the logframes, as further detailed in Part II. Apart from Project planning, significant progress was made in the implementation of the four new Projects, and a number of key outputs and outcomes evolved in 2005 from the new MTP Projects and their predecessors, which are described below:

It is important to note here that in the initial transition to the four new MTP Projects, the first two (MTP Projects 8 and 9) are significantly larger than the other two. In part, this is a result of how IWMI's project portfolio was spread across the four new MTP Projects in the transition. In addition, to a large extent, MTP Projects 10 and 11 are still emerging and thus many of the activities are only in the planning and proposal stage. The Project narratives and logframes will further describe the current state and evolution of MTP Projects 10 and 11.

#### (a) New Research:

Corresponding with IWMI's new research framework, the Institute has commenced a host of studies in each of the four key activities. These activities are largely concentrated in IWMI and the CPWF Benchmark Basins in Asia and Africa (see Section C for further discussion of the Benchmark Basin approach).<sup>5</sup> Some examples of new research efforts at IWMI include:

TABLE 1.  
**Former IWMI MTP Projects and linkages with Project Portfolio**

Former MTP Projects		New MTP Projects
MTP Project 1: Agricultural Water Management	— — — →	MTP Project 8: Basin Water Management
MTP Project 2: Smallholder Land and Water Management	— — — →	MTP Project 9: Land, Water and Livelihoods
MTP Project 3: Groundwater Management		<i>Ended, merged with MTP Projects 8 and 9</i>
MTP Project 4: Water resources Institutions and Policies		<i>Ended, merged with MTP Projects 8, 9, 10, and 11</i>
MTP Project 5: Water, Health and Environment	— — — →	MTP Project 10: Agriculture, Water and Cities
		MTP Project 11: Water Management and Environment

<sup>5</sup> CPWF Benchmark Basins: the Andes<sup>5</sup>, Indo-Gangetic, Kharkhe, Limpopo, Mekong, Nile, Sao Francisco, Volta, and the Yellow; IWMI Benchmark Basins: the Ruhuna, Krishna, Syr Dayra, and Olifants.

**Mapping Water Productivity:** In 2005, IWMI commenced two new studies under MTP Project 8 to assess basin scale water productivity in the Krishna and Syr Dayra basins, located in India and Central Asia, respectively. In the Olifants basin in southern African, a water allocation and balance model (WEAP) has been calibrated for the Olifants basin, with scenario testing planned for 2006. In addition, research on the water productivity of irrigated agriculture in the Olifants is complete with a draft report under review. Finally, as part of the Challenge Program on Water and Food's (CPWF) Basin Focal Project, IWMI is leading a study on water productivity in the Karkheh Basin in Iran and is partner in a similar study in the Niger Basin.

**Mapping Water Poverty:** Under MTP Project 8, IWMI commenced two new studies on the relationship between water management and poverty in the Krishna Basin in India and in the Ferghana Valley in Uzbekistan. As part of the studies, a generic methodology will be developed on water poverty mapping. In addition, the IWMI-led CPWF Basin Focal Project in Iran also includes an in-depth study on water poverty in the Karkheh basin.

**Identifying High Potential Interventions:** Several new activities began in late 2004 and 2005 to identify and assess high potential interventions to improve land and water resources management. Some examples include 1) a set of studies examining small scale technologies and water management institutions in rainfed and irrigated systems and their role in poverty alleviation (MTP Project 9); a study funded by BMZ in the Krishna Basin to test risk mitigation options and solutions for wastewater use in agriculture (MTP Project 10); and 3) two activities funded by the CPWF and the GEF in the Olifants Basin to identify guidelines, tools and methodologies related to the sustainable use of wetlands (MTP Project 11).

**Assessing Impacts:** In 2005 IWMI undertook a study to analyze policy, legal framework, implementation processes related to Irrigation Management Transfer and their related outcomes and impacts in 50 countries (MTP Project 9). In addition, IWMI is currently conducting two ex-post impact assessments under MTP Project 9 of small-scale irrigation technologies and their prospects for upscaling in Africa. The first study examines the impact of the treadle pump on food security and

poverty alleviation in Malawi together with the opportunities and constraints for further adoption in the country. The second study, which focuses on the broader SADC region, aims to fill a critical knowledge gap on the adoption, impacts and sustainability of selected agricultural water management (AWM) practices and technologies in an effort to improve food security in rainfed and irrigated areas. The study will produce an inventory of existing small-scale AWM technologies in the SADC region, estimations of their unit costs and their impact on poverty alleviation, and, based on these findings, recommendations for future investment and promotion for smallholder farmers and herders.

### **(b) New Research Outputs**

In 2005, IWMI scientists produced over 140 peer reviewed articles, reports, books and book chapters. Some of the key outputs include:

#### **MTP Project 8: Basin Water Management**

- € Ganges and Indus river basin land use/land cover (LULC) and irrigated area mapping using continuous streams of MODIS data (Thenkabail et al., 2005)
- € Irrigation and Drainage Performance Assessment: Practical Guidelines (Bos et al., 2005)
- € Locating the poor: Spatially disaggregated poverty maps for Sri Lanka (Amarasinghe et al., 2005)
- € Irrigation and River Basin Management: Options for governance and institutions (Svendsen (ed), 2005)
- € Irrigation and water policies in the Mekong region: Current discourses and practices (Molle, 2005)

#### **MTP Project 9: Land, Water and Livelihoods**

- € Pro-poor intervention strategies in irrigated agriculture in Asia: Issues, lesson, operations and guidelines) (Hussain, 2005)
- € Adoption and impacts of micro-irrigation technologies: Empirical results from selected localities of Maharashtra and Gujarat states of India (Namara et al., 2005)
- € Watershed management challenges: Improving productivity, resources and livelihoods (Sharma et al., 2005)

- € “Bright spots” in Uzbekistan, reversing land and water degradation while improving livelihoods: Key developments and sustaining ingredients for transition economies of the former Soviet Union (Noble et al., 2005)
- € When “conservation” leads to land degradation: Lessons from Ban Lak Sip, Laos (Lestrelin et al., 2005)

#### **MTP Project 10: Agriculture, Water and Cities**

- € Managing wastewater agriculture to improve livelihoods and environmental quality in poor countries (Raschid-Sally et al., 2005)
- € Special issue of the Journal of the ICID on Wastewater Use in Irrigated Agriculture: The water chain approach (Huibers et al., 2005)
- € Irrigated urban vegetable production in Ghana: Sources of pathogen contamination and health risk elimination (Amoah et al., 2005)
- € Elevated levels of cadmium and zinc in paddy soils and elevated levels of cadmium in rice grain downstream of a zinc mineralized area in Thailand: Implications for public health (Simmons et al., 2005)

#### **MTP Project 11: Water Management and Environment**

- € Planning for environmental water allocations: An example of hydrology-based assessment in the East Rapti River, Nepal. (Smakhtin and Shilpakar, 2005).
- € Working wetlands: Classifying wetland potential for agriculture (McCartney et al, 2005)
- € Ecosystems and human well-being: Wetlands synthesis (Finlayson et al., 2005)
- € Impacts of irrigation on fisheries in rain-fed rice farming landscapes (Nguyen Khoa et al., 2005)

IWMI also produced 9 Water Policy Briefs, which are short briefing notes that provide policy recommendations based on IWMI peer reviewed research. The 2005 Water Policy Briefings covers such topics as: irrigation performance, groundwater management, multiple use water systems, wastewater re-use, land degradation, and environmental water allocation. All Briefings are available on IWMI’s website at:

<http://www.iwmi.cgiar.org/waterpolicybriefing/>.

In addition to publications, IWMI and its partners produce a range of tools, methodologies and other International Public Goods (IPGs) to serve as

resources for researchers and practitioners. Two examples of more recent IPGs that are being actively utilized include:

**Global Irrigation Area Map:** In mid-2005, IWMI, released the first version of the Global Irrigated Area Map (<http://www.iwmi.org/info/main/index.asp>) on a dedicated website (which currently receives ~2000 hits and 130 GB of downloads each month), supported by full documentation, methodology and source materials. The “map” includes a global map of irrigated area, a global map of rainfed cropland areas and a global map of land use/land cover areas.

#### **Water, Agriculture, Technology Environment and Resources Simulation (WaterSim) Model:**

IWMI continues to further develop the WaterSim model, which projects additional water needs, growth of irrigation and rainfed sectors, trade, under different scenarios. The model, developed by IWMI and IFPRI, is now running and is being used for a scenario analysis of future global water needs (and options) in agriculture as part of the IWMI-led Comprehensive Assessment of Water Management in Agriculture (SWIM-2). In 2005, the WaterSim model was also being used to assess the water and agriculture related impacts of the World Trade Organization and other trade agreements in Vietnam, Uzbekistan and Morocco.

#### **(c) Application of IWMI Research**

Finally, the outcomes and impacts of several past IWMI research project became evident in 2005 at both the policy and implementation level. Examples of recent research outputs and their linkages to past and present IWMI MTP Projects include the following:

- € The **Catholic Relief Services initiates a community-based micro-watershed water supply activity** in Afghanistan based on the results of the country’s drought preparedness assessment through an IWMI study on Drought Assessment and Mitigation in Southwest Asia funded by the US State Department (related to MTP Project 8 and former MTP Project 1).
- € Newly **revised World Health Organization guidelines for the safe use of wastewater** in agriculture influenced by IWMI research on wastewater irrigation (related to MTP Project 10 and former MTP Project 5).



- € Ghana's new draft **National Irrigation Policy recognizes "informal irrigation"** as equally important as the Governmental supported "formal irrigation sector", due in part to IWMI research on the livelihoods impacts of urban and peri-urban agriculture and guidelines for national water management policies (related to MTP Project 10 and former MTP Projects 4 and 5).
- € IWMI confirmed as the **fifth International Organization Partner of the Ramsar Convention** on Wetlands during the 9<sup>th</sup> Conference of Parties in Kampala, Uganda, November 2005. Resolution IX.16 welcomed IWMI as a formal partner; the first from outside the original conservation NGOs that have supported the Convention since its establishment. The formal involvement of IWMI is an historic step. It represents a stronger focus within the Convention on sustainable development/integrated management of wetlands and the role IWMI can play in this process (related to MTP Project 11 and former MTP Project 5).
- € IWMI's assessment of the risk of cadmium contamination in rice-based systems led to **improved protection of public health and long-term livelihoods of cadmium exposed communities in northwestern Thailand**. The outputs were adopted by the Royal Thai Government through the Land Development Department, Ministry of Agriculture and Cooperatives, the Bureau of Occupational and Environmental Disease and the Ministry of Public Health. Those influenced by the research outputs include Thai policy makers and researchers. Those primarily affected were communities in Mae Sot, now no longer dietarily exposed to cadmium contaminated rice (Related to MTP Project 10 and former MTP Project 5).

## 2) Strengthening Project Management

As noted in IWMI's MTP 2006-2008, one of the key goals for 2005 was to reduce the complexity of IWMI's research management. Two key developments emerged in 2005 in this regard. The first development relates to a concerted effort to create a smaller number of larger projects at IWMI. In 2004, IWMI's research portfolio contained over

100 research projects of various forms and sizes. Beginning in 2005, with the introduction of the new research structure, IWMI began reviewing each of these projects, consolidating where appropriate and closing out projects that were completed or no longer fit within the current research framework. While a dramatic reduction in project numbers cannot occur overnight due to on-going commitments and some of these commitments remain in the 2006 portfolio, IWMI now has approximately 40 projects with the aim of further consolidation in the coming years.

Secondly, after a major streamlining of the Institute's project management system, IWMI's Program Office began training IWMI researchers in the new system. Over 90 IWMI researchers attended these sessions as well as representatives from some of IWMI's partner organizations. IWMI also recently completed Version 1 of an internal, quarterly project monitoring system called e-Project file, which will allow for more efficient and effective project monitoring and evaluation. Training is currently on-going and the system will begin tracking project progress in 2006.

## 3) Assessing IWMI Impact

In 2005, IWMI produced two impact assessment studies as follows:

- € Performance Evaluation and Impact Assessment of the *ASIALAND* Network: Management of Sloping Lands for Sustainable Agriculture Project-Phase 5, CD-ROM, IWMI-SEA. [http://www.iwmi.cgiar.org/pubs/Other\\_Publications/index.htm](http://www.iwmi.cgiar.org/pubs/Other_Publications/index.htm) (Maglinao et al. 2005)
- € Assessing the Outcomes of IWMI's Research and Interventions on Irrigation Management Transfer (IMT). Contributing chapter to the SPIA Commissioned book on CGIAR NRM Impact Assessment (Giordano et al. 2006 Forthcoming).

To further strengthen and support IWMI's work in NRM impact assessment, internally IWMI conducted a Project Management course (described above), that includes a module on impact assessment and organized a session on impact assessment during the Institute's Annual Research Meeting in November 2005. Externally, IWMI has also formed an alliance with the

WorldFish Center and CIFOR to collaborate on NRM impact assessment. To carry forward this initiative, the three Centers are developing a work program and identifying staff members (either existing or newly recruited) with complementary backgrounds and skills to form the core group. The three Centers are currently working out the details of this collaborative effort.

#### 4) Implementation of the Knowledge Center Initiative

IWMI has also strengthened its collaboration with many of the national partners and is evolving its role as an international research center in response to the needs of the partners as perceived by IWMI. In addition to the Institute's focus on knowledge **generation**, some of the changes involve identifying opportunities to continually **share** knowledge with IWMI's partners and stakeholders; to **broker** South-South collaboration with the larger NARES from, for example, India, China and Brazil; to identify appropriate partnerships with development organizations to facilitate the **application** of the knowledge generated. The key concept adopted by IWMI to address these changing roles is the Knowledge Center Initiative that is intended to help develop and balance the four knowledge roles recognized as crucial for the organization, i.e.:

- € **Knowledge Generation:** IWMI generates knowledge through applied, policy oriented research and long-term future oriented strategic research on its priority themes (MTP Projects) in its priority geographic areas.
- € **Knowledge Sharing:** Knowledge sharing involves building a learning organization as well as taking responsibility for making the knowledge IWMI generates, as well as the germane knowledge produced by others, accessible and available to others.
- € **Knowledge Brokerage:** International centers can play a key role in opening a window-on-the-world for national researchers through the development of international research alliances, both South-South and South-North.
- € **Knowledge Application:** Knowledge only has impact if it is used. However, IWMI is not well placed to put the knowledge it generates directly into the hands of all potential users. Thus, for this role IWMI will be responsible for

establishing impact pathways with appropriate development partners (NARES, local NGOs, and international NGOs) who will enable the application of IWMI's knowledge.

All four knowledge roles are necessary to produce the longer term, broad-based impacts intended by organizations such as IWMI, with a mandate to conduct research that contributes to the fulfillment of the Millennium Development Goals. As such, IWMI is incorporating the four roles into the Institute's research lifecycle through strategic research alliances with partners and stakeholders in developing and developed countries. Thus, while knowledge generation remains the core function of the Institute, IWMI and its partners and stakeholders simultaneously explore options for knowledge sharing, brokerage and application throughout the entire research process. By adopting this approach, we believe that IWMI will better position itself along the research to development continuum and thereby strengthen the overall mandate and impact of the Institute and the research it produces.

Some examples of IWMI progress in the latter three knowledge roles include the following:

- € **Knowledge Sharing:** In 2005, IWMI commenced a pilot initiative entitled Knowledge Sharing in Research, supported by the CGIAR's ICT-KM program. The purpose of the project is to improve the impact of agricultural research for development by building knowledge sharing and communication mechanisms directly into the research process. One of the key pillars of this approach is to involve key partners and stakeholders in the design and implementation of research activities. Ten CPWF and IWMI projects are involved in this pilot initiative, which includes knowledge sharing and outcome/impact oriented training programs to assist the project leaders in identifying and incorporating key knowledge sharing tools into the research process.
- € **Knowledge Brokerage:** In 2004-2005, IWMI and ICRISAT helped to facilitate interactions between researchers and policymakers from East and Central Africa (ECA) and India to share the Indian experiences in agricultural water management and offer lessons to the countries of ECA where similar climate, ecology and socio-economic conditions exist.

**Box 1****Benchmark Basin Approach**

IWMI's primary research sites and field laboratories are the benchmark basins of the CGIAR Challenge Program on Water and Food, as well as IWMI's own (smaller scale) benchmark basins. In these basins IWMI is not only generating and sharing knowledge, but also working with a range of partners from NARES to NGOs and to farmer organizations to have this knowledge applied for the direct benefit of poor farmers and their families. In the benchmark basins IWMI has developed long term programs and partnerships that will enable it to assess the impact its interventions have on key indicators, such as those related water productivity and water poverty. IWMI's research priorities are developed in close consultation with the key partners in the benchmark basins, as well as the system of international agricultural research to which it belongs. It is IWMI's responsibility to translate the diverse set of the partners' priorities into a coherent and focused research agenda with emphasis on achieving impact on sustainable water and land resources management, efficiently and effectively.

The nine CPWF benchmark basins are the physical locations in which the large majority of the CPWF research is focused. They represent a range of agro-ecological zones, high priority water issues, and provide a home for a very large share of the world's poor people. For IWMI, the CPWF benchmark basins are the areas where we explore key elements of our research agenda through collaborative work with partners, closely linked to the stakeholders in each basin. The benchmark basins are large enough to accommodate all scales of research from irrigation systems up to institutional reform and conflict management in international basins. In most cases the IWMI research sites represent only parts of the basin, but the CPWF as a whole attempts to bring the results of the research together at the basin scale and to monitor (long-term) impact of the knowledge generated through the program. Within the four smaller scale IWMI Benchmark Basins, IWMI aims to develop longer-term programs, establish closer working relationships with research partners and stakeholders, and build up datasets and experiences in the basins to facilitate single basin projects as well cross-basin analysis.

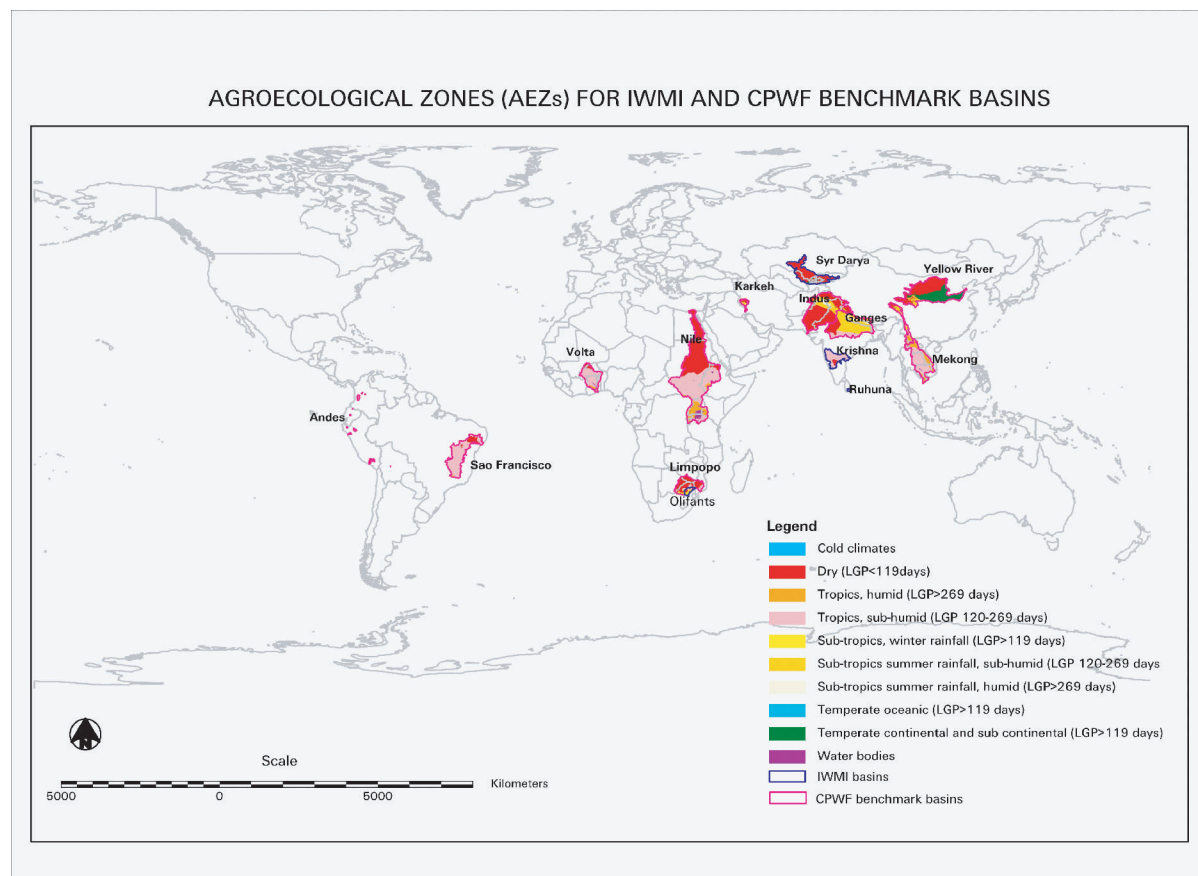
Following a number of IWMI and ICRISAT supported exchanges between the Indian Council of Agricultural Research (ICAR) and the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), the Government of India has now approved a strategic partnership agreement with ASARECA in agriculture and natural resource management research, development and capacity building in the ECA countries.

- € **Knowledge Application:** IWMI has formed a number of strategic alliances with NGOs to assist in the design, implementation and dissemination of research outputs. For example, IWMI is working with World Vision in the Olifants Basin, an IWMI Benchmark Basin, to provide research, policy and capacity building support to the Government of South Africa in implementing the country's national water and

agricultural policies and laws in the basin. Through another project on Multiple Use Water Supply Systems, IWMI is working with a range of international and national NGOs in Asia and Africa (including Catholic Relief Services, International Development Enterprises, and World Vision) to improve food security and health, alleviate poverty, and enhance gender equity through more productive use of small-scale water supplies.

### **C. Plans for 2006 and Highlights of the 2007 Project Portfolio**

To further advance the goals and objectives of the 2004-2008 Strategic Plan, in the years 2006 and 2007 IWMI will concentrate on prioritizing and implementing the new MTP Projects in IWMI's regions and Benchmark Basins. Two important



Source: FAO 1978-81; FAO 1980; FAO 1995; FAO/IIASA/UNFPA 1982.

programmatic changes that will occur in 2006 and thus impact the 2007 Project Portfolio are 1) the completion of the Comprehensive Assessment of Water Management in Agriculture (SWIM-2) and 2) the transfer of the System-wide Initiative on Malaria and Agriculture (SIMA) to a regional partner in Africa. Each of these areas is described in more detail below.

