

LAYING THE FOUNDATION FOR A GLOBAL INITIATIVE FOR WATER SAVING IRRIGATION by Sandra Postel and Paul Polak

A Proposal to Ujjwal Pradhan of the Ford Foundation from International Development Enterprises

A: BACKGROUND AND RATIONALE by Sandra Postel

I. Water and Food: Global Trends

Irrigation has been a powerful tool of human advancement for 6,000 years. It remains a cornerstone of agriculture today, as farmers strive to meet the increasing food demands of ever larger populations. Today, an estimated 40 percent of the world's food comes from irrigated cropland, and because of limited opportunities to expand rainfed production, most experts believe that the vast majority of additional food supplies will need to come from irrigated land.

Even as we are becoming more dependent on irrigation, however, the productivity of the global irrigation base is in jeopardy from the overpumping of groundwater, the growing diversion of irrigation water to cities, and mounting water shortages. One of the key findings of my just-released book, *Pillar of Sand*, is that nearly 10 percent of the global food supply depends on the overpumping of groundwater—an unsustainable practice that cannot continue indefinitely. So much water is being diverted for irrigation and other human uses that many major rivers now run dry for large portions of the year-- including the Yellow in China, the Indus in Pakistan, the Ganges in South Asia, and the Colorado in the American Southwest. The health and functioning of many aquatic ecosystems-- from the shrinking Aral Sea to the Yellow River delta-- depend on more efficient irrigation and water-use practices in order to reserve some water for natural systems.

Moreover, populations continue to grow rapidly in water-short regions. Worldwide, the number of people living in countries classified as water-stressed is projected to increase more than six-fold-- to 3 billion-- by 2025. The vast majority of these people will be in Asia and sub-Saharan Africa, regions already plagued by severe poverty and food insecurity.

At the same time, many farmers in poor regions lack access to affordable irrigation technologies or have no way of stretching the finite supplies they do have in order to increase their crop production. There are tens of millions of farmers, particularly in South Asia and sub-Saharan Africa, who have missed out on irrigation's benefits. Partly as a result, hunger and poverty remain entrenched in large pockets of the countryside.

II. The Challenge: Doubling Water Productivity

Pillar of Sand makes the case for a doubling of water productivity-- that is, getting twice as much output or service from each cubic meter of water extracted from rivers, lakes, and aquifers. Only by meeting this challenge does it seem possible to satisfy the food needs of 8-9 billion people, while at the same time protecting the health of the aquatic environment.

Doubling agricultural water productivity will involve a host of different measures. The best strategies will vary from one location to another, but will typically involve a mix of technological, institutional, and policy reforms. The core of such an effort, however, is the re-design. Approximately 90 percent of the global irrigation base is still watered by flood or furrow methods that are little different from the way farmers watered their fields hundreds of years ago. Only about 1 percent of the world's irrigated land is currently watered by the most efficient irrigation method available-- drip irrigation, the precise delivery of small, steady volumes of water directly to the roots of plants.

III. The Global Initiative on Water-Saving Irrigation

I have been talking with Paul Polak, President of IDE, for several years now about the benefits of expanding the worldwide use of drip irrigation. It was a trip to India with Paul in January 1998 that opened my eyes to the potential of low-cost drip irrigation systems for small farmers. With these IDE-designed systems, it was now possible to envision a much wider use of drip irrigation than had ever before seemed practical. At the same time, new research coming out of Texas and elsewhere was showing good success with drip irrigation on cotton, a crop that is both widely planted worldwide and a heavy user of water.

During that trip to India, which included field trips with Professor R.K. Sivanappan, often called the "father of drip irrigation" in India, Paul began talking with me about a global initiative aimed at spreading drip irrigation to a much larger area of land and to many more farmers. With IDE's expertise in designing and marketing affordable, water-saving irrigation systems and my experience in tracking, analyzing, and communicating about global irrigation trends to both policymakers and the public, it seemed that a good synergy could develop from our collaboration. In many ways, Pillar of Sand (along with my earlier book, Last Oasis), provides an intellectual platform from which to launch such a bold initiative. Indeed, I can think of no single action program that would better begin to implement the changes called for in Pillar of Sand than a large-scale effort to spread the use of drip irrigation.