### 1) Prioritizing and implementing the new MTP Projects in IWMI's regions and benchmark basins

With the details of the new MTP Projects in place and their linkages with the new research framework solidified (Figure 1), IWMI is now focusing its efforts

on creating and implementing regional research strategies that match different elements of the MTP Projects with the key priorities and needs of the regions and benchmark basins in which IWMI is active. The Benchmark Basins serve (see Box 1) as the Institute's primary research sites and field laboratories in Africa and Asia, although complementary activities also take place outside of these basins. IWMI has four benchmark basins: the Olifants, Ruhuna, Krishna, and Syr Darya;<sup>6</sup> and works closely in six of the CPWF's nine benchmark basins, namely, the Karkheh, Nile (Blue), Limpopo, Indo-Gangetic, Mekong and Volta.<sup>7</sup>

Map 1 shows each of the IWMI and CPWF Benchmark Basins and agroecological zones covered.

<sup>6</sup> IWMI formally adopted the Syr Darya Basin in 2006 as one of its benchmark basins. The Rechna Doab has also served as an IWMI benchmark basin, but is now absorbed in the larger CPWF Indo-Gangetic Basin.

<sup>7</sup> The other three CPWF Benchmark Basins are the Andes, Sao Francisco, and the Yellow River.

**Box 2*****IWMI's Global Research Division***

IWMI's Global Research Division (GRD) conducts strategic global and cross regional research. Its global research includes global assessments of the natural resource base (e.g., Global Irrigated Area Map and Global Wetlands Map and Inventory), analyses of the impact of global change processes (e.g., climate change and world trade agreements), and explores future scenarios and implications for policy (e.g., the impact of virtual water trade on global water use). In addition, in collaboration with the Comprehensive Assessment on Water Management in Agriculture and the Challenge Program on Water and Food, the GRD conducts cross-regional studies drawing on the research in the IWMI and CPWF benchmark basins. Finally, the GRD provides support services in terms of the provision, storage and analysis of spatial and non-spatial data and products.

To prioritize IWMI's research agenda in each of these benchmark basins, in 2005 and 2006 IWMI held regional research planning workshops in its regional offices in Thailand, Uzbekistan, India, Ethiopia, South Africa, and Ghana, and in the Institute's Global Research Division (GRD) in Colombo (see Box 2). During each of the meetings, IWMI researchers and managers reviewed

IWMI's four new MTP Projects and identified the key linkages with basin, regional, and national research priorities. The outcome of these discussions is a new research matrix for the Institute (see Table 3). The matrix now serves as the road map for IWMI's current and future project portfolio in each of IWMI's regions.

TABLE 3  
**IWMI Research Matrix (2007-2009)**

Region	Benchmark Basin	Key Research Areas	MTP Project Output				CGIAR System Priorities
			MTP 8	MTP 9	MTP 10	MTP 11	
Asia							
Southeast Asia	Mekong	Water institutions and governance	1	1			3C,
		Sustainable watershed management		2			4A, 4B, 4C,
		Inland fisheries and livelihoods		2			4D
		Land and water degradation		3			5C
		Environmental flows and fisheries				1	
South Asia	Krishna, Ruhuna	Water allocation in basins	1				2C,
		Water management to reduce poverty	1				3B, 3C,
	Indo-Ganges	Water productivity	2				4A, 4B, 4C,
		(Ground) water inst. and governance	3	1			4D
		Small scale land and water interventions		1			5C, 5D
		Safe and productive use of wastewater			1		
		Urban demands, ag and environment			2		
		Wetland inventory & mapping				2	
Central Asia and Iran	Sry Darya/ Karkheh	Water allocation in basins	1				3B, 3C,
		Water management to reduce poverty	1				4A, 4B, 4C
		Water productivity	2				4D
		Water institutions and governance			1		5C, 5D
		Land and water degradation			3		

Africa				
West Africa	Volta	€ Water management to reduce poverty	1	2C,
		€ Water productivity	2	3A, 3B, 3C
		€ Water institutions and governance	3	4A, 4B, 4C
		€ Small scale land and water interventions	1	5C, 5D
		€ Multiple use systems	2	
		€ Safe and productive use of wastewater		1
		€ Urban demands, ag and environment		2
East Africa	Nile/ Blue Nile	€ Water management to reduce poverty	1	3B, 3C,
		€ Water productivity	2	4A, 4B, 4C,
		€ Water institutions and governance	3	4D
		€ Small scale land and water interventions	1	5C, 5D
		€ Multiple use systems	2	
		€ Livestock, land and water	2	
		€ Sustainable use of wetlands		2
Southern Africa	Limpopo/ Olifants	€ Water productivity	2	3B, 3C,
		€ Water management and governance	3	4A, 4B, 4C,
		€ Small scale land and water management	1	5C
		€ Multiple use systems	2	
		€ Sustainable use of wetlands		2
Global Research Division				
GRD	Global and cross- regional/ basin analysis	€ Water allocation in basins	1	3B, 3C,
		€ Water management to reduce poverty	1	4A, 4B, 4C
		€ Water productivity	2	5D
		€ Water institutions and governance	3	
		€ Environmental flows and fisheries		1
		€ Wetlands inventory & mapping		2
		€ Sustainable use of wetlands	1	2

As we implement this matrix in 2006 and 2007, some of the key research highlights include:

**Mapping Water Productivity:** Building on the water productivity mapping exercises currently underway in several IWMI and CPWF benchmark basins (including the Krishna, Olifants, Karkheh, and Syr Dayra), IWMI will further develop and refine methodologies to map and quantify irrigated crop water productivity using remote sensing tools. In addition, IWMI will produce maps and rapid mapping methods using remote sensing and GIS techniques that accurately delineate irrigated, rainfed and wetland production systems. Complementing this effort, IWMI will develop assessment and decision support tools to analyze basin scale water use and environmental flow requirements and conduct various trade-off analyses. Ultimately, these efforts will lead to the testing and development of technical and policy recommendations to improve basin scale water productivity and water allocation strategies.

**Mapping Water Poverty:** IWMI intends to build on its past and on-going water poverty related research in several IWMI and CPWF Benchmark

Basins (including the Ruhuna, Syr Dayra, Krishna, and Karkheh basins) to improve the qualitative and quantitative understanding of the relationship between water and poverty. Methodologies as well as analytical tools will be developed for use in IWMI/CPWF benchmark basins and elsewhere, and from that, intervention pathways will be identified to alleviate poverty through water provision and the better management of land and water resources. IWMI is currently in the process of developing proposals to expand both its water productivity and water poverty work to the Indo-Gangetic and Nile Basins.

**Assessing High Potential Interventions:** In 2006 and 2007, under MTP Projects 9, 10 and 11 IWMI will examine the adaptation and implementation of small-scale water harvesting structures to improve water productivity in Sub-Saharan Africa; document and disseminate global community led “bright spots” for improved land and water management; analyze innovative technologies and policies that enhance opportunities for disadvantaged rural farmers faced with problematic saline/sodic soils and water in Central Asia; identify

viable, low-cost options to enhance food safety and reduce the human health impacts of microbiologically contaminated wastewater use in agriculture in West Africa; provide recommendations for the safe use of faecal sludge in agriculture in West Africa; develop global guidelines for implementing environmental flow requirements; and demonstrate evidence-based viable interventions for sustainable land and water management in wetlands in Southern Africa.

**Assessing Impacts:** The four MTP Projects will work together to assess the actual and potential impacts of various interventions such as the:

- € socio-economic and environmental impacts of irrigation investments in Sub-Saharan Africa;
- € global trends and impacts of land and water degradation on food security and water productivity
- € costs and benefits of options addressing heavy metal contaminated irrigation water in Southeast Asia
- € impact of built structures on fisheries and related livelihood activities in the Mekong Basin;
- € impacts of irrigation systems on biodiversity in Sri Lanka.

See MTP Project Logframes for additional details.

## 2) Completion of the Comprehensive Assessment of Water Management in Agriculture (SWIM-2)

The Comprehensive Assessment of Water Management enters into its final year in 2006. The program's outputs will include:

- € An *assessment report* informing decision-makers on water and agriculture investments to reduce poverty and promote environmentally sustainable practices;
- € *Assessment research* documented in a book series, research reports, journal articles, discussion papers, working papers, briefs, and other outlets;
- € *Assessment tools and information* including models (updated Podium and WaterSim); data and information tools (global map of irrigated areas, environmental flows map, information on virtual water trade); literature reviews

(irrigation impacts); assessment approaches including valuation and participatory impact assessment approaches for fisheries and irrigation; and case studies focusing on water, food, livelihoods and environment;

- € *Capacity building* in terms of student training (MScs, PhDs), and interaction with a broad number of partners from developed and developing countries
- € *A network of water, food and environment partners* to continue the task into the future, including close linkages with the Challenge Program on Water and Food. Communities of Practice are also being formed around issues such as water and poverty, climate change, water and agriculture.

The past year was a breakthrough for the Assessment report, the flagship product of SWIM-2, with very active participation and considerable progress made on the individual chapters. Extensive documentation and related project outputs can be found on the SWIM-2 website (<http://www.iwmi.cgiar.org/assessment>).

Communication of findings has been an integral part of the assessment process, with large numbers of researchers and practitioners participating in the process and presentation at key meetings. For example, in March the findings of the Assessment chapter on Rice were reviewed and discussed at a WWF/PCARRD workshop "International Dialogue on Rice and Water: Exploring Options for Food Security and Sustainable Environment," hosted by IRRI. In the same month, SWIM-2 hosted a session at the Fourth World Water Forum entitled "Assessing livelihood and environmental synergies and trade-offs for water management in agriculture." SWIM-2 is linked to other assessments, like the International Assessment on Agricultural Science and Technology for Development (IAASTD), which looks to SWIM-2 for water input.

Communication will continue through 2006 and continue into 2007 targeting a number of audiences: policymakers and investors; the general public; researchers and practitioners; education programs; NGOs and local communities. The co-sponsors-the FAO, CGIAR, Ramsar Convention on Wetlands, and the Convention on Biological Diversity-have all agreed to transmit the results to their constituents. SWIM-2 will be highlighted at a series of media

events and symposia including: the launch of the Assessment summary for decision makers at the World Water Week in Stockholm, in September; the Brisbane 9th International River Symposium and the Regional Workshop on Agricultural Water Management (AWM) in Eastern and Southern Africa to be held in Maputo, Mozambique; and in November SWIM-2's research outputs will be formally handed over to the Challenge Program on Water and Food at the CPWF Synthesis Conference. SWIM-2 is in discussions with: the Global Water Partnership for country level dialogues using assessment results; with GOFAU to bring results into educational curriculum; and is proposing to work with local communities to translate assessment findings into results meaningful for the local context.

### **3) Future of the System-wide Initiative on Malaria and Agriculture (SIMA)**

In 2001 IWMI, on request of then Center Directors Committee (CDC), convened a System-wide Initiative on Malaria and Agriculture (SIMA). Since its inception, SIMA has initiated research projects in several African and Asian countries with the aim of developing agriculture-based anti-malarial intervention strategies, and has produced a host of high profile research outputs. Unfortunately, despite concerted funding raising efforts, the Program has found it difficult to secure significant financial support for future activities. A large proposal to the Grand Challenges in Global Health was not funded and a proposal to the African Development Bank is still pending. The 2006-2008 MTP states that if additional funding was not forthcoming in 2005/6, SIMA would begin winding down its activities. In addition, the Science Council in their recent commentaries on IWMI's Medium Term Plans noted that some of the proposed work of the program is outside of the Institute's comparative advantage and the CGIAR's research priorities, and urged a review and a maintenance of the focus on the core strengths of the CGIAR.

In light of these events, in its November 2005 meeting, the IWMI Board responded positively to suggestions from African national partners to pass on the responsibility for the SIMA network to one or more African national or regional partners. The

CDC (now Alliance Executive) supported this suggestion at its meeting in Marrakech in December 2005. Discussions are ongoing with NEPAD. The year 2006 is a transition year; by the end of 2006 IWMI will have transferred SIMA and it will no longer be a CGIAR system-wide initiative.

### **D. Research Collaboration**

The approach to research adopted by IWMI is based on partnerships. The performance of the organization therefore depends on the types and levels of partnerships IWMI achieves. Most of IWMI's research is conducted through a range of collaborative agreements, often through research networks or consortia. IWMI has paid much attention over the last five years to increasing the quality of its partnerships—to a level where responsibility, resources and credit are shared fairly and equitably among the partners, with respect for the potential contribution of all. Part of the increased level of partnerships are the strongly increased linkages with many of the other CG centers, be it through bi-lateral collaboration or through system-wide initiatives such as the Comprehensive Assessment of Water Management for Agriculture and the Challenge Program on Water and Food. IWMI has also strengthened its collaboration with many of the national partners, and, as noted above, is drawing on the Knowledge Center Initiative to further develop and balance the four knowledge roles recognized as crucial for the organization.

We provide below a summary of some of the key new developments in IWMI's collaborative arrangements.

### **ARIs/NARES**

€ **University of Florida:** The University of Florida is establishing a new Water Institute. Related to this development, the University of Florida and IWMI plan to establish a Memorandum of Understanding to cover joint research and capacity building activities. Two activities likely to commence with this collaborative relationship are joint research on wetlands management and the development of a water ontology to improve knowledge sharing among water experts.



- € **Global Irrigated Area Mapping Consortium:** In 2006, IWMI together with the Food and Agricultural Organization of the United Nations, the Asian Institute of Technology, the University of North Dakota, Yale University and several NARES are working together to develop new techniques of multi-temporal satellite image analysis mapping; quantify irrigated area at global and regional scales; and to evolve and improve mapping at regional scales.
- € **Stockholm Environment Institute:** IWMI's collaboration with SEI is growing. In addition to a joint Post Doc in Small-scale System Innovations, IWMI and SEI submitted a joint proposal to SIDA for the Green-Blue Water Initiative Program. Future plans include a joint Post Doc on sustainable sanitation. To capture the range of current and proposed collaborations, the two organizations are currently drafting a Memorandum of Understanding.
- € **Regional NARES:** IWMI is seeking closer collaboration through research projects and knowledge brokerage initiatives with subregional and regional networks in Africa, such as CORAF in West Africa; SADC in southern Africa; ASARECA in Eastern Africa; and FARA, the Forum for Agricultural Research in Africa.

#### **International Organizations:**

IWMI was confirmed as the fifth International Organization Partner (IOP) of the **Ramsar Convention** on Wetlands during the 9<sup>th</sup> Conference of Parties in Kampala, Uganda, in November 2005. As an IOP, IWMI will serve as a permanent observer on the Standing Committee and as a full member of the Scientific and Technical Review Panel.

#### **Future Harvest Centers**

In addition to past and present **joint projects** with IRRI, ICRISAT, CIMMYT, and IFPRI; **joint appointments** with ICARDA, WorldFish and IFPRI; and the **MTP alignment process** in Africa, IWMI is further strengthening its research and operational collaborations with several Future Harvest Centers, including:

- € **ILRI:** IWMI and ILRI recently signed an overarching agreement on joint appointments and are in the process of recruiting a joint staff member to conduct research on water-livestock interactions.
- € **WorldFish and CIFOR:** As noted above, IWMI, WorldFish and CIFOR have commenced a strategic alliance on impact assessment. ICRAF has also expressed an interest in joining this collaborative effort.
- € **WorldFish:** A very significant event for the Institute is its growing collaboration with the WorldFish Center. Following meetings of the WorldFish and IWMI Boards at the headquarters of the WorldFish Center in Penang, Malaysia, from 6-9 March 2006, the two Boards agreed to continue to further pursue their organizational alliance through 1) the establishment of shared corporate services, 2) the identification of areas of collaborative research, and 3) increasing the number of joint Board members and through regular meetings of the Board Chairs and the Center DGs to review progress on collaboration.

#### **E. Program Reviews**

Since the last IWMI External Performance Management Review in 1999-2000, IWMI has organized five Center Commissioned External Reviews (CCER) as follows:

- € 2001: Human Resources Operations
- € 2002: Water, Health and Environment, former MTP Project 5
- € 2003: Center-wide Program review in conjunction with Strategic Planning process
- € 2004: IWMI-Tata Water Policy Program, within the former Groundwater Management MTP Project 3
- € 2005: Agricultural Water Management, former MTP Project 1

IWMI's next External Program and Management Review will take place in 2006. Following the endorsement of the recommendations by the CGIAR, IWMI will begin tracking its implementation progress in annual Medium Term Plans.

#### 4. CENTER FINANCIAL INDICATORS

Over the period 2000-2003 IWMI experienced a spurt in its activities and funding during which the Institute grew in size and also repositioned itself as a key player on the global stage. Following this period of rapid growth, we are now in the process of consolidation. Apart from the healthy growth rate and consolidation of advances of recent years, consolidation also means a continuous change process to keep pace with the rapidly changing external world. For example, activities in Ghana and Ethiopia continue to increase, and new projects have come on stream in South Africa, Ghana and India, in particular.

In contrast with an average annual increase of 35 percent in funding over the period 2000-2003, growth over the period 2004-2005 has been more modest. IWMI's funding for core activities registered a 7 percent increase in 2004 and 14 percent increase in 2005. In 2006, the Institute projects an increase of 9 percent. In 2005, IWMI recorded total revenues of \$30.09 million, an increase of 30 percent over 2004, including \$5.6 million for non-IWMI implemented CPWF funding (and consequently a total of \$24.5 million for "core-IWMI"). The revenue included \$8.42 million of unrestricted grants, \$1.97 million in program restricted grants, and \$19.71 million of restricted grants and other revenue. The unrestricted funding increased by 10 percent over 2004.

Expenses grew at a similar rate with the income to accommodate the growth and expansion. IWMI's

overhead as a percentage of total costs remained at 18 percent in 2005 as compared to 23 percent for 2001 and 29 percent for 2000. This is by and large the result of a relatively low increase in support function cost in comparison to the increase in operations that more than trebled in the past years.

IWMI's total reserves at the end of 2005 are \$4.6 million, up from \$4.2 million in 2004, mainly due to a net surplus of \$0.4 million in 2005. The reserves are projected to increase to \$5.1 million by the end of 2006. IWMI's financial position is stable and continues to improve.

The CGIAR has developed four parameters to measure financial health of the centers. These are: 1) long term financial stability (recommended range 75-90 days), 2) short term solvency (recommended range 90-120 days), 3) efficiency of operations (indirect cost to direct cost) and 4) cash management on restricted operations ratio. IWMI's short term solvency ratio is 96 days and long term financial stability ratio is 71 days at the end of 2005, projected to increase to 75 days at the end of 2006. The efficiency of operations ratio was 22 percent in 2005, projected to be at the same level in 2006; and the cash management on restricted operations is 25 percent. Most of these ratios are within the acceptable range, and IWMI is committed to ensuring the adherence to these levels in the future as well.

IWMI's financial ratios are calculated by taking into account both core IWMI expenditures and IWMI implemented Challenge Program expenditures. It does not include non-IWMI implemented Challenge Programs.

# International Water Management Institute

## Medium Term Plan 2007-2009

### IV. MTP Projects

#### 1. MTP PROJECT 8

##### **Basin Water Management: *Understanding Water Productivity***

###### ***Rationale for the MTP Project and Changes***

IWMI's MTP Project "Basin Water Management" encapsulates this expanded view of water (and land) productivity. The overarching goal of the project is to provide a better understanding of the tradeoffs and options in agricultural water management at the basin scale and contribute to improved equity and productivity in water use through the development of appropriate tools and methodologies for analysis and management. This MTP Project serves as the cornerstone of IWMI's research agenda, providing the context for problem identification (sectorally, spatially, and temporally) as well as the impact assessment of proposed solutions to contribute to IWMI's mission of improving the management of land and water resources for food, livelihoods and nature. Changes from the 2005-2008 MTP logframe reflect this implementation strategy, as well as some changes to help clarify alignment with CGIAR system priorities, and to better define output targets.

Historically, water management for agriculture was equated with the development and operation of water systems and structures, largely for irrigation. However, the rapid growth of urban centers and industry has led to increasing competition for water across sectors. Thus, the key challenge now for agricultural water management is achieving "more crop per drop" an approach that marked a paradigm shift in IWMI's thinking on how to increase food production for a growing population while simultaneously meeting the water quality and quantity requirements of other economic and environmental sectors.

From the mid 1990s, IWMI began to place irrigation management into the overall context of river basins

and to examine the interlinking hydrologic, socio-economic and environmental aspects of water management at multiple scales. Since then, IWMI's research on water productivity has matured significantly by incorporating issues of environmental and human health; examining the linkages between water and land productivity as well as identifying opportunities for improved productivity across the entire blue-green, rainfed-irrigated, surface-groundwater spectrum; and, most importantly, assessing the impact of water productivity on the alleviation of poverty and hunger.

The specific focal areas leading to Outputs of this MTP project are:

- € **Sustainable water use in agriculture:** To develop, test and apply analytical frameworks, water accounting methodologies and supporting tools to quantify and manage water resources for agriculture at a basin scale and to assist managers apply them in selected basins.
- € **Understanding water productivity at basin scale:** To understand the impacts of field, farm and system level improvements in land and water productivity at the basin scale and to provide methods and tools for planners to develop appropriate policies and supporting strategies to increase net basin level water productivity.
- € **Institutions and policies for better water management at the basin scale:** To analyze, contextualize, evaluate and recommend appropriate institutional arrangements to manage water resources for agriculture at basin scale, over a range of contrasting conditions, with special emphasis on the balance between sustainable and productive use of water.

###### ***Alignment of the MTPs with the CGIAR System Priorities***

The research proposed in this project is completely aligned with CGIAR System priorities addressing

primarily CGIAR System Priority 4 – Poverty alleviation and sustainable management of water, land and forest resources (80%), with a smaller percentage of activities (20%) addressing priorities 3B, 3C, and 5D.

MTP Project 8 fulfils two functions in terms of IWMI's broader research agenda:

- 1) to identify, from a basin scale perspective and from synthesis of existing research, where there are opportunities for specific diagnostic or action research on interventions relating to agriculture, water and land (MTP Project 9), urban-agricultural interactions (MTP Project 10) and water use impacts on the environment (MTP Project 11).
- 2) to test the impacts and implications of the results of research conducted in the other three MTP Projects at basin scale based on scenarios of adoption, scale, intensity and so on. It seeks to understand the trade-offs between the multiple objectives of poverty reduction, environmental protection and increased agricultural productivity of promising research and interventions developed for specific users and locations.

The comparative advantage of the MTP Project, and of IWMI more broadly, is to take a multi-disciplinary perspective on the use of water for agriculture and balancing its consequences for development and conservation. Irrigation is, globally, by far the largest user of water resources, and this fact is central to basin level water management *in toto*. It is central to the challenge of satisfying higher value water needs (drinking water

supply, sanitation, power generation, industrial and environmental uses) as competition intensifies in over-allocated basins. Irrigated agriculture is the safety valve for meeting these needs, while at the same time increased productivity is required to match continually increasing food demands with changing dietary preferences. At an international level there are no other research institutes with this focus or capability.

There have been significant advances in hydrology in that last 50 years, coupled by considerably greater spatial information relevant to hydrological processes and agricultural production, as a result of innovation and development in Remote Sensing, GIS and distributed simulation modeling. Land use change in Asia, and to a lesser extent in Africa, has been dramatic and has resulted in hydrological changes that are greater than the potential impacts of climate change, although this fact is often overlooked.

Understanding the interactions between land use, hydrology and other human activity will become increasingly important as largely agrarian developing countries urbanize and industrialize. It is also equally important to undertake a better balance of development and preservation in Africa, where well-advised water management and development offers considerable potential to alleviate poverty and provide a springboard for economic development.

In 2006, 55 individual activities of varying size and funds have been grouped in 8 projects across the three MTP Project 8 outputs. Table 1 shows more clearly how the MTP Project outputs and project groupings address the Science Council Strategic Priorities.

TABLE 1  
**Meeting the CGIAR System Priorities**

Output	Project group	CGIAR System Priorities
Sustainable water use in agriculture	Water allocation in basins	4a, 4c, 4b
	Supporting IWRM for agriculture	4a, 4c
	Water management to reduce poverty	5d, 3b, 3c, 4b
Understanding water productivity at basin scale	Quantifying and improving water productivity	4a, 4c, 3b, 3c, 4b
Institutions and policies for better water management at basin scale	Water governance in Africa	4a
	Transboundary & interstate water mgmt.	4a, 4b
	Groundwater institutions and mgmt.	4a
	Research needs and pathways – global to regional	5d

## **Description of Impact Pathways**

The framework for long-term impact is provided through the research conducted in IWMI and the CPWF's benchmark basins. The benchmark basins provide a working laboratory where research across the IWMI MTP Projects and disciplines can be conducted in one "living laboratory" and over a period of time (ideally 10-15 years) that matches the evolution of cause and effect at landscape level. In addition to providing research results that, as far as possible, become generic, working at a basin level should promote direct developmental impact through maturing professional links with policymakers and natural resources managers *in situ*.

The primary beneficiaries and end users of MTP Project 8 outputs therefore tend to be resource managers, policymakers and those charged with putting policy into practice. A second tier of beneficiaries comprises managers, researchers and consultants, who can take advantage of integrated methodologies, tools and techniques that support integrated water resources management (IWRM), and take account of a broad range of stakeholder perspectives and needs within a river basin.

Typically, river basins cut across multiple agro-ecological zones, and each one provides a different niche for agricultural development that needs to be balanced in terms of basin water resources and their reliability. Generally speaking MTP Project 8 has a stronger focus on arid and semi-arid tropical and sub-tropical locations where irrigation and water harvesting are important, and where drought and water stress are evident.

In Africa, MTP Project 8 research aims to underpin options for sustainable development focused on poverty alleviation, whereas in Asia, there is a much

stronger focus on addressing the problems of over allocation of water (basin closure), the consequences of agricultural intensification (non-point source pollution), negative environmental impacts through diversion of stream flow to irrigation, and balancing competing uses from urban and industrial growth.

## **Research Approach to Develop International Public Goods (IPG)**

MTP Project 8 is more involved in assessment type activities than the other MTP Projects, but primarily from a perspective of "how to assess" rather than in doing assessment for its own sake. Therefore, projects like Global Irrigated Area Mapping (GIAM) do indeed produce global assessments of irrigated area, but their greater utility lies in the development of techniques of image analysis, sub pixel area decomposition, validation and statistical analysis, which benefit a wider set of users working at different scales and purposes. Water resources managers commonly encounter major problems with a lack of data, poor data quality or continuity, or crucial gaps in types, time-series or spatial coverage. This has often meant that the hydrology and groundwater hydrology (water resources assessment) behind what should be routine water accounting, are often inadequately done and severely limit the development of sound and sustainable water allocation strategies. It is this gap and pressure to develop agriculture that has led, inadvertently, to many basins' water resources being over-exploited in IWMI's client countries. IWMI has a key role in promoting and supporting better quantified water management at all scales.

Examples of some of MTP Project 8's IPG products are shown in the table below:

International Public Good	Research Approach
Global Irrigated Area Mapping (GIAM) - including website with products, methodologies and data. - also Land use / Land Cover and Rainfed Agriculture maps at the global scale	1. Limited research partnerships with FAO, AIT, Univ. North Dakota, Yale University to develop new techniques of multi-temporal satellite image analysis mapping and quantify irrigated area at global and regional scales. 2. Broader based partnership with national research centers to evolve and improve mapping at regional scales.
IWMI Data Storehouse Pathway	Provides access to RS/GIS Products, data, interim products (megafiles of time series imagery) and raw data developed primarily from the GIAM project.
Drought Monitoring	Drought monitoring pilot website, combining agro-meteorological and remote sensing approaches. Potential for real time operation.
Consortium for Spatial Information (coordinated by IWMI)	Cross-CGIAR initiative to make all geospatial products and base data sets available from different Future Harvest Centers to improve research capability within and outside CGIAR. Extensive metadata development.
Diagnostic Tools to predict and develop scenarios for future water use in agriculture	PODIUM – National and basin level water demand scenarios for food production, through in-country partnerships and workshops. WATERSIM – potential impacts of trade on water use for agriculture at global and regional scales.
Basin Data Sets	Provision of benchmark data sets on GIS, topography, land use, etc. for IWMI and CPWF benchmark basins.

### ***Elaboration of Partners' Roles***

IWMI combines many disciplines under one roof and complements this with carefully selected and strong research and development partners through ARIs, national research services and practitioners, such as river basin managers. The key comparative advantages of MTP Project 8 lie in the combination of technical, economic and institutional research, and the ability to draw on comparative and instructive intelligence and experience from different regions, agro-ecological zones and stages of development. There are strong links between MTP Project 8 and the Challenge Program on Water and Food and also in preparing and moving forward from the Comprehensive Assessment of Water Management in Agriculture (SWIM-2). In all cases, MTP Project 8 research is in the category of primary research provider, but working in close collaboration with partners on the ground.

In addition to the CA, CPWF and SWIM-2, other major collaborators from international and national research organizations include: FAO (Rome and Bangkok); CARE/Nepal; Chinese Centre for Agricultural Policy; International Rice Research Institute (IRRI); CIMMYT; ICRISAT; ICARDA; International Program for Technology Research in Irrigation and Drainage (IPTRID); CSIRO, Australia; SEI, Boston; Nile Basin Initiative, ASARECA; Iranian Agricultural Engineering Research Institute.

Collaboration and joint research with universities include: Wuhan University, China; Asian Institute of Technology; Wageningen Agricultural University; IHE Delft; ZEF, Bonn; Cornell University; UC Davis; Yale University; University of North Dakota; ITC, Enschede; University of Witwatersrand; University of Pretoria; University of Natal; Sokkoine University of Agriculture, Tanzania; Mekelle University, Ethiopia; Kasetsart University, Thailand.

Additionally, work is conducted with executive agencies such as Irrigation Departments and Water Management Authorities, including the Andhra Pradesh Department of Irrigation (India), Khuzestan Water and Power Authority (Iran) and DWAF (South Africa). Sometimes this is research or applied research and sometimes it is somewhere between research and consultancy, providing services to these executive agencies, but working in collaboration with them – a combination of research, action and capacity building, as seen in the recently completed Pehur High Level Canal Operations Support project in Pakistan.

Over the MTP period, MTP Project 8 will increasingly focus on the nexus of food, livelihoods, water management and environment, that has emerged strongly as a key research need from SWIM-2. This will involve better integration through land and water use dynamics at basin scale, and more importantly, through the institutional development and adaptation required.

**MTP 8: Basin Water Management: 2006-2009**

	Outputs	Intended User	Outcome	Impact	Sub-Region	Link to CP SW/EPs
Output 1 Sustainable water management	Appropriate water accounting methodologies and allocation frameworks developed and adapted for use in developing country basin level water management, including: remote sensing and GIS tools, and improved hydrologic science.		Analytical frameworks, water accounting methodologies and supporting tools to quantify and manage water resources for agriculture at a basin scale developed, tested and managers assisted in applying them in selected basins.	The tradeoffs and options in agricultural water management at basin scale better understood and improved equity and efficiency in water use promoted through the development of appropriate tools and methodologies for analysis & management. Bound into national policy.		
Output Targets 2006  Water allocation in Basins	Case studies of <b>groundwater-surface water interactions and allocation</b> management completed and in Tunisia (Cap Bon), Fergana Valley (Uzbekistan). Decision support models completed. Pilot study completed in Karkheh Basin.	Decision makers Researchers Local WR managers	Assessment and decision support tools used by local agencies in collaborating countries and elsewhere.	Formal water accounting and allocation systems incorporate both surface and groundwater.	Central Asia, Africa (Sub-Saharan Africa and North Africa)	CPWF
	Integrated modelling frameworks for <b>economic analysis of water allocation options</b> completed in Krishna Basin (India), Karkheh Basin, (Iran) and Olifants Basin (South Africa). Data bases established.	National and international water policy makers	Allocation situation in the basins understood. Alternative allocation options considered by decision makers.	Water policy and allocations adjusted to match resource availability and committed uses.		
	Decision aid <b>for participatory planning and management</b> completed for Upper Ruaha Basin, Tanzania.	Ministries of water Resources, Agriculture & Environment	Decision tool used in field by Tanzanian Natural Resources Managers.	Locally adapted wetland and irrigation management strategies adopted.		
	Case studies of <b>historical to current water resources development and allocation</b> completed in Ruhuna, Sri Lanka, Tunisia, Karkheh, Krishna and Olifants basins.	Policy makers, decisions makers, service providers	Lessons incorporated into water policy and associated institutional development.	Greater equity in water resources allocation.	Sub-Saharan Africa, North Africa, South Asia.	CPWF

	Outputs	Intended User	Outcome	Impact	Sub-Region	Link to CP SW/EPs
	<b>Assessment of drought and adaptation strategies</b> at basin scale completed. Development of monitoring tools and DSS in Iran and South Asia.	Researchers, Decision Makers Practitioners	Increased recognition and active inclusion of hydrologic variability and drought in water allocation strategies.	Drought monitoring and forecasting routinely practiced in host countries.	South Asia, Iran and Central Asia.	
Supporting Integrated Water Resources Management for Agriculture.	Design tools for small scale reservoirs and case studies on <b>hydrological impacts of ensembles of small reservoirs</b> completed in Volta Basin.	Researchers and practitioners	Operational and institutional innovations in reservoir management from projects replicated at wider scale.	IWRM policies developed to better manage and support small irrigation in host countries.	East Africa (Sub-Saharan Africa).	CPWF
	<b>Health impact assessments of small dams</b> completed in Ghana, Burkina Faso, Morocco and Tigray, Ethiopia.	Donors, decision makers and practitioner	Dams better designed to mitigate negative health impacts.	Reduced burdens of water related diseases in populations using and living near small dams.	East Africa (Sub-Saharan Africa) and MENA.	
	Decision support tools and MIS completed for pilot areas in Fergana Irrigation system– <b>linking system management to WUA levels</b> . WUAs trained in Central Asian Region.	Irrigation system operators	Better service provided to WUA's by canal operators.	Improved farm production, diversification and farm incomes, with minimal salinisation.	Central Asia	
Water management to reduce poverty in Africa.	Knowledge base and websites developed on <b>rural incomes and food security</b>	Researchers Decisions makers	Knowledge bases used by decision makers.	Rural incomes enhanced.	Sub-Saharan Africa	
	Methodologies developed to assess the <b>links between water and poverty</b> . Interventions identified to mitigate poverty through water use. In Karkheh, Iran; Syr Darya, Uzbekistan; and Lower Krishna Basin.	Researchers, Decision Makers Practitioners	Poverty maps and analysis linked to water availability, access and use help specify well targeted development to alleviate poverty.	Poverty reduced through water related interventions.	Central Asia, India	CPWF
	<b>Synthesis assessment of irrigation in Kenya</b> .	Researchers, Decision Makers Practitioners	Recommendations for poverty alleviation through local scale irrigation development and management in Africa.	Improved success in implementation of small scale irrigation in Africa.	East Africa	
	Numerical model <b>study of coastal aquifers</b> in Sri Lanka completed. Well reclamation strategy post Tsunami situations recommended.	Practitioners Users, NGOs INGOs	Improved drinking well reclamation management in post Tsunami or sea water intrusion situations.	Stabilisation of coastal communities post-disaster.		



	Outputs	Intended User	Outcome	Impact	Sub-Region	Link to CP SW/EPs
Output Targets 2007	<b>Economic-hydrological modelling</b> for whole Krishna basin, and more detailed work for Andra Pradesh completed.	Decision makers NR and water Managers	Options for economically efficient and equitable water use accepted by water managers for all three states in Krishna Basin.	State water policies developed with balanced understanding of economic and equity objectives.	South Asia, Sub-Saharan Africa, Central Asia	CPWF
Water allocation in Basins	Similar modelling completed for Olifants and Karkheh basins.		Alternative allocation scenarios accepted in Olifants and Karkheh.			
	<b>Regional drought monitoring tools</b> completed in Iran. Regional drought centre established.	Researchers, Decision Makers Practitioners NGOs	Increased recognition and active inclusion of hydrologic variability and drought in water allocation strategies.	Drought monitoring and forecasting routinely practiced in host countries.	South Asia, Iran and Central Asia	
	Case studies of <b>historical to current water development</b> in Zayandeh Rud (Iran) and Chao Phraya (Thailand) completed. Final synthesis of 9 basin studies completed. General and specific policy prescriptions published.	IWMI, Global water community, respective basin management agencies/ institutions	Recognition of basin closure by water managers and adoption of adaptive management strategies. Awareness of the political dimension and arena for water management reinforced.	Contributes to attainment of sustainable water use in multiple basins in world.	Global	CPWF
	Ethiopian case studies of <b>environmental operations for dams</b> completed. Guidelines for environmental operations of dams in Africa published.	Decision makers Water Managers	Guidelines adopted in Nile Basin.	Guidelines put into practice in dam operations in the Nile Basin.	Africa	
Supporting Integrated Water Resources Management for Agriculture	Design guidelines for <b>effective ensembles of small scale reservoirs</b> . Assessment of hydrological impacts complete.	NGOs, Decision makers	Design guidelines adopted by agencies and NGOs in Ghana and Burkina Faso.	New reservoirs designed and developed according to guidelines.	West Africa	
	<b>Trade-off and hydro-economic analysis</b> framework for <b>agricultural water development</b> in Upper Nile completed.	Researchers, Decision Makers Practitioners NGOs	Options for agricultural water development accepted.	Options for agricultural water development implemented.	Africa	CPWF
	Final recommendations for <b>canal management</b> in Fergana Irrigation system—linking system management to WUA levels.	Irrigation system operators	Recommendations accepted.	Recommendations adopted	Central Asia	

	Outputs	Intended User	Outcome	Impact	Sub-Region	Link to CP SW/s
Water management to reduce poverty	Recommendations for <b>poverty focused water related interventions</b> completed in Karkheh, Iran, Syr Darya, Uzbekistan, and Lower Krishna Basin. Preliminary poverty-water basin studies in Nile basin.	Researchers, Decision Makers Practitioners	Poverty maps and analysis linked to water availability, access and use help specify well targeted development to alleviate poverty.	Poverty reduced through water related interventions.	Central Asia, India,	CPWF
	<b>Synthesis of water and poverty methodologies</b> (spatial, statistical and geo-spatial) completed.	Researchers Practitioners NGOs	Methodologies adopted by broader range of researchers and users.	Water development funding is better targeted.	Central Asia, India,	CPWF
Output Targets 2008 Water Allocation in Basins	<b>Alternative water allocation plans</b> developed, substantiated and proposed. Techniques documented.	State Governments of Andra Pradesh, Maharashtra and Kamataka.	Improved and commonly accepted water assessment and management plan for Krishna Basin.	Economic-hydrologic modelling incorporated into basin planning and management more widely in India.	South Asia	
	Guidelines for <b>catchment management strategies</b> complete and submitted.	Waternet/CPWF/ National Governments	Catchment guidelines internalised through stakeholder process already.	Improved catchment management performance and poverty reduction.	South Africa	
	Complete <b>design and management package for ensembles of small dams</b> , incorporating downstream hydrology impacts and health management.	Governments of Ghana and Burkina Faso. NGOs	Adoption of guidelines by client agencies. More widespread dissemination of methods and guidelines in other African countries.	Routine application of guidelines leads to increasing number of successful small reservoir projects in W. Africa.	West Africa	CPWF
	Final <b>guidelines for large dam operations</b> in Africa, balancing livelihoods and environment.	Decision makers and water managers	Guidelines adopted.	Guidelines implemented. Environmental flow regimes established.	Africa	CPWF
Water management to reduce poverty	<b>Poverty reducing water related interventions</b> identified in Nile and Niger and Ganges Basins through water and poverty analysis methodologies developed to 2007.	Decision makers. NRM and water managers NGOs	Interventions accepted by partner agencies and government.	Interventions promoted and adopted by poor communities.	Africa and Asia	CPWF
Output Targets 2009 Water Allocation in Basins–assessment of adaptive management.	Synthesis of all basin trajectory, <b>allocation modelling and scenario testing</b> work in benchmark, BFP (Basin Focal Project) and CPWF basins. Decision support tool box for allocation analysis.	Researchers, Decision Makers Practitioners Consultants	Historical synthesis, and improved hydrology and water accounting methods adopted in partner basins.	Approaches and tools adopted more widely and contribute towards establishment of formal allocation policies and water rights systems.	Global	CWPF

	Outputs	Intended User	Outcome	Impact	Sub-Region	Link to CP SW/EPs
Agricultural responses to re-allocation	Case studies of <b>transfers of water out of agriculture and their impacts</b> and corresponding responses/adaptations in India and China. Preliminary methodologies published.	Decision Makers Practitioners	Economic and equity impacts of water transfer recognized and understood by policy makers.	Compensation mechanisms for water transfer from agriculture developed.	China, India	
Quantifying and managing water quality impacts from agriculture.	Application of preliminary methodology and modelling framework for <b>managing NPS pollution</b> to new cases studies in Asia and Central Asia.	Researchers	Techniques adopted and improved.	Techniques disseminated to local researchers and practitioners.	Iran, China, Southeast Asia.	
Output 2 Understanding Water Productivity	Development and documentation of trade-off analysis between sustainability and productivity at basin scale, and clear policy recommendations and examples to show optimal strategies and trade-offs for balanced development of rain-fed and irrigated agriculture at basin scale.		The impacts of field, farm and system level improvements in land and water productivity at basin scale understood, and methods and tools for planners to develop appropriate policies and supporting strategies to increase net basin level water productivity provided.	The tradeoffs and options in agricultural water management at basin scale better understood and improved equity and efficiency in water use promoted through the development of appropriate tools and methodologies for analysis and management.		
Output Targets 2006  Quantifying and improving water productivity	Preliminary methodologies developed to <b>map and quantify irrigated crop water productivity using remote sensing</b> , in Syr Darya and Krishna Basins.	Researchers	Remote sensing techniques adopted and enhanced by local researchers and practitioners.	Strategies and programmes in place to allocate and use water in ways that improve water productivity and minimise agricultural demand.	Central Asia, India	CPWF
	<b>Quantified trade-offs and methodologies developed for irrigated and enhanced rainfed agriculture</b> in Karkheh Basin.	Researchers Decision makers	Balanced policies for irrigated and rainfed development developed.	Balanced policies for irrigated and rainfed development implemented.	Iran	CPWF
	Preliminary <b>comparative valuation of agriculture and wetland services</b> in Sao Francisco Basin and in small reservoirs in Volta Basin, and Limpopo/Olifants.	Researchers Resource Managers	Valuations and valuation methods discussed by research community	Valuation methods improved and adopted.	Sri Lanka Ghana/ Burkina Faso (Brazil)	CPWF
	International workshop on <b>Global Irrigated Area Mapping</b> (Colombo, 10/06) completed. V2. of Global Irrigated Area Map completed and reviewed.	RS researchers	New techniques disseminated and used in target regions—Central Asia, China, India.	Assessment of irrigated area improved through distributed programme of research with national and regional partners.	Global and Asia/Africa regional	CPWF

	Outputs	Intended User	Outcome	Impact	Sub-Region	Link to CP SW/EPs
Output Targets 2007	Decision support tools to <b>minimise NPS pollution and export to downstream wetlands</b> completed intensified agriculture case study in Sao Francisco Basin.	Researchers Resource Managers	Decision support tools adopted and used.	NPS pollutant loads reduced.	Brazil	CPWF
	Remote sensing <b>methods for quantifying and mapping water productivity</b> finalised in Central Asia and Krishna.	Researchers Irrigation managers	Methods adopted by research community and water managers and BFPs.	Water productivity rapidly and cheaply assessed.	Central Asia	CPWF
	Case studies of <b>water productivity</b> in the Nile and Niger Basins.	Researchers Resource Managers	Cases studies disseminated and read by planners.	Approach replicated in other basins.	Africa	CPWF
Output Targets 2008	Final synthesis and case studies of <b>methods of water productivity assessment</b> at different scales.	Researchers Resource Managers	Methods adopted by project related partners.	Methods gain general acceptance.	Olifants, Krishna, Rechna Doab, Central Asia	CPWF
	Recommended <b>strategies for irrigated and enhanced rainfed agriculture</b> in selected African Countries.	Researchers Policy makers	Water productivity analysis adopted by water resources and land use planners in host countries.	Strategies and programmes in place to allocate and use water in ways that improve water productivity and minimise agricultural demand.	Volta	CPWF
Output Targets 2009	Final recommendations for the <b>management of water productivity</b> through water allocation, system management and farm level. Generic decision support tools for water productivity analysis published.	Researchers Resource Managers	Water productivity analysis established as a generic tool. A new agenda for agricultural water management in Africa. Allocation strategies that account for water productivity developed.	Water management strategies focus on increased water productivity.	Global	CPWF

	Outputs	Intended User	Outcome	Impact	Sub-Region	Link to CP SW/EPs
Output 3	Sets of policies, institutional models and supporting strategies for management of agricultural water at basin scale in a variety of developing country conditions, including IWMI's benchmark, Comprehensive Assessment and Challenge Programme Basins.		Appropriate institutional arrangements to managewater resources for agriculture at basin scale, over a range of contrasting conditions, and with special emphasis on the balance between sustainable and productive use of water analysed and promoted.	The tradeoffs and options in agricultural water management at basin scale better understood and improved equity and efficiency in water use promoted through the development of appropriate tools and methodologies for analysis and management.	Sub-Saharan Africa	CPWF
Output Targets 2006	Case studies of different types of <b>customary water law</b> , its context and relation to the modern state in Limpopo and Volta basins.	Most African Governments	New water legislation internalises the findings of this research in Africa.	Better water laws leading to balanced development of water for agriculture and conservation of the environment.	East Africa	
Water Governance	Case study <b>of formal and informal legislation as it affects small scale water users</b> in Tanzania (Ruaha)	Ministries of Water Resources & Agriculture	Local agencies understand and internalise importance of customary laws and their interaction with formal law.	Development of more appropriate regulations		
	<b>Institutional and socio-economic characterisation of the basin</b> completed for Limpopo Basin.	NEPAD, Waternet, CPWF	Case study read.	Case study promotes institutional change and development.	South Africa	
	<b>Transaction cost analysis of the institutions of water resources and irrigation management</b> in Kal Oya, Sri Lanka.	World Bank Local decision makers	Institutional bottlenecks identified and agreed by WB and GoSL	Project developed to address bottle necks and improve institutional arrangements.	Sri Lanka	
Transboundary and Interstate Water Management	20 MSc Students trained in institutional survey methods, producing >10 cases studies of <b>customary water law and practice</b> in Volta and Limpopo	Policy makers, lawyers, researchers, NGOs	Water administrators re-discover local and remnant practices.	Legislators empowered to develop more appropriate water law, based on common African customs and approaches.	Africa	CPWF
	Case study of <b>drivers in Transboundary Water Law.</b>	National and regional policy & law makers	Raises awareness of developed country bias in framing Transboundary water law for Africa.	Promotes a more independent, Africa relevant approach.	Africa	CPWF

	Outputs	Intended User	Outcome	Impact	Sub-Region	Link to CP SW/EPs
	Stocktaking and analysis of all options for <b>developing more secure and sustainable water use</b> in India.	Senior water policy makers, environ. groups, NGOs	Technical and political options balanced.	Contributes to revised and sustainable agenda for further water development in northern India.	India	CPWF
	Case studies of the <b>political geography of the Lower Krishna Basin</b> and institutional adjustment to water scarcity in the whole basin.	Decision makers Researchers, environmental groups, NGOs	Opens the door for a broader and more open discussion of allocation options and associated development pathways within 3 member states.	Leads to recognition that further water development is not a sustainable or equitable outcome and that broadscale water policy has to change.	South Asia	
(Groundwater) Institutions & Management	Trainings completed in <b>groundwater management</b> (India), <b>IWRM</b> (Southern Africa).	Practitioners	Better groundwater and surface water policy through better understanding of social and technical interactions.	Sustainable water allocation from groundwater and surface water.	Africa, South Asia	CPWF
	CA Groundwater Synthesis Book published by CABI—multiple case studies.	Decision makers, researchers, practitioners	Alternative options for groundwater management in agriculture disseminated.	Innovative solutions created and adopted for sustainable groundwater management.	Global	
	Policy prescriptions for <b>management and regulation of groundwater use</b> for agriculture in Africa, South and East Asia.	National, state and provincial government water policy makers	Recommendations selectively incorporated into national and local policies.	Policies implemented and stabilise economically beneficial but sustainable groundwater use in agriculture.	East Asia, South Asia & Sub-Saharan Africa	
Research needs and pathways—global to regional assessment.	<b>Framework database of climate, topography, land use and land cover, demography and other products</b> at 500m resolution, linked by GeoNetwork/DivaGIS.	All users of CGIAR spatial data/FAO/ UNEP/WFP/ WHO/ OCHA	Data used by large community of GIS and NR researchers and practitioners over the globe. Cross-CGIAR NR data sets used by different institutes and by other researchers.	Better, cross disciplinary geospatial analysis for natural resources management. High quality, cross centre and multi-disciplinary research in the CGIAR.	Global	
	Results of modelling scenarios on the <b>impact of WTO the linkages between water use and agriculture</b> in China, and also in CPWF basins.	Decision makers, Policy analysts	Better understanding of the behaviour of the world trade system and its effects on water use.	Adapted trade policies that mitigate water scarcity.	East Asia and Global	
	<b>Agriculture and water research gaps</b> in Nile Basin identified and prioritised.	NBI	Increased focus of NBI investment into agriculture and water related research. CG research priorities for Nile Basin harmonised.	Funding buy-in for more agriculture and water research by NBI.	Sub-Saharan Africa	CPWF

	Outputs	Intended User	Outcome	Impact	Sub-Region	Link to CP SW/EPs
Output Targets 2007	Recommendations for the <b>incorporation or accommodation of customary water law in national and transboundary water law</b> in Africa. Book published.	Policy makers, Water and NR managers NGOs	Inclusion of customary law and protection of customary users within both national and transboundary water law and agreements.	Relevant transboundary law, leading to better water sharing and management mechanisms between African countries.	Africa	CPWF
Water Governance	Case studies of <b>conflict resolution on agricultural to urban water transfer</b> in Hyderabad.	Researchers Urban and Ag water managers	Case studies promote discussion in management agencies.	Case studies lead to development of more formal conflict resolution procedures.	India	
	Proceedings and synthesis of 2006 seminar on <b>Triggers of Water Policy Reform.</b>	Policy makers, Researchers NGOs	Options for instituting appropriate water reform communicated to regional policy makers.	Water reforms better targeted and timed.	Asia	
Transboundary and Interstate Water Management	Final synthesis of <b>drivers and local customary law in relation Transboundary Water Law</b> in Africa	National and regional policy & law makers	Raises awareness of developed country bias in framing TB water law for Africa.	Promotes a more independent, Africa relevant approach.	Africa	CPWF
	Case studies from <b>River Linking Projects in India</b> published.	Researchers Decision makers NGOs	Cases studies discussed and accepted by water policy makers in India	Leads to evolution and greater public understanding of and participation in the River Linking Debate.	India	CPWF
(Groundwater) Institutions & Management	Second training course in China. More than 150 mid level and senior professionals trained in <b>groundwater policy and management.</b> Research project evidence synthesised. Third SIDA IWRM training completed.	Indian and Chinese water professionals and senior policy makers	Group learning and innovation internalised in groundwater management policy and strategy.	Effective groundwater managers take innovative steps to improve sustainability of groundwater use in China and India. New research proposals generated within countries from training and collaboration.	Africa India China	CPWF
	Generic recommendations for developing <b>good groundwater governance frameworks</b> in different contexts.	Groundwater researchers and policy makers across the globe	GW hydrologists and engineers better appreciate and internalise the social and economic dimensions of groundwater use.	More socio-economic perspectives appear in national groundwater plans and management strategies, especially in India and China.	Africa India China	CPWF
	Seminar and proceedings on the <b>role of Energy Pricing in water management</b> in Asia.	Groundwater researchers and policy makers	Findings communicated to energy policy makers in Asia.	Findings internalised in energy policy. Energy policies developed to contribute to water demand management.	Asia	

	Outputs	Intended User	Outcome	Impact	Sub-Region	Link to CP SW/EPs
Research needs and pathways—global to regional assessment.	Analysis of <b>global impacts of WTO on agriculture and water use</b> : case studies for Uzbekistan and Morocco.	Decision makers, Policy analysts	Better understanding of the behaviour of the world trade system and its effects on water use.	Adapted trade policies that mitigate water scarcity.	East Asia and Global	
	Prototype integrated <b>cross-CG centre interactive GIS</b> completed.	All users of CGIAR spatial data/ FAO/ and UN agencies	Prototype used for geo-spatial analysis by broad range of CGIAR researchers.	Better, cross disciplinary geospatial analysis for natural resources management.	Global	
Output Targets 2008	Final synthesis of <b>conflict resolution on agricultural to urban water transfer in India</b> .	Researchers Urban and Ag water managers	Recommendations accepted.	Recommendations implemented.	India	
Water Governance	Recommendations made.					
Transboundary and Interstate Water Management	Recommendations for developing <b>more secure and sustainable water use in India</b> in relation to the River Linking Programme.	Senior water policy makers, environmental groups, NGOs	Technical and political options balanced.	Contributes to revised and sustainable agenda for further water development in northern India.	India	CPWF
(Groundwater) Institutions & Management	Synthesis of training programme and lessons. Generic recommendations for <b>developing good groundwater governance frameworks</b> in different contexts made.	Indian and Chinese water professionals and senior policy makers.	Trained groundwater professionals with broader socio-economic understanding embedded in national management and advisory systems.	Improved knowledge and holistic approach to groundwater management and policy implemented—moving towards sustainable groundwater management.	Africa India China	CPWF
Output Targets 2009	Synthesis of <b>economic analysis of trade-offs and benefits between agricultural and natural eco-systems</b> .	Researchers	Common understanding in valuation between agricultural development and environmental protection partners.	Regular adoption of simple valuation and trade-off analysis in multi-disciplinary water research.	Africa, Asia	
	Case studies of <b>institutional measures to support and implement environmental water allocation</b> in Africa and Asia.	Researchers and water managers	Awareness raising in partner agencies.	Development of better institutional frameworks for environmentally sustainable water development.	Africa, Asia	
	Cases studies of <b>institutional innovation to support poverty alleviation through water development</b> in Africa.	Policy makers, NR managers, NGOs	Case studies communicated to broad range of African country partners.	Leads to institutional innovation in those countries.	Africa	

Note 1: Revised logframe for MTP Project 8 based on half million dollar groupings.



## 2. MTP PROJECT 9

### **Land, Water and Livelihoods: Improving livelihoods for the rural poor**

#### **Rationale for the MTP Project and Changes**

The **Land, Water and Livelihoods** MTP Project examines opportunities across the hydrologic cycle (green and blue water; surface and groundwater; quantity and quality) and rainfed-irrigation continuum to improve water and land productivity. Specifically, the Project aims to *identify and test high-potential interventions to conserve resources and increase land and water productivity for improved livelihoods, health and equity across the continuum of water management options, within integrated social-ecological landscapes.*

This project builds upon and complements MTP Project 8, *Basin Water Management*, which provides the overall context for IWMI's research on water productivity and water poverty across the hydrological cycle at the basin, national and global scales, and sets the agenda for the identification and impact assessment of interventions at finer scales. Thus, within the context set by MTP Project 8, Project 9, *Land, Water and Livelihoods*, focuses on identifying and testing technological, policy and institutional interventions to conserve resources and increase land and water productivity. Project 9 begins with interventions that focus on the household and community scale and encompasses catchment and landscape scales to ensure sustainability and account for off-site impacts.

Food security remains elusive for more than 1 billion people worldwide. Despite the benefits of the Green Revolution, declines in household food production are commonplace for about 60 percent of the rural population in tropical and sub-tropical countries. The reasons for these declines are manifold. However, poor land and water management practices and policies are partly responsible for accelerating degradation of agricultural lands that directly impact smallholders, and also cause off-site damage to downstream producers and the environment. Poor farmers function within wider landscapes and political contexts which impact on their capacity to improve their livelihoods. Poor

farmers are driven onto marginal lands by population or policy forces, for example, and poorly designed interventions can inadvertently result in resource degradation, or reduce access of the poorest to needed resources. This MTP Project addresses these issues by integrating multiple uses within landscapes, multiple stakeholders, and multiple management actors and options, while still focusing on concrete and actionable interventions to improve livelihoods at the household level.

The Project was developed in 2005 from the MTP Project 'Smallholder Land and Water Management', and examines a broader range of management solutions across the rainfed-irrigated continuum, including a greater emphasis on institutions and governance interventions, thus becoming a more inter-disciplinary Project. In 2006, the emphasis is on implementing this relatively new Project across regions in IWMI's benchmark basins. The strategy for implementing the Project includes several main features: strategic planning to focus Project activities in high priority regions and consolidate and prioritize existing activities; integration of institutions and governance perspectives across the Project; development of key partnerships to enhance expertise to address the broader range of management solutions for multiple water uses. Changes from the 2005-2008 MTP logframe reflect this implementation strategy, as well as some changes to help clarify alignment with CGIAR system priorities, and to better define output targets.

The specific focal areas leading to Outputs of this MTP Project are:

- € **Intensifying Low Productivity Systems:** To identify and research technical, institutional and policy options for small-scale water management that can increase productivity and socio-ecological resilience of poor farmers, and address sustainable use of soil and water resources in rainfed and irrigated systems.
- € **Multiple Use Catchment and Systems:** To provide tools and strategies that improve water productivity and maintain landscape integrity to maximize environmental goods and services including agriculture, livestock and fisheries production, and ensure equitable accrual of benefits from increased production.

€ **Rehabilitation of Degraded Lands:** To better understand the impacts of soil degradation on water availability and productivity, and contribute to rehabilitation of degraded lands through testing and local adaptation of management systems that restore resource quality and maximize sustainable use of low quality soils and water.

### **Alignment of the MTPs with the CGIAR System Priorities**

The research proposed in this Project is completely aligned with CGIAR System priorities addressing primarily CGIAR System Priority 4 – Poverty alleviation and sustainable management of water, land and forest resources (80%) focusing on 4C and 4D, with a smaller percentage of activities (20%) addressing priorities 3B, 3C, 5C and 5D (Table 1).

Strategic priority 4C Improving water productivity, is a primary goal of Outputs 1, 2, and 3 of this MTP Project. Output 2 also addresses priority 4A: by developing analytical methods and tools for the management of multiple use landscapes (SG 1), and participatory activities that will enhance the management of landscapes (SG 2). In addition, Output 3 contributes to priority 4D by identifying potential domains of adoption and improvement of technologies for improving soil productivity (SG3),

preventing degradation, and for rehabilitating degraded lands.

Both specific goals of 4B, Sustaining and managing aquatic ecosystems for food and livelihoods, will be increasingly addressed through newly initiated activities in collaboration with the WorldFish Center in India and Southeast Asia. These activities will have a strong livelihoods focus and therefore also contribute to priority 3C by addressing the needs of the poor aquatic resource user and improving equitable accrual of benefits. A growing portfolio of activities related to livestock and water, being implemented in collaboration with ILRI, will contribute to 4D SG 2: to protect the livelihoods of rural livestock keepers in low potential environments and to 3B SG 2 by providing analysis and tools to manage intensification of crop-livestock systems to improve production while limiting negative impacts on the poor and the environment.

As mentioned above, research on interventions in institutions and governance are an increasing area of emphasis in this MTP Project, and will contribute to priority 5C, rural institutions and their governance, primarily focused on small-scale water management systems, and to 5D by designing pathways for scaling up and out of water management interventions.

TABLE 1  
**Meeting CGIAR System Priorities**

Output	Project group	CGIAR System Priorities
Intensifying Low Productivity Systems	Small-scale land and water interventions	4C
	Water institutions and governance	4C, 5C
	Development needs and pathways	5D
Multiple Use Catchments and Systems	Sustainable Watershed Management	4A, 4C, 5C
	Multiple Use Systems	4A, 4C, 5C
	Livestock, land and water	4C, 4D, 4A, 3B
	Inland fisheries and livelihoods	4C, 4B, 4A, 3C
Rehabilitation of Degraded Lands	Land and water degradation	4C, 4D

## **Description of Impact Pathways**

The framework for long-term impact is provided through the research conducted in IWMI and the Challenge Program on Water & Food's (CPWF) benchmark basins. The benchmark basins provide a working laboratory where research across themes and disciplines can be conducted in one "living laboratory" and over a period of time (ideally 10-15 years) that matches the evolution of cause and effect at landscape level. It allows local problem identification and direct development impact to evolve through on-going relationships with policymakers and natural resources managers *in situ*, while in combination also allows local outcomes to be broadened to generic and IPG outputs.

As noted in Map 1 in the MTP narrative, research in this MTP Project spans the entire range of ecoregions included in IWMI's benchmark basins. Specific work often has a particular ecoregion focus for targeted impact. Activities related to small-scale land and water interventions, for example, take place in benchmark basins in South Asia and Sub-Saharan Africa, and thus to a large extent focus on semi-arid tropical and subtropical ecoregions. These are primary low productivity areas in which water scarcity and spatial and temporal variability in rainfall are important constraints to production. Irrigation in many forms is an important feature and research looks at technical and management solutions that can improve management of irrigation water (small scale, individual and community scale emphasized) and target the poor for benefits. Work on water institutions and governance, and sustainable watershed management, however, spans multiple ecoregions. Management issues may differ where the management of scarcity is a primary concern in semi-arid areas, and the management of water quality a primary concern in the humid tropics. However, sustainable water resources development and management at the landscape scale is still a key entry point for this MTP Project in addressing poverty. Research on multiple uses of water focuses on ecoregions where the greatest livelihood impacts are anticipated, acknowledging the central role of livestock in livelihoods in semi-arid areas, and of inland fisheries in more humid zones. Research under Output 3 focuses on two areas where soil

degradation is strongly linked to water degradation and limits water productivity in semi-arid areas, i.e. sandy tropical soils and saline prone lands.

IWMI is both a **primary** and **secondary** research partner in this Project. In the larger share of activities such as development of technologies to rehabilitate sandy tropical soils, development of improved institutional frameworks for water management, developing knowledge of relationships between land degradation and water quality, or analysis of gender and poverty impact of small-scale technologies, IWMI acts as a primary research partner. Sometimes, however, for example by coordinating and leading collaborative activities in partnership with universities and NARES in which student research and training play a major role, such as in the Smallholder Systems Innovation project in South Africa and Tanzania, IWMI plays primarily the role of a secondary research partner, involved in synthesis research.

In addition to its primary research function, IWMI plays various roles in this Project. An example is the large number of CPWF projects in this MTP Project. In many, IWMI's involvement is not only as a research partner but also partly **catalytic** and **facilitative**, stimulating investments and enabling activities of partners and stakeholders who are the primary research partners. In an important set of activities which are now drawing to a close, including investments in irrigation in Africa, pro-poor investments in Asia, and other SWIM-2 assessment activities, IWMI has played a vital **advocacy** role. Within this MTP Project, IWMI will continue to play an advocacy role through its relationship with regional planning taking place within regional networks, particularly in Africa.

### **Research Approach to Develop International Public Goods (IPG)**

MTP Project 9 is more involved with development, adaptation, and testing of local resource management technologies and approaches than MTP Project 8. As such, IPGs come through multi-location implementation, and through application of modeling and database development that allows generic outcomes from activities designed also for local impact. (Table 2)

TABLE 2.

**Selected completed and future IPGs and their research approach.**

International Public Good	Research Approach
'Bright Spots' database	Meta-analysis of case studies from 55 developing countries
Spatial model to assess carbon sequestration potential and water use impacts	Global spatial data sets combined with multi-location case study data
Strategies to mitigate land degradation	Assess impact domains for developed technologies
Operational framework of out-scaling multiple use systems	Conceptual framework developed from multi-partner, multi-location studies
Water productivity framework for crop-livestock systems	Generic models combined with multi-location studies
Decision support for tools for landscape management	Adapting models from multi-location data

**Elaboration of Partners' Roles**

NARES partners in Africa and Asia play vital secondary roles—research, facilitative and enabling—in all Project activities. In all activities in the Project, IWMI works directly with local partners in benchmark basins.

Joint programs implemented through joint appointments with other Future Harvest Centers is one type of partnership that is vital to attaining the Project goals. Currently a joint ICARDA/IWMI appointment in Central Asia since 2004 plays a key role contributing to Output 3: strategies to reverse degradation in soils. A WorldFish/IWMI joint appointment in Southeast Asia and South Asia contributes to Output 2: Improving water productivity in multiple use systems and catchments. A recently negotiated ILRI/IWMI program will hire a jointly appointed scientist by the end of 2006, who will play a vital role also in Output 2. This partnership has grown out of IWMI's participation in the CGIAR System-wide Livestock Program (SLP), to which IWMI has contributed to strategic planning. The joint appointee in 2006 will contribute to the SLP project portfolio, and in the future will increasingly contribute towards the Centers' goals as the IWMI/ILRI program develops.

This Project has been an important contributor to SWIM-2. A range of outputs will be completed this year including an Assessment chapter and a book that will contribute to the finalization of SWIM-2 (Output 3). This Project is also an important contributor to the CGIAR Challenge Program on Water and Food (CPWF), including activities related to 6 CPWF projects, including the

Multiple Use Systems project, and a new CPWF small grants project related to water efficient farming in India.

An important partner for this Project in South Asia is the Sri Ratan Tata Trust of India. This ongoing partnership is entering its second 5-year phase (2006-2010), and is built on a stable long-term commitment between IWMI and the Sri Ratan Tata Trust to form the IWMI-Tata collaborative entity. Within this entity, the Tata Trust plays a catalytic role, by stimulating investments, and helping to set relevant priorities. It also plays an advocacy role, often by making investments for impact, based on IWMI-Tata research. The North Gujarat groundwater initiative and the Central India Initiative are two examples which follow through the entire research/development pathway within this partnership.

ARI partners (including IRD, IHE, SEI, IRC, IFDC, University of KwaZulu Natal) provide expertise in critical areas such as rural water supply (IRC), advanced research methodologies in areas such as hydrology and catchment modeling (IRD, IHE, University of KwaZulu Natal), and are essential for capacity building, in that their senior scientists act as co-supervisors of IWMI PhD students, and provide high quality academic environments for their training (IHE, University of KwaZulu Natal). IRD has been a particularly important partner, seconding 10 or more scientists per year to our Southeast Asia program. NGO partners (including IDE, EnterPrise Works, CARE, PDA, CRS) often play facilitative, enabling and advocacy roles, and play an important role in applying the knowledge generated from the research, as exemplified by CRS's development of multiple water use systems.

## MTP 9: Land, Water and Livelihoods: 2006- 2009

	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Output 1	Technical, institutional and policy options for small scale water management identified and promoted that can increase productivity and socio-ecological resilience of poor farmers, and address sustainable use of soil and water resources in rainfed and irrigated systems (5 years).	Researchers Donors Policy makers	Increased understanding of technologies and management approaches that can increase productivity and address sustainable use of water resources in rainfed and irrigated systems which positively influences investment, management and policy decisions.	Farmers benefit from interventions that conserve resources and increase land and water productivity for improved livelihoods, health and equity across the continuum of water management options.	Global	
Output Targets 2006	A suite of outputs including: studies on <b>small-scale irrigation technologies in Sub-Saharan Africa</b> ; an on-line <b>irrigation benchmarking</b> service; and training and implementation of the PODIUMSIM model in several countries.	Researchers Decision makers Development workers IPTRID	Review of small-scale irrigation technologies, tools for benchmarking irrigation systems, and modelling water use inform intervention strategies in irrigated agriculture.	Enhanced standard of irrigation and drainage research and development in and by developing countries.	Global	
Small scale land and water interventions						
Water institutions and governance	Recommendations for improved water management developed based on a synthesis of knowledge regarding <b>irrigation management transfer (IMT)</b> from a 50 country survey.	Researchers Donors Policy makers Resource managers	Enhanced understanding of best practices in managing water resources at various scales in Africa and Asia.	Contribution towards improved governance for management of water resources in Africa and Asia.	Global	
Water institutions and governance	Key policy briefs on <b>sustainable water management</b> in India developed and presented at IWMI-Tata workshop in March.	Policy makers Researchers Water managers NGO's	Increased awareness of groundwater use and governance issues in India.	Improved policy and programs to govern groundwater use in India.	Asia	
Development needs and pathways	Case studies that test hypotheses regarding the impacts <b>of international global ecosystem services treaties, on local land and water use</b> , in Africa and Latin America.	Researchers Policy makers	Pilot analysis linking water and carbon cycles in the context of global carbon markets (Kyoto Protocol CDM-AR projects) alerts policy makers to potential impacts.	Sustainable design of local projects driven by international treaties.	Global	

	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Output Targets 2007  Small scale land and water interventions	Tools and strategies designed for <b>efficient rainwater harvesting, and maximizing water-nutrient synergies</b> in non-irrigated farming systems in the Volta basin of Northern Ghana.	Resource managers Extension services Policy makers Researchers	Tools and strategies launched for efficient rainwater harvesting, and maximizing water-nutrient synergies.	Efficient rainwater harvesting technologies adapted for farming systems in Ghana.	Sub-Saharan Africa	CPWF
Small scale land and water interventions	Adaptation and implementation of <b>small scale water harvesting structures</b> to improve water productivity.	Extension agents Researchers Resource managers	Small scale water harvesting structures adapted to improve water productivity.	More efficient use of rain water in semi-arid areas of Tanzania and South Africa.	Sub-Saharan Africa	
Development needs and pathways	Comprehensive assessment of <b>socioeconomic and environmental impacts of irrigation investments</b> , both positive and negative, in the selected sites in Ethiopia.	Decision makers Policy makers Donor community	Assessment of the impacts of past irrigation investments in Ethiopia inform decision makers.	Improved effectiveness of future investments in water management in Ethiopia.	Sub-Saharan Africa	
Development needs and pathways	Tools that allow national and regional decision makers to evaluate the impacts <b>of international global ecosystem services treaties, on local land and water use.</b>	Researchers Policy makers Resource managers	Regional land availability and suitability for CDM AR projects better understood through maps developed as part of a practical framework for design and evaluation of CDM-AR projects.	Sustainable implementation of CDM-AR projects.	Global	
Output Targets 2008  Small scale land and water interventions	Analysis of impact of <b>soil and water conservation technologies</b> on field scale hydrology and water productivity.	Researchers Donors Policy makers Resource managers	Better insight into the hydrological processes at smallholder farming scale in arid and semi-arid zones.	Improved food security for poor farmers in semi-arid zones of Africa.	Sub-Saharan Africa	
Development needs and pathways	<b>Water management intervention options</b> with poverty alleviation potential identified and development plan drafted for Northeast India.	Donors Development agencies Extension agents NARS	Water management intervention options incorporated into development programs.	Improved livelihood security for poor farmers in NE India.	South Asia	

	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Output Targets 2009  Small scale land and water interventions	Development of policy and institutional frameworks to target the poor for <b>out-scaling of small-scale water technologies</b> in Africa.	Donors Development agencies Extension agents NARS	Policy and institutional options for out-scaling incorporated into development programs.	Improved adoption of small-scale water management technologies by poor rural farmers.	Sub-Saharan Africa	
Water institutions and governance	<b>Governance frameworks for integrated green/blue water</b> resources management developed for Africa and Asia.	Decision makers Policy makers Donor community Resource managers	Recommendations for integrated governance of green/blue water resources understand in national contexts.	Improve productivity of green/blue water resources in catchments in Africa and Asia.	Global	
Output 2	Strategies developed that improve water productivity and maintain landscape integrity in multiple water use systems and catchments to preserve ecosystem services including sustainable livelihoods. (5 years)	Researchers Resource managers Policy makers	Tools and understanding that facilitate improved management of community water resources and catchment landscapes to maximize environmental goods and services used by resource managers and policy makers.	Farmers benefit from interventions that conserve resources and increase land and water productivity for improved livelihoods, health and equity across the continuum of water management options.	Global	
Output Targets 2006  Sustainable watershed management	Recommendations developed and documented for improved community based <b>management of natural resources in the micro-watershed</b> in India.	Researchers Policy makers Resource managers	External and internal incentives for local cooperation in water conservation within the context of up- and down-stream externalities at the meso-watershed scale better appreciated.	Increased understanding of the potential for collective and local action for water conservation reflected in watershed management plans.	South Asia	
Multiple use systems	Conceptual and operational tools and guidelines designed for <b>assessing multiple water use systems</b> in smallholder farming communities.	Researchers Resource managers NGO's in the water development sector	Tools and guidelines utilized for design and analysis of multiple water use systems, to improve livelihood opportunities, equity and health.	Better design and implementation of water infrastructure development for multiple uses, having positive impact on health and livelihoods.	Global	CPWF

	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Output Targets 2007  Sustainable watershed management	Strategies developed for improved eco-hydrological <b>landscape management in upgraded smallholder rainfed farming systems</b> at watershed and basin scale.	Researchers Resource managers NGO's	Improved understanding of system interactions between water for food requirements and water to sustain ecological functions in watersheds.	A contribution towards improved livelihoods in smallholder rainfed systems through better water management.	Sub-Saharan Africa	
Multiple use systems	Recommendations developed and documented based on analysis of <b>water quality issues in multiple use systems</b> designed for domestic and productive water uses.	Researchers Resource managers NGO's in the water development sector	Recommendations adopted within design and analysis of multiple water use systems, to improve livelihood opportunities, equity and health.	Better design and implementation of water infrastructure development with positive impact on health and livelihoods.	Global	CPWF
Livestock, land and water	Assessment of trade-offs in <b>livestock</b> rearing between using crop residues as animal feed or for soil management characterized and impacts on water balance and soil conditions.	Researchers Resource managers	Relationships between livestock rearing, water balance and soil conditions better understood through case study analysis.	Capacity to better integrate livestock and cropping in mixed land use systems.	South Asia	CPWF
Inland fisheries and livelihoods	Guidelines developed based on analysis of impact of <b>built structures on fisheries related livelihoods</b> in Cambodia.	Resources managers Researchers Policy makers	Guidelines for design of built structures adopted to minimize or mitigate impacts on fisheries and livelihoods.	Improved management of aquatic ecosystems for food and livelihoods.	Southeast Asia	
Output Targets 2008  Sustainable watershed management	Analysis of the functioning of riparian zones and other <b>landscape components with respect to livelihoods and water quality</b> , in upstream and downstream catchment areas in Laos.	Resources managers Researchers Policy makers	Science-based decision support tools used to inform stakeholders of potential options for riparian zone management.	Improved water quality through better landscape management in upper catchments in Southeast Asia.	Southeast Asia	
Multiple use systems	Develop knowledge and practical tools and guidelines for <b>design of multiple use systems</b> that provide water for various domestic and productive purposes in households and communities.	Researchers Resource managers NGO's in the water development sector	Tools and guidelines for design and analysis of multiple water use systems, to improving livelihood opportunities, equity and health.	Better design and implementation of water infrastructure development for multiple uses, having positive impact on health and livelihoods.	Global	CPWF



	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Output Targets 2009  Sustainable watershed management	Tools for integrated planning of <b>green and blue water management</b> at the watershed scale in Sub-Saharan Africa.	Researchers Water resource planners Development agents	Tools for integrated planning of green and blue water management applied in watersheds in Tanzania and South Africa.	Improved water based livelihoods and improved water productivity in Sub-Saharan Africa.	Sub-Saharan Africa	
Livestock, land and water	Develop options for enhancing <b>water productivity in mixed crop livestock systems</b> in semi-arid areas of Sub-Saharan Africa.	Researchers Resource managers Regional networks in soil and water management	Options to improve water productivity disseminated within regional networks that promote improved resource management for the benefit of poor farmers.	Improved livelihoods of smallholder farmers in mixed crop-livestock systems, and mitigate land degradation in Sub-Saharan Africa.	Sub-Saharan Africa	SLP
Inland fisheries and livelihoods	Policy options developed based on analysis of <b>policy impact in the inland fisheries</b> sector.	Government agents Resource managers Policy makers	Policy options disseminated amongst state governments in India.	Policies governing inland fisheries improved for the benefit of the poor who depend on fisheries for their livelihood.	South Asia	
Output 3	Greater understanding of the impacts of soil degradation on water availability and water productivity, and strategies to reverse degradation in sandy tropical soils and salinity prone lands developed.	Policy makers Donors Farmers	Interventions to rehabilitate degraded lands, expand 'Bright Spots,' and increase local adaptation of management systems that restore resource quality and maximize sustainable use of low-quality soils and water, disseminated to donors, farmers and other policy and decision makers.	Farmers benefit from interventions that conserve resources and increase land and water productivity for improved livelihoods, health and equity across the continuum of water management options.	Global	
Output Targets 2006  Land and water degradation	Assessment of trends and <b>impacts of land and water degradation on food security and water productivity.</b>	Researchers Policy makers Donor community Investment community	Recommendations for the greatest opportunities to reverse negative trends in land and water inform a wide audience through presentation at the World Water Forum, Mexico, and Stockholm Water Week.	Better recognition and appreciation of opportunities that exist to reverse negative trends in land and water degradation.	Global	SWIM-2

	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Land and water degradation	<b>Community led 'Bright' spots</b> established and documented, and tools for mapping and evaluating developed and disseminated.	Researchers Policy makers Resource managers Extension workers	Case studies with quantitative analysis of 'Bright' spots shape interventions to be tested in the region.	Improved understanding of the potential to tackle salinity and sodicity problems within local contexts in Central Asia.	Central Asia	
Output Targets 2007	Innovative technologies and policies developed that enhance opportunities for disadvantaged rural farmers in Central Asia faced with problematic <b>saline/sodic soils and water.</b>	Policy makers Researchers Resource managers	Improved policy and technical capacity to manage saline/sodic soils and water.	Enhanced productivity in agricultural systems in Central Asia affected by saline/sodic soils and water.	Central Asia	
Land and water degradation	Strategies to <b>manage soil constraints and water balances</b> in upland undulating areas of catchments in Thailand.	Researchers Resource managers	Increased understanding of how to utilize production systems to manage water balances in catchments.	Improved management of upland undulating areas of catchments in Thailand.	Southeast Asia	
Output Targets 2008	Models developed of on-site degradation processes and their off-site impacts, based on detailed analysis of farming systems on <b>degraded lands.</b>	Researchers Resource managers	Models of on-site degradation processes and their off-site impacts inform researchers and resource managers.	Models used as a basis for development of recommendations for new practices for land rehabilitation in SE Asia.	Southeast Asia	
Land and water degradation	Evaluate and introduce an environmentally friendly, <b>novel technology for the rehabilitation of degraded land in rain-fed cropping systems</b> in the lower Mekong Basin.	Researchers Resource managers	Novel technologies introduced and understood by national researchers and extension services.	Improved water productivity and water quality in lower Mekong basin sites.	Southeast Asia	
Output Targets 2009	Research-based approaches developed that prevent or <b>mitigate land and water degradation under high population density</b> and improve small-scale agricultural livelihoods in Sub-Saharan Africa.	Researchers Resource managers Policy makers Development community	Approaches to mitigate land and water degradation disseminated within regional networks in Africa.	Food security improved in rural areas with high population density in Africa through increased land and water productivity.	Africa	

### 3. MTP PROJECT 10

#### **Agriculture, Water and Cities: Making an asset out of wastewater**

##### ***Rationale for the MTP Project and Changes***

The Agriculture, Water and Cities MTP Project was established in 2005 to focus on the challenges of urbanization, food supply and water quality at the rural-urban interface. Specifically, the Project aims to *identify and test interventions for the rapidly growing sector of urban and peri-urban agriculture that can take advantage of urban waste resources while protecting environmental and human health*. Through this Project, IWMI and its partners aim to achieve enhanced urban food safety and security, increased institutional support and capacity and an increased political recognition of the benefits of intensive, irrigated urban and peri-urban production systems.

It is expected that 60 percent of the world population will be urban by 2030, with the majority living in slums. Most urban growth will occur in less developed countries, situated in Sub-Saharan Africa and South Asia. Local policymakers have started to respond to this demographical shift but cannot keep pace with the urbanization rate. Their major challenges are the provision of safe drinking water and appropriate sanitation for millions of urban dwellers, as well as the provision of sufficient nutritious food and livelihood opportunities. These needs are obviously interlinked, with significant implications for the urban and peri-urban environment.

A major bottleneck is adequate treatment of wastewater, which is in most developing countries severely constrained by limited financial resources. About five billion people live in conditions where domestic wastewater is discharged untreated into local water bodies. As such, millions of poor farmers in and around the growing cities depend on water of marginal quality for irrigation as they may have no better alternative or because wastewater may be the only affordable or reliable water and nutrient source. The degree of pollution can range from raw wastewater to polluted stream

water. In addition, industrial, domestic and/or storm water runoff systems are often combined, thus significantly increasing the complexity of water treatment and re-use scenarios. The common element is that the water is not safe according to national and/or international guidelines and can lead to obvious health risks for farmers and consumers. In general, this results in “wastewater” irrigation being perceived negatively by authorities or often ignored due to the challenges of addressing the complexity of issues. IWMI accepts that un-managed the agricultural use of untreated water is undesirable from a health and environmental viewpoint, but recognizes that it is a livelihood and food supply reality in many poor countries that cannot afford the investment and maintenance costs of treatment plants for most or all of their mostly domestic effluents. As such, IWMI takes a more balanced view of the agricultural use, especially of microbiologically polluted water in a developing country context, focusing on both costs and benefits in terms of the health, environmental, food-chain, and livelihoods implications of the practice.

This MTP Project was set up in 2005 to give an extended umbrella to the wastewater related projects of IWMI’s former MTP Project, Water, Health and Environment. It will address urbanization in the context of low-income countries and the associated challenges of poverty alleviation, urban food supply, sanitation and environment. The Project examines a broad range of management solutions across the rural–urban continuum and the sanitation–agriculture interface. In 2006, the emphasis is on developing this new Project in high priority regions and consolidating and prioritizing existing activities; integrating institutions and governance perspectives across the Project; and developing necessary partnerships with the sanitation sector for joint proposals addressing urbanization and the Millennium Development Goals. The 2006-2009 MTP logframe reflects this implementation strategy as well as internal and external alignments, for example, with the revised logframe guidelines and CGIAR system priorities. The logframe was also updated according to the development of the proposal pipeline and currently funded activities.

As a relatively new area, the portfolio is still growing. Currently, the two specific focal areas leading to the Outputs of this MTP Project are:

- € **Enhancing the safe and productive use of wastewater in irrigated agriculture:** To make an asset out of domestic wastewater through efficient and viable interventions along the contamination pathway to reduce health risks for farmers and consumers while maximizing its benefits for farm households and society.
- € **Managing Urban Demands on Agriculture, Sanitation and the Environment:** To minimize negative impacts of city growth on agricultural water demand and the environment via water and nutrient recycling for intensive production systems, stakeholder involvement, capacity building and policy support.

### **Alignment of the MTPs with the CGIAR System Priorities**

The research proposed in this Project is aligned with CGIAR System priority areas 3, 4 and 5. It adds here a new geographical dimension to the thematic CGIAR system priorities with its focus on rural-urban linkages and the additional consideration of urban food supply and poverty alleviation.

*Output 1* contributes strongly to system priorities 3A (Increasing income from fruit and vegetables) and all specific goals of 4C (Improving water productivity). Improved management practices will allow *safe* water

reuse, which will decrease the pressure on other surface and groundwater resources and support the safe and sustainable production of, for example, vegetables in urban and peri-urban areas. The output also adds an important food safety component to System Priority 2C (Enhancing nutritional quality and safety), which is so far not considered in the current version of the System Priorities. Finally, the strong emphasis on microbiological food contamination, health risks and food safety contributes to specific goal 1 of priority 5B. To address the second specific goal of 3A (Enhance production of selected fruits and vegetables through improvement of farming systems) the Project is applying a strong policy and networking component through the RUAF<sup>8</sup> program, Urban Harvest, and will link to the emerging Global Horticulture Initiative.

*Output 2* supports intensive urban and peri-urban farming systems and contributes besides 3A and 4C also to system priority 4D (Sustainable agro-ecological intensification in low- and high-potential environments) and here especially to specific goal 3, 7 and 8 through its emphasis on soil fertility improvement through organic waste recycling, nutrient-water interactions and institutional constraints of urban and peri-urban agriculture. The activities under the WASPA<sup>9</sup> and RUAF umbrella significantly support learning alliances and stakeholder platforms in the rural-urban interface, thus contributing also to specific goal 2 of 5C aimed at new forms of partnerships.

TABLE 1  
**Meeting CGIAR System Priorities**

Output	Project groups	CGIAR System Priorities
Enhancing the safe and productive use of wastewater in irrigated agriculture	<i>Safer practices &amp; strategies</i>	2C, 3A, 4C, 5B
	Assessments	3A, 4C
	Institutions and policies	2C, 3A
Managing Urban Demands on Agriculture and the Environment	Stakeholder dialogue and capacity building	3A, 4D, 5C
	Resource recovery	3A, 4C, 4D

<sup>8</sup> Global network of "Resource Centres on Urban Agriculture and Food Security" <[www.ruaf.org](http://www.ruaf.org)>

<sup>9</sup> Wastewater Agriculture and Sanitation for Poverty Alleviation <[www.irc.nl/page/13348](http://www.irc.nl/page/13348)>

## Description of Impact Pathways

### The target ecoregions, the beneficiaries and end users.

The rural-urban focus of Project 10 is cross-cutting through the developing world, its ecological regions, and IWMI's benchmark basins. Also, as the use of polluted water in irrigation is not limited to drier climates, the current geographical focus on humid West Africa and South Asia reflects more the challenges of rapid urbanization in low-income countries than of particular agro-ecological zones. The basin focus remains important where a city's pollution moves downstream or where urban and agricultural water demands compete.

The direct beneficiaries from this research are governmental and municipal planners, directorates and agencies concerned with policies and practices for safe use of organic waste and wastewater in agriculture; farmer and farmer organizations depending on polluted water, civil society organizations concerned with public health and international agencies and programs such as World Health Organization (WHO), Food and Agricultural Organization of the United Nations (FAO) and the WASH campaign. Spillover benefits will accrue to collaborating agricultural universities, research institutions, NGOs, multi-stakeholder networks and the private sector. End users of safer practices will include farmers, vendors and consumers.

### The role of the center.

In this Project, IWMI is both a **primary** and **secondary** research provider by giving innovative and strategic direction of research issues in the sanitation-agriculture interface, and by taking the lead to progress on identified priorities. IWMI is well equipped for both roles: Supported by its merger with IBSRAM, IWMI has a significant track record in its research on wastewater use and organic waste recycling in urban and peri-urban agriculture in developing countries. As a long-term Resource Centre on Urban Agriculture and Food Security the Resource Centre on Urban Agriculture and Forestry (RUAF) in South Asia and Anglophone West Africa, partner of Urban Harvest, and core member of 'Streams of Knowledge', IWMI has a comparative advantage to link between the traditional rural focus of agricultural research and the food and sanitation related challenges of urbanization. In this function, the

center is also **facilitating** research and knowledge transfer and actively functioning as a **global advocate** of urban and peri-urban agriculture.

### Steering the impact pathway.

To address the complex challenges and emerging constraints facing agriculture in the rural-urban interface, a multi-faceted approach that encompasses innovations in policy, institutions and adaptation of existing knowledge and generation of and new technologies is required. Strategic linkages between the sanitation and agricultural sectors and beyond our conventional (rural) research partners are necessary. Only the participatory integration of all stakeholders relevant in an urban or peri-urban context can pave the way to a sustainable impact. A multidisciplinary focus on stakeholder perceptions and institutional and economic aspects of changes or innovations is another key requirement for successful adoption of improved technologies or policies, be it on safer irrigation practices, resource recovery through ecological sanitation or the contribution of irrigated urban agriculture for urban diets. Besides local partnerships, strategic alliances (e.g. with WHO, FAO, IRC, RUAF, ILRI, EcoSan network) will support the international uptake of the Project outputs, such as the 2006 WHO guidelines on wastewater use in agriculture.

### Research Approach to Develop International Public Goods (IPG)

MTP Project 10 is focusing on *Analyzing high potential interventions* (see Figure 1 of the MTP narrative), thus like Project 9, it is more involved with development, adaptation, and testing of local resource-based management technologies and approaches than the other MTP Projects. As such, IPGs develop in two ways:

- € For Output 1 mostly through testing of health risk reducing strategies and technologies for recognition by national and international agencies in their guidelines (WHO, USAID, FAO; see above).
- € For Output 2 through the analysis of stakeholder approaches, adoption drivers and constraints that allow generic lessons on the viability of interventions, operational frameworks and decision support for similar or related projects.

TABLE 2

**Examples of MTP Project 10 IPGs**

International Public Goods	Output	Research Approach
Safe irrigation practices database and training material	1	Participatory field research and reviews
Safe food handling practices database and awareness material	1	Stakeholder surveys and participatory research program
Assessment reports on urban agriculture and wastewater use	1	National, regional and global assessments
Strategies for viable options of resource recovery from urban waste for agriculture	2	Multi-stakeholder analysis of technical, institutional and financial drivers and constraints
Contributions to Policies, Strategies, Guidelines and Declarations	1, 2	Stakeholder processes and awareness creation for new knowledge

**Elaboration of Partners' Roles**

Ministries, municipal authorities (agriculture, planning, public health) and community-based multi-stakeholder groups are key partners in the search for and implementation of appropriate interventions, which are backed by policy and institutional support structures. In all activities the crucial secondary research role is taken by local NARES, including universities, often assisted by NGOs and community-based multi-stakeholder groups. Regional networks, such as Le Centre Régional pour l'Eau Potable et l' Assainissement à faible coût (CREPA), in West Africa as well as Advanced Research Institutions, such as Wageningen Agricultural University and International Reference Center for Water and Sanitation (IRC), complement our thematic expertise and geographical spread. Through our integration in international networks, such as the Resource Centre on Urban Agriculture and Food Security (RUAF), Urban Harvest and Streams of Knowledge, an active exchange with partners from other regions and continents is taking place. Universities in our project countries as well as in Europe, USA and

Canada allow the continuous integration of students in our research activities.

The Project is collaborating with Food and Agricultural Organization of the United Nations (FAO) and World Health Organization (WHO) and contributing to the Comprehensive Assessment (SWIM-2) and the CGIAR Challenge Program on Water and Food (CPWF). Strategic partnerships have been established with IRC and the Department for Water and Sanitation for Developing Countries (SANDEC) of the Swiss Federal Institute of Science and Technology (EAWAG), representing the sanitation sector, and the University of Copenhagen (Public Health) as well as Stockholm Environment Institute (SEI) with regard to ecological sanitation. Linkages to other CG centers exist with Centro Internacional de la Papa (CIP) through Urban Harvest, with ILRI on wastewater irrigated fodder production, and with ICARDA through a joint appointment on marginal quality water including wastewater (see MTP Project 9). Linkages with the World Vegetable Center and Global Horticulture Initiative are progressing.

## MTP 10: Agriculture, Water and Cities: 2006- 2009

	Outputs	Intended Users	Outcome	Impact	Sub-Region
Output 1 Activity groups	Best practices and policy recommendations to support safe and productive wastewater use in urban and peri-urban agriculture <b>(5 years)</b>	Farmers, Vendors Consumers, Authorities/ Policy makers, extension, Academia/ students, Researchers Donor community Irrigation stake- holders, WHO, FAO, WASH	Wastewater being considered as an asset based on efficient and viable interventions along the contamination pathway to reduce health risks for consumers while maximizing its benefits for farm households and society.	Reduced health risks for consumers and increased recognition of wastewater use as a beneficial common reality.	Low-income countries in Africa and Asia
Output Targets 2006  Safer practices & strategies	Options for consumer health <b>risk reduction identified</b> among food vendors in Ghana and <b>recommendations for safe vegetable washing practices</b> verified in the laboratory.	Vendors Consumers Authorities	Public health sector in Ghana strengthened through low-cost options for consumer health risk reduction available for adoption studies.	Increased potential for consumer safety and positive recognition of wastewater using farmers by authorities.	West Africa
Assessments	A first national (Ghana) and sub-regional (West Africa) <b>analysis of irrigated urban and peri-urban agriculture</b> and wastewater use published as hardcopy and web-based.	Academia, Authorities Students FAO	Increased knowledge base on irrigated urban agriculture available for the research community and other stakeholders.	Better understanding of the significance, benefits and risks of wastewater irrigated (peri)urban agriculture.	West Africa
Assessments	<b>Review of wastewater generation, treatment and sanitation</b> in 30 cities published.	Researchers Policy makers Donors	Increased attention to the reality of wastewater use worldwide.	Increased recognition of the significance of wastewater use among policy makers and donors.	Global
Institutions & policies	Informal irrigation, urban and peri-urban agriculture (UPA) and <b>options for health risk reduction incorporated</b> into the <b>new irrigation policy for Ghana.</b>	Authorities, Irrigation stakeholders	First national irrigation policy and strategies in SSA, which considers informal irrigation including UPA and a balanced approach between food safety and farmers' livelihoods.	Political recognition and support of informal irrigation including UPA and wastewater use in Ghana.	Ghana

	Outputs	Intended Users	Outcome	Impact	Sub-Region
Output Targets 2007 Safer practices & strategies	<b>Options for health risk reduction disseminated</b> among households and food vendors in the three major cities of Ghana.	Vendors Consumers Authorities	Street food vendors and households use low-cost options for health risk reduction.	Increased consumer safety without compromising the contribution of wastewater irrigated agriculture.	West Africa
Safer practices & strategies	<b>Recommendations for safer farming practices verified</b> in on-farm trials in Ghana and disseminated through farmer field schools.	Farmers FAO Extension service	Public health sector in Ghana strengthened through low-cost options for consumer health risk reduction available for adoption studies.	Increased consumer safety.	West Africa
Safer practices & strategies	<b>Implementation potential</b> incl. costs and benefits of options addressing <b>heavy metal contaminated irrigation water assessed</b> in Thailand.	Authorities Researchers	Thai authorities use decision supporting tools and recommendations.	Controlled health risks in contaminated areas; Stakeholders benefit from applied interventions with high adoption potential.	South and South East Asia
Output Targets 2008 Safer practices & strategies	<b>Catalogue of improved, tested and validated practices and strategies</b> for health risk reduction in wastewater irrigation.	WHO, User of WHO guidelines in low-income countries, FAO	Contributions acknowledged by WHO for further improvements of their Guidelines on wastewater use in agriculture.	More officially recognized options for safeguarding consumers health in low-income countries	Global
Assessments	<b>Framework of institutions and GIS based risks maps</b> along the contamination pathways developed for Hyderabad, Faisalabad, Accra and Kumasi.	Researchers Authorities	Authorities use frame-work and maps for identification of effective entry points and strategies for risk reduction in India, Pakistan and Ghana.	Reduced health risks for livestock and humans through well-targeted inventions.	Asia West Africa
Assessments	Review of the significance of wastewater use in Africa and Asia with <b>case studies on livelihood impact, costs and benefits.</b>	Researchers Authorities Policy makers Donors	Policymakers have an increased knowledge of the significance of wastewater use.	Increased recognition of the significance of wastewater use.	Global
Safer practices & strategies	<b>Campaign material for WASH</b> adding hygiene requirements related to food-chain contamination.	WASH, authorities	WASH uses material.	Consumers aware of linkages between food chain and general hygiene, and risks mitigation measures.	West Africa



	Outputs	Intended Users	Outcome	Impact	Sub-Region
Output Targets 2009  Safer practices & strategies	<b>Application potential of 2006 WHO guidelines tested</b> in low-income country context (SSA, India).	WHO, FAO	Recommendations on improvements for wastewater guidelines acknowledged by WHO and FAO.	FAO and WHO better equipped for the next revision of their wastewater use guidelines.	West Africa, India
Safer practices & strategies	<b>Economic valuation of wastewater irrigation</b> in Hyderabad, India and Faisalabad, Pakistan.	Authorities	Policymakers use economic valuation in their decision making.	Increased sustainable irrigated food and fodder production.	India, Pakistan
Safer practices & strategies	<b>Verified recommendations for health risk reduction in wastewater irrigation</b> in Hyderabad, India and Faisalabad, Pakistan.	Authorities	Authorities use and promote safety recommendations.	Increased food and fodder safety.	India, Pakistan
Output 2	Knowledge base on urban water and nutrient demands, waste and wastewater generation and feasible options for resource recovery in agriculture. <b>(5 years)</b>	Authorities, NGOs, farmers, traders, private sector donors; projects, researchers, communities	Options to reduce negative impacts of city growth on agricultural water demand and the environment via water and nutrient recycling, enhanced natural processes, stakeholder involvement, capacity building and policies.	Improved rural-urban linkages and resource recovery in view of water and nutrients.	India, West Africa
Output Targets 2006  Stakeholder dialogue and Capacity Building	New <b>linkages between the agricultural and sanitation sectors established</b> in Sri Lanka and Bangladesh.	Authorities Communities Farmers	Improved stakeholder platforms and learning alliances in Rajshahi, Bangladesh, and Kurunegala, Sri Lanka.	Increased knowledge sharing and institutional capacities for key stakeholder in project cities.	South Asia
Stakeholder dialogue and Capacity Building	<b>Improved urban capacities through multi-stakeholder processes and training</b> on Urban Agriculture (Accra, Hyderabad, Freetown).	Authorities Farmers Private sector Traders	Increased understanding of urban agriculture in Accra, Hyderabad and Freetown.	Urban stakeholders consider urban farming in their decision making.	India, West Africa
Output Targets 2007  Resource recovery	<b>Technically, institutionally and financially viable options to support solid waste and sludge recycling for food production</b> in Accra, Kumasi and Tamale (all Ghana).	Authorities NGOs, Farmers Private sector Donors	Decision support for closing the rural-urban nutrient cycle in three Ghanaian cities.	Resource recovery, reduced waste volumes and lower sanitation costs.	West Africa

	Outputs	Intended Users	Outcome	Impact	Sub-Region
Stakeholder dialogue and Capacity Building	<b>Institutional capacity building and community strategies</b> linking urban sanitation and (peri)urban agricultures in Rajshahi, Bangladesh, and Kurunegala, Sri Lanka.	Communities Farmers Authorities	Multi-stakeholder processes adopted by project communities.	Improved capacities for safe resource recovery in project cities in Bangladesh and Sri Lanka.	Asia
Resource recovery	<b>Guidelines for co-composting and direct sludge applications</b> for authorities and farmers in Northern Ghana.	Authorities Researchers	City managers and farmers follow recommendations for the safe use of faecal sludge.	Improved capacities for sustainable resources management.	West Africa
Output Targets 2008	<b>Water and nutrient balances for five African and Asian cities established.</b>	Researchers, Authorities	Better understanding of urban-rural food flows and water needs in five	Improved city planning capacity of urban water demands. selected African and Asian cities.	India Africa
Resource recovery					
Stakeholder dialogue and Capacity Building	<b>Multi-stakeholder processes supported</b> on urban agriculture in Freetown, Ibadan, Kathmandu and Bangalore.	Authorities Farmers Private sector Traders	Participatory policy formulation and/or action planning on urban agriculture in Ibadan, Kathmandu, Freetown and Bangalore practiced by communities.	Improved urban management capacity.	India, Nepal West Africa
Resource recovery	<b>Guidelines on ecological sanitation at community level</b> developed in Vietnam and Ghana.	Authorities, donors, projects	Recommendations for viable agro-ecological sanitation projects used by authorities.	Improved sanitation and resource recovery for agriculture.	Vietnam, Ghana
Stakeholder dialogue and Capacity Building	<b>Guidelines and options for stakeholder involvement</b> in agro-sanitary slum upgrading in West Africa.	Authorities	Increased attention of authorities to bottom-up approaches in sanitation in project cities in Ghana and Nigeria.	Improved sanitation and resource recovery in African slums.	West Africa
Output Targets 2009	<b>Demonstration projects for ecological sanitation in place</b> in Vietnam and Ghana.	Authorities, Universities	Increased attention of decision makers and academia to options for ecological sanitation in Vietnam and Ghana.	Improved sanitation and resource recovery for agriculture.	Vietnam, Ghana
Resource recovery					
Stakeholder dialogue and Capacity Building	<b>Guidelines on multi-stakeholder processes in the agro-san interface</b> based on project experiences in Africa and Asia.	Authorities, Researchers, planners, Donors	Stakeholders use guidelines in new projects.	Improved project capacities for viable stakeholder participation.	India, Nepal West Africa, Sri Lanka, Bangladesh

## 4. MTP PROJECT 11

### **Water Management and Environment: *balancing water for food and ecosystems***

#### ***Rationale for the MTP Project and Changes***

The emphasis within MTP Project 11 has been placed on the environment component of the water-food-environment nexus. IWMI's research interests in the environmental aspects of water resources development and agricultural management in river (as well as aquifer or lake) basins arose from the realization that water and its uses had to be considered in a broader integrated context.

Thus, the goal of the MTP Project 11, Water Management and Environment, is ***to identify and test interventions that safeguard the environment and associated delivery of ecosystem services vital to human well-being, while enhancing land and water resources management for agriculture.***

While it is widely recognized that healthy and resilient ecosystems provide a diverse range of services to humans that are essential for securing food and livelihoods for the rural and peri-urban poor, the importance of ecological resilience and biodiversity in supporting ecosystem services and human well-being remain poorly integrated within land and water resources management. As a consequence, many ecosystems, in particular inland and coastal wetlands, are subject to increasing degradation, with serious implications for human well-being, especially in the longer-term. Agriculture and irrigation, in particular, have been singled out as major drivers of ecosystem degradation and loss, reducing the capacity of ecosystems to deliver services to people. Moreover, as the linkages between ecological resilience and biodiversity, and agricultural systems are seldom considered, the socio-economic value of ecosystems to people continues to be underestimated. Inevitably, continued degradation will threaten the sustainability of agricultural systems and the ability to meet the Millennium Development Goals, the 2010 Biodiversity Target and other global targets.

IWMI's research within this MTP Project commenced in 2005 and was built on previous

research that focused on ecosystems and included research on wastewater, now included in MTP Project 10, and health research on malaria that was moved into SIMA. Thus, in 2006, the research uses as a platform and strengthens early work done on: i) the impacts of irrigated agriculture on downstream wetlands, ii) the sustainable use of wetlands for food production, iii) estimation of the environmental water requirements of river systems, and iv) biodiversity conservation in multifunctional landscapes through the implementation of eco-agriculture strategies. At the same time, it capitalizes on the considerable effort made in 2005 to consolidate linkages with partner organizations specializing in environment, especially those with emerging programs on agriculture and water resources management. The research also takes into account guidance from the CGIAR Science Council to consolidate and focus the range of activities under the Project. Changes from the 2005-2008 MTP logframe reflect this sharpened focus through better defined output targets, as well as a few changes to clarify the alignment with CGIAR system priorities.

In 2006, the specific focal research areas for this MTP Project are:

- € **Addressing environmental water requirements in basins:** To develop and test best practice frameworks that enable explicit inclusion of the environment sector in water resources development and management, and within these frameworks further develop and apply methods to determine and implement the water requirements of aquatic ecosystems.
- € **Enhancing benefits in agriculture-wetlands interactions:** To identify, contextualize and promote the application of appropriate policies and practices for water management in agriculture across the continuum of water management options to enhance food/agricultural production and poverty reduction while minimising wetland degradation.
- € **Valuing contributions of ecosystem services to livelihoods:** To assess and demonstrate the economic value of the range of ecosystem services to basin water and land productivity, poverty reduction and livelihoods strategies; and to improve understanding of synergies and tradeoffs with food production so as to ensure sustainable benefits for people and ecosystems.

These focal areas are reflected in a consolidated and tighter group of activities developed for this MTP Project (Table 1). This consolidation is based on a reassessment of past activities and assessment of opportunities, including closing knowledge gaps and exploring the range of response options arising from global assessments such as the Millennium Ecosystem Assessment and the Comprehensive Assessment of Water Management in Agriculture.

Activities related to environmental water needs have been reassessed as the development of desktop/rapid methods and assessments are completed and attention shifts towards implementation in priority basins. Further consolidation has occurred within the group of outputs related to integrated management of agriculture and wetlands with an emphasis on examining the sustainable use of wetlands for livelihoods and the provision of inventory information on wetlands and the many ecosystem services they provide. The latter is addressing a major information gap about the importance of wetlands for agriculture. The information being provided will support the development of tools for integrated social, economic and ecological analysis of synergies and trade-offs within wetlands. The development and application of better economic tools to assist in trade-off analyses provides a linkage between the analyses of livelihoods in wetlands and the successful implementation of environmental water requirements.

### ***Alignment of the MTPs with the CGIAR System Priorities***

In 2006, individual projects were grouped into three key areas to show how the work addresses the Science Council Strategic Priorities (Table 1). The

focus of the current work is on Strategic Priority 4A covering integrated land, water and forest management at the landscape level through Specific Goal 1 to develop analytical methods and tools for the management of multiple use landscapes with a focus on sustainable productivity enhancement, as well as 4B covering sustaining and managing aquatic ecosystems for food and livelihoods through Specific Goal 1: Identification of viable governance and management systems that sustain aquatic ecosystems and increase the sustainable benefits that poor households derive from these ecosystems and their services. Strategic Priorities 3C and 4C, covering enhancement of income through increased productivity of fisheries, and improvements in water productivity, are also addressed.

### ***Description of Impact Pathways***

The focus for the research is provided principally through IWMI's benchmark basins and through the basins where the Challenge Program on Water and Food (CPWF) is working. The primary beneficiaries and end users of MTP Project 11 outputs are agriculture and water managers from governmental agencies, private organisations or NGOs. A key pathway for increased impact with policymakers has been established through the Ramsar Wetlands Convention following the granting of formal International Organisation Partner status to IWMI in late 2005. IWMI is the first organisation to be granted this status outside the four conservation organisations that helped establish the Convention more than 30 years ago. This status provides direct links with the Convention's subsidiary bodies and a mechanism for IWMI to align key activities within this MTP Project with the technical agenda on agriculture, water and wetlands established by the

TABLE 1  
**Meeting CGIAR System Priorities**

MTP Outputs	Project Group	CGIAR System Priorities
Water allocation and environmental flows	E-flows theory and applications Improved livelihoods with dam management	4A, 4B, 4C
Sustainable use of wetlands	Sustainable management of wetlands in southern Africa Wetlands inventory and assessment Agriculture-wetland interactions	3C, 4A, 4B, 4C
Economic valuation of ecosystem services of wetlands	Techniques for economic valuation of wetlands	4B

Convention. It also provides a direct and formal pathway for outcomes to be transferred to relevant national agencies as well as NGOs and observers associated with the Convention. Further, the impact of IWMI's research is being extended through formal agreements in place between Ramsar and other international bodies that have an explicit interest in water management and agriculture. This includes linkages and collaboration with water and wetland-related science-based conservation groups and ecological research schools in addition to more traditional links in the water and agricultural sectors.

A second tier of beneficiaries from this MTP Project comprises land and water managers, researchers and consultants, who can take advantage of the integrated methods, tools and techniques that are being developed through IWMI's research to support integrated water resources management (IWRM), and take account of a broader range of stakeholder perspectives and needs within river basins and across wider landscapes, e.g. those that connect fisheries and different agricultural activities with the wider ecosystem services provided by wetland ecosystems, including rivers.

Research outcomes are being promoted through direct inter-relationships and formal collaboration with NGOs and national resource managers, policy makers and those charged with putting policy into practice in IWMI and CPWF basins. This is evident

in the research being undertaken in Sri Lanka and southern Africa where IWMI is able to bring ecological expertise to irrigation, wetland livelihoods and poverty reduction projects.

The development of techniques for the acquisition of standardised data for assessing the interactions between wetland ecosystems, agriculture, livelihoods and poverty reduction is a key focus. In many places the basic inventory data that can be used to inform land and water managers are not available, or are available at inappropriate scales. These shortfalls are being addressed in further multiple-scale and regionally relevant wetland inventory and assessment, linked with integrated ecological, social and economic analyses.

### **Research Approach to Develop International Public Goods (IPG)**

IWMI's water management and environment research is developing a knowledge base and technology for linking ecological condition and resilience to improved livelihoods and poverty reduction. This is being developed around links with natural resource and ecological scientists to assess the extent of available information, building from the recently completed Millennium Ecosystem Assessment and from the Comprehensive Assessment of Water Management in Agriculture, and targeting local interventions and the

TABLE 2  
**Selected completed and future IPGs and their research approach**

International Public Good	Research Approach
Hydrology-based desktop methods for rapid assessment of environmental water requirements for rivers	Analysis of data requirements for rapid assessments and the development of approaches that can readily be applied for water resources planning purposes when data are scarce or absent
Guidelines and methods for determining and implementing environmental water requirements in river basins	Multi-party review of existing methods in multi-location case studies and publication of guidelines appropriate for a range of basin contexts
Decision Support System for planning and managing dam operation regimes in a river basin context with diverse stakeholder needs	Decision Support System developed through analysis of existing approaches and stakeholder consultation, and field tested with partners
Framework and suite of integrated interdisciplinary tools for addressing trade-offs between social, economic and ecological aspects of wetland use for agriculture	Conceptual models for addressing trade-offs developed by integrating social, economic, ecological, hydrological, agricultural and spatial analysis of multi-location case studies
Tools for standardised wetland inventory and data management	Multi-party analysis and development of tools and data management approaches, including remote sensing applications used for agricultural, environmental and water resources management
Economic tools for valuing the ecosystem services provided by wetlands	Adaptation of general economic tools for specific application in wetlands, particularly those used for or affected by agriculture

development of techniques to rapidly enable further data collection, including new inventory techniques and spatial modelling linking social, economic, agricultural, water resources and ecological data.

### **Elaboration of Partners' Roles**

As this is a developing area of research for IWMI, the Institute is taking a lead role in order to establish priorities and partnerships that complement its existing expertise in wetland ecology, hydrology, agriculture and socio-economics, as well as familiarity with the Ramsar Wetlands Convention and recent international water-related assessments. In all activities in the MTP project, IWMI works directly with partners in a facilitative or enabling role. In general IWMI conducts primary research and coordinates and leads research to develop tools and data management approaches that can support national data acquisition as a basis for addressing trade-offs between social, economic and ecological outcomes.

In particular, IWMI is able to develop hydrologic-ecologic methods or tools that can be used and modified as required nationally or regionally. This is exemplified through IWMI's role in water allocation and environmental flows where the purpose is to develop desktop and holistic methods and undertake trial applications to assess their usefulness and constraints when determining environmental water needs in different basins. Partners, including the University of New Hampshire, The South African Institute for Water Research and international organizations (ICIMOD, IUCN, The Nature Conservancy), provide access to data resources and assist in the development and trials, and co-develop and provide feedback on the usefulness of methods. IWMI also provides an international mentoring role on the process and technical aspects of determination and implementation of environmental flows in different basin contexts, to increase national and regional capacity, and develop and promote the uptake of guidance on the integration of the environment as a sector in river basin planning and management. Local capacity building in these activities is dependent on partners who have access to local networks and stakeholders. Similarly, IWMI provides a research coordinating and leadership role in the projects, addressing improved livelihoods with dam management and sustainable management of wetlands in Africa. This involves project management across sites and countries, the integration of social, economic and ecological data,

the provision of spatial data, and the development of methods for assessing trade-offs between water and land uses. Partners, such as local universities and agencies and organizations such as Cemagref, IUCN and FAO undertake on-site and/or within country analyses based on agreed procedures, ensure access to local networks and provide specific local knowledge, as well as extend the analyses beyond case study sites and support interdisciplinary technical capacity building.

IWMI has initiated research within the emerging research area of wetland inventory and assessment through an international partnership to develop appropriate techniques to ensure standardization of technical approaches and data acquisition. International partners, including FAO and the Ramsar Wetlands Convention, are providing access to databases and regional networks and expertise, with national partners, like the Sri Lankan Central Environmental Authority, providing on-ground support for data acquisition and adjustment of techniques to suit local circumstances and capacity. Other agencies, such as earth observation agencies, are being encouraged to participate to provide and assess information contained in integrated regionally-relevant databases, especially in cross-border basins. IWMI is further participating in a network of partners to address the interactions between wetlands and agriculture; international organizations (e.g. FAO, MedWet, IUCN, Wetlands International, WWF), academic institutions (e.g. Wageningen University and Research Centre) as well as ARIs and NARES, are part of this developing partnership initiative and will provide expertise in wetland-related agricultural practices and access to national networks to establish case studies. In this instance IWMI is providing leadership of the analyses to address the technical aspects of interactions between wetlands and agriculture.

IWMI expertise on wetland ecosystems is also being used to support the development of techniques for economic valuation of wetlands through a partnership developed through the Ramsar Wetlands Convention. Utilizing the established mechanisms of the Ramsar Convention, IWMI has been able to facilitate partnerships and undertake research to address the environmental component of the water-food-environment nexus. As IWMI has a formal partnership with the Convention and its environmental partners, it has successfully facilitated partnership-based research with agricultural and environmental interests for balancing water for food and ecosystems.

**MTP 11: Water Management and Environment: 2006- 2009**

	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Output 1	Improved best practice frameworks, methods, technical guidance and policies for addressing environmental water needs in basins.	Conventions; Ministries of Agriculture, Water Resources, and Environment; Researchers; NGOs	Adoption and implementation of better approaches for determining and implementing environmental water allocations; methods included in and supported by policies and management plans.	Improved integration of environmental water needs in water resources planning and management at international, national and basin scales; more equitable and sustainable allocation of basin water resources.		
Output Targets 2006	Hydrology-based desktop methods for <b>rapid assessment of environmental water requirements for rivers</b> ; review of water allocation methods for different wetland types.	Researchers; Ministries of water resources; Wetland planners and managers; Conventions	Regionally appropriate, desktop/rapid environmental flow methods made available and used for planning environmental flow allocations and policies for rivers.	Greater and earlier inclusion of environmental water allocations in basin planning process for water resource developments in different basin socio-economic/development and ecosystem contexts.	South and Southeast Asia	
Water allocation and environmental flows						
Output Targets 2007	<b>Guidelines and methods</b> for planning and determining environmental water requirements in river basins.	Researchers; Ministries of water resources, Agriculture and Environment; Wetland planners and managers; Conventions; International river basin policy makers	Global and regionally appropriate guidelines and methods made available and used for determining policies and planning water allocations and predicting water stress across sectors within basins, including trans-boundary basins.	Increased recognition of and inclusion of environmental basin-wide approaches in water and land management policies and planning, including responding to water stress/scarcity, particularly across sectoral and/or jurisdictional boundaries.	Asia; Global	
Water allocation and environmental flows						
Water allocation and environmental flows	<b>Global analysis of case studies, and guidelines on implementation of environmental water requirements</b> in river basins.	Conventions; Researchers; Ministries of water resource, agriculture and environment; NGOs	Case studies and guidelines made available and used to assist planners and managers to implement environmental flows in river basin water allocations.	Enhanced awareness and understanding of methods available for environmental flow implementation, access to best practice methods; increased technical capacity to determine and implement environmental allocations.	Global Asia	

	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Water allocation and environmental flows	Field-tested <b>Decision Support System</b> for quantitative and equitable optimisations of environmental, social, economic and health benefits in <b>large dam operation.</b>	Ministries of water resources, Agriculture and Environment; River basin authorities; NGOs; Researchers	Most appropriate best practice DSS identified for use for planning and managing different dam operation regimes in a river basin context with diverse stakeholder needs.	Increased understanding developed of the links between downstream environmental flow needs and other user requirements, dam design and operation.	Ethiopia	CPWF
Output Targets 2008  Water allocation and environmental flows	Consolidation of Ramsar Convention technical <b>guidance on water and wetlands issues.</b>	Conventions; Ministries of water resources, Environment and Agriculture; NGOs; Researchers	Integrated and complete suite of water-related guidance available and adopted by the Ramsar Convention.	Increased institutional and technical capacity for enhancing links between water resources, agriculture and wetland planning and management at a basin-scale.	Global	
Water allocation and environmental flows	<b>Case studies on use of Decision Support Systems</b> to assist decision-makers and involve stakeholders in large dam planning and operation; <b>Practitioner handbook</b> on the <b>use of DSS in planning dam operation.</b>	Ministries of water resources, Agriculture and Environment; NGOs; Researchers	Demonstrated value of and improved knowledge base on state-of-the-art dam decision-support tools for Africa; implications of different dam management regimes on agriculture, livelihoods, health and environment used to revise and maximize operation of new and existing large dams in at least one country.	More rigorous and equitable operation and management of large reservoirs to maximise multiple downstream benefits and account for stakeholder needs; Strengthened national/regional capacity for dam planning and operation.	Africa; Ethiopia	CPWF
Water allocation and environmental flows	<b>Cross-sectoral assessment of legislation, policies,</b> institutional and other arrangements required for <b>national adoption of environmental flows concepts</b> in developing country context.	Ministries of water resources and environment; NGOs; Researchers	Proposed action plans for building long term sustainable environmental flow programmes accepted for adoption in at least one Asian country; comprehensive environmental flow assessment completed for at least one Asian basin.	Linkages and synergies identified among water resources, agriculture and environment sectors; increased national and regional institutional and technical capacity in environmental flow assessment.	Asia	



	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Output Targets 2009  Water allocation and environmental flows	<b>Analysis of the effectiveness of guidelines for environmental water allocations</b> in light of greater experience in on-ground implementation and changes in methods.	Ministries of water resources, Agriculture and Environment; NGOs; Researchers	<i>Revision of environmental flow plans and policies to support more equitable allocations.</i>	Improved implementation of environmental flows taking into account greater experience and rapid changes in tools.	Global Asia Africa	
Output 2	Best practice guidelines, methods, quantitative knowledge base, capacity and policy recommendations supporting integrated and balanced management of agriculture and wetlands.	Ministries of Water Resources, Agriculture and Environment; Policy makers; Farmers; NGOs Researchers; Convention Parties	Improved policies and practices for environmentally sustainable water management in agriculture identified and promoted for update across the spectrum of agriculture-wetlands systems.	Enhanced benefits from agriculture-wetlands interactions that contribute to agricultural production and poverty reduction while minimizing wetland degradation and loss of beneficial ecosystem services.		
Output targets 2006  Sustainable use of wetlands	<b>Comparative quantitative analysis</b> of contribution of wetland agriculture and natural resources to household food security and income and <b>trade-off analysis of wetland uses</b> based on the results.	Ministries of Water Resources, Agriculture and Environment; Policy makers; Farmers; Researchers; Conventions; NGOs	Strengthened existing knowledge base available for use for environmentally sustainable wetland development and management for agriculture; improved tools for trade-off analysis developed; Capacity building needs identified in 8 southern African countries.	Increased recognition and understanding of diverse roles of wetlands in supporting food production and other livelihoods needs.	Southern Africa.	CPWF
Wetland inventory and assessment	<b>Review of existing wetland inventory and techniques</b> for use in ecoagriculture landscapes; bioregional analysis of the distribution of important wetlands; <b>wetland database and maps</b> for Sri Lanka.	Ministries of Water Resources and Environment; Researchers; Convention Parties; NGOs	Improved knowledge of techniques for wetland inventory, including gaps and research priorities; Improved knowledge of the distribution of important wetland and agricultural systems across bioregions for use in conservation and water and land planning; Enhanced capacity for wetland data management in Sri Lanka.	Increased recognition of the strengths and weaknesses of inventory tools and research needs; Wider recognition of the importance of different wetland types regionally in relation to water and land resource management; Improved data management for wetland inventory.	Global; Sri Lanka	

	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Output targets 2007  Sustainable use of wetlands	Identification of evidence-based <b>innovative interventions for sustainable land and water management in wetlands</b> commonly utilised for agriculture and other livelihoods activities.	Ministries of Water Resources, Agriculture and Environment; Policy makers; Farmers; Researchers; Convention Parties; NGOs	Enhanced capacity to manage wetlands for agriculture in a sustainable manner to increase water productivity and minimise negative impacts on human well-being and environment.	Progressively more sustainable wetland use for agriculture that maximises benefits for local communities and across sectors; Development of national wetland management strategies and supporting legislative, policy and institutional frameworks.	Southern Africa	CPWF
Agriculture-wetlands interactions	<b>Review of wetland-agriculture interactions and issues.</b>	Ministries and other authorities; Policy makers; Farmers; Private sector; Researchers; Convention Parties	Improved policies and practices for environmentally sustainable agriculture, wetlands and water management identified and documented for the spectrum of agriculture-wetlands systems.	Enhanced benefits from agriculture-wetlands interactions that contribute to agricultural production and poverty alleviation while minimizing wetland degradation and loss of beneficial ecosystem services.	Asia; Africa	
Wetland inventory and assessment	First set of global, national and regional <b>wetlands inventories (databases and maps) produced/refined.</b>	Ministries of water resources and environment; NGOs; Researchers; Conventions	Wetland inventories used to highlight high priority areas for management and policy interventions to balance food-poverty-livelihoods-ecosystem interactions; Increased availability of knowledge on condition of wetlands of high strategic importance for agriculture, water resources, rural communities and conservation.	Increased knowledge sharing, leading to improved management of wetland and agriculture landscapes; Enhanced capacity for wetland condition and risk assessment and monitoring.	Global South Asia Southern Africa	CPWF

	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Sustainable use of wetlands	<b>Review of biophysical and socio-economic consequences</b> of large-scale, cumulative adoption of <b>small-scale technologies to enhance agricultural productivity.</b>	Ministries of water resources, Agriculture and Environment; Policy makers; Farmers; Researchers; Conventions	New knowledge generated on implications for environmental and livelihoods sustainability of large-scale uptake of small-scale technological and other management interventions to enhance agricultural productivity on irrigated and rainfed lands.	Increased, more widespread recognition and understanding of socio-economic implications and environmental limitations of small-scale technical and management interventions to increase agricultural productivity; Reduced risk of longer-term detrimental impacts on human well-being and environment of small-scale technological/management interventions.	Africa	
Output Targets 2009  Agriculture-wetlands interactions	<b>Policy recommendations and policy briefs on best practice guidelines for sustainable management of wetland and agricultural systems;</b> Synthesis of wetland management options for southern Africa and a <b>handbook on maximising livelihood benefits</b> through agriculture in southern African wetlands.	Policy makers; Conventions; Authorities; NGOs; Researchers; Ministries of water resources, Agriculture and Environment; Wetland and Water resource managers; Farmer organisations	Best practice methods and guidelines used for policy development and management, for improved, diversified agricultural productivity and livelihoods without compromising wetland sustainability; Participatory, incentive-based sustainable wetland use initiated with southern African communities in at least two countries.	Targeted inter-sectoral policy and institutional reform leading to improved food and environmental security and socio-economic welfare of wetland-dependent communities in at least 8 southern African countries; National and regional institutional and technical capacity strengthened at government, extension and local levels.	Global	
Wetland inventory and assessment	<b>Second set of national and regional wetlands inventories</b> (databases and maps) produced/refined and a <b>draft global wetlands map</b> produced.	Ministries of water resources and environment; NGOs; Researchers; Conventions	Wetland inventories used to highlight high priority areas for management interventions to balance food-livelihoods-ecosystem and water-poverty interactions; increased availability of knowledge on condition of wetlands of high strategic importance for agriculture, water resources, rural communities and conservation.	Increased knowledge sharing, leading to improved wetland site management; Enhanced capacity for wetland and agro-ecosystem condition and risk assessment and monitoring.	Global Southern Africa	

	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Sustainable use of wetlands	<b>Case study analysis of biophysical and socio-economic consequences</b> of large-scale, cumulative adoption of <b>small-scale technologies</b> to enhance agricultural productivity.	Ministries of water resources, Agriculture and Environment; Policy makers; Farmers; Researchers; Conventions	New knowledge generated on implications for environmental and livelihoods sustainability of large-scale, uptake of small-scale technological and other management interventions to enhance agricultural productivity on irrigated and rainfed lands.	Identification of most appropriate small-scale interventions from socio-economic and environmental perspectives; Reduced risk of longer-term detrimental impacts on people and the environment of small-scale technological advances.	Global Southern Africa	
Output 3	Quantitative assessments of the economic value of the range of ecosystem services from wetlands; improved tools for trade-off analysis and strategies to maximize benefits.	Ministries of water resources, Agriculture and Environment; Policy makers; Farmers; Researchers; Conventions	Enhanced economic valuations of ecosystem services from wetlands and recognition of the overall value of these ecosystems and the nature of trade-offs with agriculture and water resources.	Increased consideration of wetlands in water and land management and policy making and reduction of further wetland degradation or loss.		
Output Targets 2006  Economic valuation of ecosystem services of wetlands	<b>Best practice guidelines</b> for economic valuation of ecosystems services from wetlands.	Policy makers; NGOs; Conventions; Researchers; Private sector	Improved and consolidated suite of approaches/tools for economic assessment of ecosystem services from wetlands applicable in diverse contexts.	Increased consideration of wetlands in water and land management and policy making especially in relation to communities that depend on wetlands for multiple services.	Global	
Output targets 2007  Economic valuation of ecosystem services of wetlands	<b>Knowledge-based tools for making trade-offs</b> when considering agricultural developments.	Policy makers; NGOs; Conventions; Private sector	Transparent analysis of trade-offs when making decisions about water and agricultural developments, strategies or policies.	A reduction in the loss and degradation of wetlands as a consequence of water and agriculture policies or development strategies.	Southern Africa	CPFW

	Outputs	Intended User	Outcome	Impact	Sub-Region	Links to CPs and SW/EPs
Output targets 2008  Economic valuation of ecosystem services of wetlands	<b>Refined guidelines</b> for economic valuation of wetlands based on case studies incorporating environmental flows and decision support systems for dam operation.	Ministries of water resources, Agriculture and Environment; Policy makers; Farmers; Researchers; Conventions	Improved economic analyses and management policies for rivers and wetlands based on practical experience with environmental flow allocations and decision support systems.	Greater acceptance of the use of economic tools for managing wetlands and water for multiple purposes, especially those that support local people and contribute to poverty reduction.	Africa Asia	
Output targets 2009  Economic valuation of ecosystem services of wetlands	Analysis of <b>institutional aspects of economic valuation of wetlands</b> case studies and policies governing land and water management, with specific reference to agriculture.	Ministries of water resources, Agriculture and Environment; Policy makers; Researchers; Conventions	Increased relevance of and economic valuation to water and land management and policies, and greater integration of valuation in river basin planning and management.	Greater recognition of the value of multiple ecosystem services from wetlands when making decisions about water and land management and poverty reduction.	Africa Asia	

# International Water Management Institute Medium Term Plan 2007-2009

## V. Financial Information

### IWMI-Cost Allocation: Allocation of Projects Cost to CGIAR System Priorities, 2005-2009 (in \$ million)

Project	System Priorities	2006 (estimated)	2007 (proposal)	2008 (plan 1)	2009 (plan 2)
01 Integrated Water Management for Agriculture	Priority 4C	0.000	0.000	0.000	0.000
Total by project		0.000	0.000	0.000	0.000
02 Sustainable Smallholder Land & Water Management Systems	Priority 4C	0.000	0.000	0.000	0.000
Total by project		0.000	0.000	0.000	0.000
03 Sustainable Groundwater Management	Priority 4C	0.000	0.000	0.000	0.000
Total by project		0.000	0.000	0.000	0.000
04 Water Resource Institutions & Policies	Priority 4C	0.000	0.000	0.000	0.000
Total by project		0.000	0.000	0.000	0.000
05 Water, Health & Environment	Priority 4C	0.000	0.000	0.000	0.000
Total by project		0.000	0.000	0.000	0.000
06 Comprehensive Assessment	Priority 4A	0.426	0.000	0.000	0.000
	Priority 4B	0.284	0.000	0.000	0.000
	Priority 4C	0.426	0.000	0.000	0.000
	Priority 4D	0.284	0.000	0.000	0.000
Total by project		1.420	0.000	0.000	0.000
07 Systemwide Initiative on Malaria and Agriculture	Priority 4A	0.035	0.000	0.000	0.000
	Priority 4B	0.012	0.000	0.000	0.000
	Priority 4C	0.012	0.000	0.000	0.000
	Stand-alone Training	0.023	0.000	0.000	0.000
	New Research Areas	0.035	0.000	0.000	0.000
Total by project		0.117	0.000	0.000	0.000

Project	System Priorities	2006 (estimated)	2007 (proposal)	2008 (plan 1)	2009 (plan 2)
08 Basin Water Management	Priority 3B	0.533	0.542	0.539	0.537
	Priority 3C	0.533	0.542	0.539	0.537
	Priority 4A	4.266	4.333	4.314	4.293
	Priority 4B	0.533	0.542	0.539	0.537
	Priority 4C	3.732	3.791	3.775	3.757
	Priority 5D	1.066	1.083	1.079	1.073
Total by project		10.663	10.833	10.785	10.734
09 Land, Water and Livelihoods	Priority 3B	0.413	0.451	0.474	0.496
	Priority 3C	0.413	0.451	0.474	0.496
	Priority 4A	0.825	0.903	0.947	0.993
	Priority 4B	0.413	0.451	0.474	0.496
	Priority 4C	3.715	4.062	4.262	4.468
	Priority 4D	1.651	1.805	1.894	1.986
	Priority 5C	0.413	0.451	0.474	0.496
	Priority 5D	0.413	0.451	0.474	0.496
Total by project		8.256	9.025	9.473	9.927
10 Agriculture, Water and Cities	Priority 4C	1.026	1.083	1.105	1.127
	Priority 4D	0.440	0.464	0.474	0.483
	Priority 5B	0.293	0.310	0.316	0.322
	Priority 5C	0.147	0.155	0.158	0.161
	Priority 3A	1.026	1.083	1.105	1.127
Total by project		2.932	3.095	3.158	3.220
11 Water Management and Environment	Priority 3C	0.125	0.142	0.145	0.148
	Priority 4A	0.753	0.851	0.868	0.886
	Priority 4B	1.129	1.277	1.302	1.328
	Priority 4C	0.502	0.567	0.579	0.590
Total by project		2.509	2.837	2.894	2.952
Water for Food Challenge Program	Priority 4D	0.000	0.000	0.000	0.000
Total by project		0.000	0.000	0.000	0.000
Total by center		25.897	25.790	26.310	26.833

**IWMI-Undertaking, Activities and Sectors, 2005-2009 (in \$ million)**

Undertaking, Activities and Sectors	2006 (estimated)	2007 (proposal)	2008 (plan 1)	2009 (plan 2)
Increasing Productivity	0.000	0.000	0.000	0.000
Germplasm Enhancement & Breeding	0.000	0.000	0.000	0.000
Production Systems Development & Management	0.000	0.000	0.000	0.000
Cropping systems	0.000	0.000	0.000	0.000
Livestock systems	0.000	0.000	0.000	0.000
Tree systems	0.000	0.000	0.000	0.000
Fish systems	0.000	0.000	0.000	0.000
Protecting the Environment	12.949	12.896	13.156	13.417
Saving Biodiversity	0.000	0.000	0.000	0.000
Improving Policies	7.769	7.736	7.892	8.050
Strengthening NARS	5.179	5.158	5.262	5.366
Training and Professional Development	0.000	0.000	0.000	0.000
Documentation, Publications, Info. Dissemination	0.000	0.000	0.000	0.000
Organization & Management Counselling	0.000	0.000	0.000	0.000
Networks	5.179	5.158	5.262	5.366
<b>Total by center</b>	<b>25.897</b>	<b>25.790</b>	<b>26.310</b>	<b>26.833</b>



**IWMI-Cost Allocation: Allocation of Projects Cost to CGIAR Regions, 2005-2009 (in \$ million)**

Project	Regions	2005 (actual)	2006 (estimated)	2007 (proposal)	2008 (plan 1)	2009 (plan 2)
01 Integrated Water Management for Agriculture	SSA	0.000	0.000	0.000	0.000	0.000
	Asia	0.000	0.000	0.000	0.000	0.000
	LAC	0.000	0.000	0.000	0.000	0.000
	CWANA	0.000	0.000	0.000	0.000	0.000
Total by project		0.000	0.000	0.000	0.000	0.000
02 Sustainable Smallholder Land & Water Management Systems	SSA	0.000	0.000	0.000	0.000	0.000
	Asia	0.000	0.000	0.000	0.000	0.000
	LAC	0.000	0.000	0.000	0.000	0.000
	CWANA	0.000	0.000	0.000	0.000	0.000
Total by project		0.000	0.000	0.000	0.000	0.000
03 Sustainable Groundwater Management	SSA	0.000	0.000	0.000	0.000	0.000
	Asia	0.000	0.000	0.000	0.000	0.000
	LAC	0.000	0.000	0.000	0.000	0.000
	CWANA	0.000	0.000	0.000	0.000	0.000
Total by project		0.000	0.000	0.000	0.000	0.000
04 Water Resource Institutions & Policies	SSA	0.000	0.000	0.000	0.000	0.000
	Asia	0.000	0.000	0.000	0.000	0.000
	LAC	0.000	0.000	0.000	0.000	0.000
	CWANA	0.000	0.000	0.000	0.000	0.000
Total by project		0.000	0.000	0.000	0.000	0.000
05 Water, Health & Environment	SSA	0.000	0.000	0.000	0.000	0.000
	Asia	0.000	0.000	0.000	0.000	0.000
	LAC	0.000	0.000	0.000	0.000	0.000
	CWANA	0.000	0.000	0.000	0.000	0.000
Total by project		0.000	0.000	0.000	0.000	0.000

Project	Regions	2005 (actual)	2006 (estimated)	2007 (proposal)	2008 (plan 1)	2009 (plan 2)
06 Comprehensive Assessment	SSA	0.444	0.540	0.000	0.000	0.000
	Asia	0.491	0.596	0.000	0.000	0.000
	LAC	0.093	0.114	0.000	0.000	0.000
	CWANA	0.140	0.170	0.000	0.000	0.000
	Total by project	1.168	1.420	0.000	0.000	0.000
07 Systemwide Initiative on Malaria and Agriculture	SSA	0.160	0.044	0.000	0.000	0.000
	Asia	0.176	0.049	0.000	0.000	0.000
	LAC	0.034	0.009	0.000	0.000	0.000
	CWANA	0.050	0.014	0.000	0.000	0.000
	Total by project	0.420	0.116	0.000	0.000	0.000
08 Basin Water Management	SSA	5.027	4.052	4.116	4.099	4.079
	Asia	5.556	4.479	4.550	4.530	4.508
	LAC	1.058	0.853	0.867	0.863	0.859
	CWANA	1.587	1.280	1.300	1.294	1.288
	Total by project	13.228	10.664	10.833	10.786	10.734
09 Land, Water and Livelihoods	SSA	3.644	3.137	3.430	3.599	3.773
	Asia	4.027	3.467	3.791	3.978	4.170
	LAC	0.767	0.660	0.722	0.758	0.794
	CWANA	1.151	0.991	1.083	1.136	1.191
	Total by project	9.589	8.255	9.026	9.471	9.928
10 Agriculture, Water and Cities	SSA	1.141	1.114	1.176	1.200	1.224
	Asia	1.261	1.232	1.300	1.326	1.352
	LAC	0.240	0.235	0.248	0.253	0.258
	CWANA	0.360	0.352	0.371	0.379	0.386
	Total by project	3.002	2.933	3.095	3.158	3.220

Project	Regions	2005 (actual)	2006 (estimated)	2007 (proposal)	2008 (plan 1)	2009 (plan 2)
11 Water Management and Environment	SSA	1.239	0.953	1.078	1.100	1.122
	Asia	1.370	1.054	1.192	1.215	1.239
	LAC	0.261	0.201	0.226	0.233	0.236
	CWANA	0.391	0.301	0.340	0.347	0.354
Total by project		3.261	2.509	2.836	2.895	2.951
Water for Food Challenge Program	SSA	0.000	0.000	0.000	0.000	0.000
	Asia	0.000	0.000	0.000	0.000	0.000
	LAC	0.000	0.000	0.000	0.000	0.000
	CWANA	0.000	0.000	0.000	0.000	0.000
Total by project		0.000	0.000	0.000	0.000	0.000
Total by center		30.668	25.897	25.790	26.310	26.833

**IWMI-Expenditures, 2005-2009 Object of Expenditure, (in \$million)**

Object of Expenditures	2005 (actual)	2006 (estimated)	2007 (proposal)	2008 (plan 1)	2009 (plan 2)
Personnel	13.642	14.533	14.474	14.763	15.059
Supplies and services	5.166	4.281	4.263	4.349	4.435
Collaboration/ Partnerships	2.002	4.452	4.433	4.524	4.613
Operational Travel	9.366	2.102	2.093	2.135	2.178
Depreciation	0.492	0.530	0.527	0.539	0.549
<b>Total by center</b>	<b>30.668</b>	<b>25.897</b>	<b>25.790</b>	<b>26.310</b>	<b>26.833</b>

**IWMI-Financing: Members/Non Members Unrestricted Grants, 2005-2007 (in \$ million)**

Members/Non Members	2005 (actual)	2006 (estimated)	2007 (proposal)
<b>Members</b>			
Australia	0.363	0.379	0.379
Canada	0.513	0.579	0.579
China	0.010	0.010	0.010
Denmark	0.313	0.344	0.344
Germany	0.309	0.271	0.271
India	0.038	0.038	0.038
Iran	0.095	0.000	0.000
Ireland	0.746	0.690	0.690
Israel	0.190	0.190	0.190
Japan	0.101	0.111	0.111
Netherlands	1.089	1.013	1.013
Norway	0.149	0.330	0.330
Sweden	0.372	0.374	0.374
Switzerland	0.331	0.329	0.329
United Kingdom	1.088	1.119	1.119
United States	0.759	0.759	0.759
World Bank	1.500	1.750	1.750
<b>Total members</b>	<b>7.966</b>	<b>8.285</b>	<b>8.285</b>
<b>Non members</b>			
<b>Total by center</b>	<b>7.966</b>	<b>8.285</b>	<b>8.285</b>

**IWMI-Financing: Allocation of Members/Non Members Grants to Projects, 2005-2007 (in \$ million)**

Project	Members/Non Memebers		2006 (estimated)	2007 (proposal)
01 Integrated Water Management for Agriculture	Members	Non members		
	Total members + Non members			
	Unrestricted + center inc		0.000	0.000
	Total by project		0.000	0.000
02 Sustainable Smallholder Land & Water Management Systems	Members	Non members		
	Total members + Non members			
	Unrestricted + center inc		0.000	0.000
	Total by project		0.000	0.000
03 Sustainable Groundwater Management	Members	Non members		
	Total members + Non members			
	Unrestricted + center inc		0.000	0.000
	Total by project		0.000	0.000
04 Water Resource Institutions & Policies	Members	Non members		
	Total members + Non members			
	Unrestricted + center inc		0.000	0.000
	Total by project		0.000	0.000
05 Water, Health & Environment	Members	Non members		
	Total members + Non members			
	Unrestricted + center inc		0.000	0.000
	Total by project		0.000	0.000
06 Comprehensive Assessment	Members			
	Austria		0.199	0.000
	Japan		0.085	0.000
	Netherlands		0.767	0.000
	Switzerland		0.114	0.000
	World Bank		0.213	0.000
	Total members		1.378	0.000
		Non members		
		Taiwan	0.042	0.000
		Total non members	0.042	0.000
	Total members + non members		1.420	0.000
	Unrestricted + center inc		0.000	0.000
Total by project		1.420	0.000	
07 Systemwide Initiative on Malaria and Agriculture	Members			
	IDRC		0.096	0.000
	Netherlands		0.020	0.000
	Total members		0.116	0.000
	Total members + non members		0.116	0.000
	Unrestricted + center inc		0.001	0.000
Total by project		0.117	0.000	

Project	Members/Non Members	2006 (estimated)	2007 (proposal)
08 Basin Water Management	Members		
	Australia	0.209	0.189
	Canada	0.297	2.361
	Denmark	0.065	0.059
	European Commission	0.588	0.755
	France	0.243	0.482
	Germany	0.098	0.189
	IDRC	0.118	0.000
	IFAD	0.000	0.249
	Iran	0.150	0.150
	Japan	0.174	0.367
	Netherlands	0.108	0.155
	Norway	0.029	0.026
	OPEC Fund	0.090	0.000
	South Africa	0.150	0.150
	Sweden	0.026	0.383
	Switzerland	1.060	1.017
	United Kingdom	1.315	0.948
	United States	0.778	0.308
	World Bank	1.077	1.021
	<b>Total members</b>	<b>6.575</b>	<b>8.809</b>
	Non members		
	GWP Contribution	0.736	0.000
	ICRISAT	0.003	0.000
	Others	0.103	0.010
	Sri Lanka	0.026	0.000
	World Health Organization (WHO)	0.020	0.000
	ZEF	0.010	0.000
	<b>Total non members</b>	<b>0.898</b>	<b>0.010</b>
	<b>Total members + non members</b>	<b>7.473</b>	<b>8.819</b>
	Unrestricted + center inc	3.190	2.014
	<b>Total by project</b>	<b>10.663</b>	<b>10.833</b>
09 Land, Water and Livelihoods	Members		
	ADB	0.234	0.333
	Australia	0.258	0.000
	Austria	0.000	0.150
	Canada	0.015	0.000
	Denmark	0.026	0.023
	European Commission	0.369	0.458
	FAO	0.108	0.000
	France	0.924	1.000
	Germany	0.040	0.328
	India	0.113	0.100
	Netherlands	0.024	0.121
	Norway	0.012	0.010
	Sweden	0.359	0.383
	Switzerland	0.066	0.140
	United Kingdom	0.354	0.404
United States	0.430	0.100	
World Bank	0.246	0.311	
	<b>Total members</b>	<b>3.578</b>	<b>3.861</b>

Project	Members/Non Members	2006 (estimated)	2007 (proposal)
	Non members		
	ILRI	0.010	0.000
	Others	0.004	0.004
	Tata Foundation	0.746	0.487
	<b>Total non members</b>	<b>0.760</b>	<b>0.491</b>
	Total members + non members	4.338	4.352
	Unrestricted + center inc	3.918	4.673
	<b>Total by project</b>	<b>8.256</b>	<b>9.025</b>
10 Agriculture, Water and Cities	Members		
	Denmark	0.113	0.001
	European Commission	0.244	0.428
	France	0.000	0.100
	Germany	0.397	0.402
	IDRC	0.020	0.100
	Netherlands	0.309	0.409
	Norway	0.001	0.000
	Sweden	0.000	0.100
	Switzerland	0.012	0.102
	United Kingdom	0.016	0.114
	United States	0.000	0.100
	World Bank	0.011	0.110
	<b>Total members</b>	<b>1.123</b>	<b>1.966</b>
	Non members		
	CIP	0.005	0.000
	Others	0.000	0.000
	US Dept of Agriculture	0.015	0.011
	<b>Total non members</b>	<b>0.020</b>	<b>0.011</b>
	Total members + non members	1.143	1.977
	Unrestricted + center inc	1.789	1.118
	<b>Total by project</b>	<b>2.932</b>	<b>3.095</b>
11 Water Management and Environment	Members		
	Austria	0.000	0.000
	Denmark	0.022	0.111
	France	0.324	0.133
	Germany	0.021	0.117
	Netherlands	0.013	0.110
	Norway	0.006	0.105
	Sweden	0.005	0.104
	Switzerland	0.024	0.120
	United Kingdom	0.197	0.251
	World Bank	0.128	0.205
	<b>Total members</b>	<b>0.740</b>	<b>1.256</b>
	Non members		
	Global Environment Facility (GEF)	0.195	0.244
	Others	0.002	0.002
	United Nations Educational Scientific and Cultural. (UNESCO)	0.035	0.035
	<b>Total non members</b>	<b>0.232</b>	<b>0.281</b>
	Total members + non members	0.972	1.537
	Unrestricted + center inc	1.537	1.300
	<b>Total by project</b>	<b>2.509</b>	<b>2.837</b>

Project	Members/Non Members	2006 (estimated)	2007 (proposal)
Water for Food Challenge Program	Members		
	Denmark	0.076	0.030
	France	0.002	0.001
	Germany	0.114	0.045
	Netherlands	0.070	0.028
	Norway	0.034	0.013
	Sweden	0.030	0.012
	Switzerland	0.133	0.053
	United Kingdom	1.020	0.404
	World Bank	0.709	0.280
	Total members	2.188	0.866
	Non members		
	Zimbabwe	0.013	0.005
	Total non members	0.013	0.005
Total members + non members	2.201	0.871	
Unrestricted + center inc	-2.201	-0.871	
Total by project	0.000	0.000	
Total by center	25.897	25.790	

#### IWMI Staff Composition: Internationally and Nationally Recruited Staff, 2005 - 2009

Staff Type	2005 (actual)	2006 (estimated)	2007 (proposal)	2008 (plan 1)	2009 (plan 2)
Internationally-Recruited Staff (IRS)	110	112	113	118	122
Other Staff	261	257	258	262	265
Total by center	371	369	371	380	387



**IWMI-Financial Position: Currency Structure of Expenditures, 2005-2007 (in \$ million)**

Currency	Amount	2005(actual)		Amount	2006(estimated)		Amount	2007(proposal)	
		US\$Value	%Share		US\$Value	%Share		US\$Value	%Share
Australian Dollar (AUD)	0.275	0.203	0.662%	0.000	0.218	0.842%	0.000	0.217	0.841%
Euro (EUR)	0.025	0.030	0.098%	0.000	0.032	0.124%	0.000	0.032	0.124%
Indian Rupee (INR)	42.150	0.938	3.059%	0.000	1.010	3.900%	0.000	1.004	3.893%
Srilankan Rupee (LKR)	307202.473	3.018	9.841%	0.000	3.249	12.546%	0.000	3.235	12.544%
Others (Others)	3092831.704	1.646	5.367%	0.000	1.772	6.842%	0.000	1.764	6.840%
Swedish Krona (SEK)	0.417	0.052	0.170%	0.000	0.056	0.216%	0.000	0.056	0.217%
US Dollar (USD)	24.781	24.781	80.804%	0.000	19.560	75.530%	0.000	19.482	75.541%
Total by center		30.668	100.000%		25.897	100.000%		25.790	100.000%

**IWMI Statements of Activities For the Year Ended December 31, 2005 (in \$million)**

	Unrestricted	Restricted Temporary	Restricted Challenge Programs	Total 2005	Total 2004
<b>Revenue and Gains</b>					
Grant Revenue	7.963	12.030	9.648	29.641	23.045
Other revenue and gains	0.455	0.000	0.000	0.455	0.170
<b>Total revenue and gains</b>	<b>8.418</b>	<b>12.030</b>	<b>9.648</b>	<b>30.096</b>	<b>23.215</b>
<b>Expenses and Losses</b>					
Program related expenses	5.190	12.030	9.648	26.868	19.873
Management and general expenses	3.800	0.000	0.000	3.800	3.552
Other losses expenses	0.000	0.000	0.000	0.000	0.000
Sub Total expenses and losses	8.990	12.030	9.648	30.668	23.425
Indirect cost recovery	-1.005	0.000	0.000	-1.005	-0.950
<b>Total expenses and losses</b>	<b>7.985</b>	<b>12.030</b>	<b>9.648</b>	<b>29.663</b>	<b>22.475</b>
Net Surplus / (Deficit) from ordinary activities	0.433	0.000	0.000	0.433	0.740
Extraordinary Items	0.000	0.000	0.000	0.000	0.000
<b>NET SURPLUS / (DEFICIT)</b>	<b>0.433</b>	<b>0.000</b>	<b>0.000</b>	<b>0.433</b>	<b>0.740</b>
<b>Object of Expenditures</b>					
Personnel	5.398	6.788	1.456	13.642	12.590
Supplies and services	2.034	2.154	0.978	5.166	4.172
Collaboration/ Partnerships	0.851	0.819	0.332	2.002	2.144
Operational Travel	0.215	2.269	6.882	9.366	4.072
Depreciation	0.492	0.000	0.000	0.492	0.447
<b>TOTAL BY CENTER</b>	<b>8.990</b>	<b>12.030</b>	<b>9.648</b>	<b>30.668</b>	<b>23.425</b>

**IWMI Statements of Financial Position December 31, 2005 (in \$million)**

	2005	2004
<b>ASSETS</b>		
Current Assets		
Cash and cash equivalents	13.441	15.013
Investments	0.000	0.000
Accounts receivable		
Donor	3.121	2.437
Employees	0.402	0.093
Other CGIAR Centers	1.251	0.141
Others	1.280	0.718
Inventories	0.043	0.039
Prepaid expenses	0.183	0.288
Total current assets	19.721	18.729
Non-Current Assets		
Property, Plant and Equipment	2.098	2.050
Investments	0.000	0.000
Other Assets	0.000	0.000
Total Non-Current Assets	2.098	2.050
<b>TOTAL ASSETS</b>	<b>21.819</b>	<b>20.779</b>
<b>LIABILITIES AND NET ASSETS</b>		
Current Liabilities		
Overdraft/Short term Borrowings	0.000	0.000
Accounts payable		
Donor	11.912	12.116
Employees	0.098	0.021
Other CGIAR Centers	0.351	0.026
Others	1.099	0.590
Accruals	0.034	0.113
Total current liabilities	13.494	12.866
Non-Current Liabilities		
Accounts payable		
Employees	0.000	0.000
Deferred Grant Revenue	1.656	1.659
Others	0.000	0.000
Total non-current liabilities	1.656	1.659
Total liabilities	15.150	14.525
Net Assets		
Unrestricted		
Designated	3.180	3.199
Undesignated	3.489	3.055
Total Unrestricted Net Assets	6.669	6.254
Restricted	0.000	0.000
Total net assets	6.669	6.254
<b>TOTAL LIABILITIES AND NET ASSETS</b>	<b>21.819</b>	<b>20.779</b>

## References

- Amarasinghe, Upali; Samad, Madar; Anputhas, Markandu. 2005. Locating the poor: Spatially disaggregated poverty maps for Sri Lanka. Colombo, Sri Lanka: IWMI. v, 33p. (IWMI research report 96)
- Amoah, P., Drechsel, P., Abaidoo, R. C. 2005. Irrigated urban vegetable production in Ghana: sources of pathogen contamination and health risk elimination. *Irrigation and Drainage*, 54(Supplement 1):S49-S61.
- Annan, Kofie A. 2000. Chapter V: Sustaining our future. In *We the Peoples: The Role of the United Nations in the 21<sup>st</sup> Century*. Report of the UN Secretary-General to the Millennium Summit. A/54/2000. p. 8.
- Bos, M. G.; Burton, M. A.; Molden, David J. 2005. *Irrigation and drainage performance assessment: Practical guidelines*. Wallingford, UK: CABI. viii, 158p.
- FAO, 1995d. *World Agriculture: Towards 2010, An FAO Study*. Edited by N. Alexandratos, Food and Agricultural Organization of the United Nations and J. Wiley & Sons, England, pp. 488.
- FAO, 1980. *Report on the Second FAO/UNFPA Expert Consultation on Land Resources for Populations of the Future*, reprinted 1984. FAO, Rome.
- FAO/IIASA/UNFPA, 1982. *Potential population supporting capacities of lands in the developing world*. Technical Report on Project INT/513, FAO, Rome.
- FAO, 1978-81. *Report on the Agro-ecological Zones Project*. Vol.1, Methodology and results for Africa; Vol. 2, Results for Southwest Asia, Vol. 3, Methodology and results for South and Central America; Vol. 4, Results for Southeast Asia {FAO} *World Soil Resources Report* 48/1,-4.
- Finlayson, C.M. and D’Cruz, R. and Davidson, N.C. 2005. *Ecosystems and human well-being: wetlands synthesis*. Millennium Ecosystem Assessment. World Resources Institute.
- Giordano, M.; F. Rijsberman; R.M. Saleth. 2006 (forthcoming). “More Crop per Drop”: Revisiting a Research Paradigm, Results and Synthesis of IWMI Research, 1996-2005.
- Giordano, M., M. Samad, and R. Namara. 2006 (forthcoming). *Assessing the Outcomes of IWMI’s Research and Interventions on Irrigation Management Transfer (IMT)*. Contributing chapter to the SPIA Commissioned book on CGIAR NRM Impact Assessment.
- GWP (Global Water Partnership). 2000. *Framework for Action*. GWP, Stockholm, Sweden.
- HRH The Prince of Orange and F.R. Rijsberman. 2000. Summary report of the 2nd World Water Forum: From Vision to Action. *Water Policy* 2(6)387-396.
- Huibers, F. P.; Raschid-Sally, Liqa., and Ragab R. (Eds) 2005. Special issue of the *Journal of the ICID on Wastewater Use in Irrigated Agriculture – The Water Chain Approach*. *Irrigation and Drainage*, 54(Supplement 1): S1-S2.
- Hussain, Intizar. 2005. *Pro-poor intervention Strategies in irrigated agriculture in Asia*. Poverty in irrigated agriculture: Issues, lessons, options and guidelines. Bangladesh, China, India, Indonesia, Pakistan and Vietnam. Project final synthesis report. Colombo, Sri Lanka: International Water Management Institute.
- Kijne, J.W; R. Barker, D. Molden, eds. 2003. *Water productivity in agriculture: Limits and opportunities for development*. CA Series 1. CABI Publishing, Wallingford, UK.
- Lestrelin, G.; Giordano, Mark; Keohavahn, G. 2005. When “conservation” leads to land degradation: Lessons from Ban Lak Sip, Laos. Colombo, Sri Lanka: IWMI. v, 25p. (IWMI research report 91)
- Maglinao, A. R., Manzanilla, D. O., and Chandrapatya, S. 2005. *Performance Evaluation and Impact Assessment of the ASIALAND Network: Management of Sloping Lands for Sustainable Agriculture Project-Phase 5*, CD-ROM, IWMI-SEA. [http://www.iwmi.cgiar.org/pubs/Other\\_Publications/index.htm](http://www.iwmi.cgiar.org/pubs/Other_Publications/index.htm)
- McCartney, Matthew Peter; Masiyandima, Mutsa; Houghton-Carr, H.A. 2005. *Working wetlands: Classifying wetland potential for agriculture*. Colombo, Sri Lanka: IWMI. V, 35p. (IWMI Research Report 90).
- Molden, David; Sakthivadivel, Ramasamy; Samad, Madar; Burton, Martin. 2005. Phase of river basin development: The need for adaptive institutions. In Svendsen, Mark (Ed.), *Irrigation and river basin management: Options for governance and institutions*. Wallingford, UK; Colombo, Sri Lanka: CABI; IWMI. Pp. 19-29.
- Molle, François. 2005. *Irrigation and water policies in the Mekong region: Current discourses and practices*. Colombo, Sri Lanka: IWMI. v, 38p. (IWMI research report 95)

- Namara, Regassa; Upadhyay, Bhawana; Nagara, R.K. 2005. Adoption and impacts of micro irrigation technologies: Empirical results from selected localities of Maharashtra and Gujarat states of India. Colombo, Sri Lanka: IWMI. V, 42p. (IWMI Research Report 93).
- Nguyen Khoa, S.; Lorenzen, K.; Garaway, C.; Siebert, D and Chamsingh, B. 2005. Impacts of irrigation on fisheries in rain-fed rice farming landscapes. *Journal of Applied Ecology*, 42(5):892-2664.
- Noble, Andrew; ul Hassan, Mehmood; Kazbekov, Jusipbek. 2005. "Bright spots" in Uzbekistan, reversing land and water degradation while improving livelihoods: Key developments and sustaining ingredients for transition economies of the former Soviet Union. Colombo, Sri Lanka: IWMI. vi, 35p. (IWMI research report 88)
- Raschid-Sally, Liqa; Carr, R.; Buechler, Stephanie. 2005. Managing wastewater agriculture to improve livelihoods and environmental quality in poor countries. *Irrigation and Drainage*, 54(Supplement 1):S11-S22.
- Rijsberman, F.R. and D.J. Molden. 2001. Balancing water uses: Water for food and water for nature. Thematic Background Papers. International Conference on Freshwater, Bonn, 3-7 December, pp. 43-56.
- Seckler, D. 1996. The New Era of Water Resources Management: From "Dry" to "Wet" Water Savings. IWMI Research Report 1. International Water Management Institute, Colombo, Sri Lanka.
- Sharma, Bharat; Samra, J. S.; Scott, Christopher; Wani, S. P. (Eds.) 2005. Watershed management challenges: Improving productivity, resources and livelihoods. Colombo, Sri Lanka: IWMI. xiii, 336p.
- Simmons R.W., P. Pongsakul, D. Saiyasitpanich and S. Klinphoklap. 2005. Elevated levels of cadmium and zinc in paddy soils and elevated levels of cadmium in rice grain downstream of a zinc mineralized area in Thailand: Implications for public health. *Environmental Geochemistry & Health*, Volume 27, Numbers 5-6: 501 – 511.
- Smakhtin, Vladimir; Shilpakar, R. L. 2005. Planning for environmental water allocations: An example of hydrology-based assessment in the East Rapti River, Nepal. Colombo, Sri Lanka: IWMI. v, 20p. (IWMI research report 89)
- Svensden, Mark. (Ed.) 2005. Irrigation and river basin management: Options for governance and institutions. Wallingford, UK; Colombo, Sri Lanka: CABI; IWMI. xii, 258p.
- Thenkabail, Prasad S.; Schull, Mitchell; Turrall, Hugh. 2005. Ganges and Indus river basin land use/land cover (LULC) and irrigated area mapping using continuous streams of MODIS data. *Remote Sensing of Environment*, 95:317-341.
- Wallace, J.S.2000. Increasing agricultural water use efficiency to meet future food production. *Agriculture, Ecosystems and Environment* 82 (2000) 105–119.

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