IV. My Role (Sandra Postel)

The first phase of the initiative includes putting water-saving irrigation squarely on the international agenda and enlisting the input of key technical and policy leaders in irrigation in designing a strategy for the Global Initiative. One of the best ways of introducing the initiative into global policy circles and garnering support for it is to publish articles laying out the rationale for and objectives of the initiative in key journals. Published articles that begin to circulate among water and development professionals are key to building credibility and support for the initiative in its early stages. They will also be key to building the partnerships needed to carry the initiative forward. We are seeking funds to support my involvement in this early phase of work, which will include the following specific tasks:

- 1. Writing 2-3 articles for professional journals** (likely to be co-authored with Paul Polak of IDE that will Polak of IDE) that will

- (1) make the case for the need to double water productivity in agriculture over the next 30 years
- (2) describe the key role drip irrigation has to play in meeting such a goal, and
- (3) document the newly expanded potential of drip irrigation in light of IDE's experience with of low-cost drip systems for small farmers, as well as the success of drip irrigation of cotton and sugarcane, two widely planted and thirsty crops.

2. Assisting with dissemination of the above-mentioned articles to key policy makers and water professionals.

3. Participating in early strategy development for the Global Initiative with Paul Polak/IDE, including the creation of a task force for the initiative.

4. Participating in a small workshop/meeting of irrigation and water policy specialists to begin honing a strategy and work plan for the Global Initiative.

B. THE GLOBAL INITIATIVE FOR WATER SAVING IRRIGATION, by Paul Polak

I. The Role of Drip Irrigation in Doubling Water Productivity

Expanding the adoption of drip irrigation will make a substantial contribution to doubling the crop per drop, because:

1. **Drip irrigation increases crop yield** by 30% or more compared with conventional flood and furrow
2. **Drip systems reduce water losses** from soil surface evaporation, especially during the early phase of the crop cycle, and reduces conveyance losses
3. **Drip systems often reduce erosion** compared with traditional surface irrigation, and lead to a softer, less hard packed soil surface.

The doubling of irrigation productivity through expanded use of drip irrigation holds true, in spite of the fact that modern surface methods such as surge irrigation and laser leveling of fields have produced dramatic improvements in irrigation efficiency and productivity of surface methods in some areas. This holds true, because the vast majority of current flood and surface practice remains the use inefficient traditional methods unchanged for hundreds of years.

II. Affordability and Marketing: The Key Constraints to the Wider Global Adoption of Drip Irrigation

The current distribution pattern of drip irrigation makes a striking statement about the key reason it represents such a puny percentage of global irrigated acreage. 55% of the drip irrigation in the world in 1991 was used for orchards and grapes, and two thirds of the drip systems were installed in developed countries. Since a major part of the capital cost of a drip system comes from installing a plastic pipe beside each row of plants, widely spaced crops lower the capital cost, and the return on high value crops justifies for the high capital cost. The high capital cost of conventional drip systems is the most important barrier to their wider global adoption

But the greatest unmet potential for drip irrigation is in developing countries, where 75% of farmers cultivate less than five acres, conventional drip systems are too big for their micro-plots, and crops like orchards and grapes are play a relatively small role. Here, small farmers are chronically short of capital, and lower value closely spaced crops are critical both to farm family survival and to national food security

Fortunately, the critical constraint of high cost is beginning to be removed. In the past 5 years, IDE has developed, field tested, and started the marketing of low cost drip systems that cut the cost of conventional drip by two thirds. A drip system for a kitchen garden of 1/25 of an acre can be purchased for as little as \$5 (US), and can be expanded like a Lego set using the income it generates. At the same time, Qui Wei Duo and his colleagues at the Yanshan Institute have developed low cost, but large plot oriented drip systems in China, while Chapin and his colleagues have promoted bucket kits for kitchen gardens in Africa and other countries, and private companies like the Israeli firm Netafim have begun to manufacture and market drip systems targeted for small farmers.

There is no reason why the process of identifying the key contributors to cost and designing around them used by IDE and others to lower the cost of small farm drip systems, cannot be applied equally effectively to large farms in wealthier countries. Lowering the cost of conventional large farm drip systems would speed up the process of converting large cotton acreages in water short areas like the Aral Sea basin from inefficient flood to drip irrigation. Another water thirsty crop that would benefit from lowering the cost of large drip systems is sugar cane.

Finally, there are major flaws, constraints and limitations in the marketing and promotion strategies used by policy makers and the private sector in widening the adoption of drip irrigation. The development of an effective global marketing and promotion strategy for drip systems that meet the needs of both large and small farmers, combined with a disciplined R&D effort to improve technology affordability, could dramatically steepen the global adoption curve for drip irrigation.

III. The Global Initiative for Water Saving Irrigation

The Purpose of the global initiative is to facilitate the doubling of irrigation productivity in the world by increasing the adoption of water saving drip irrigation from the current level of 3 million hectares to an initial target level of 40 million hectares by the year 2015

The Objectives of the Global Initiative are

1. To establish and disseminate a conceptual and policy intellectual platform from which to launch a bold initiative to increase the global adoption of drip irrigation.
2. To establish a global task force to revise and elaborate objectives 3-7 below, and design the strategy for their practical implementation.
3. To improving the affordability of currently available drip systems for large and small farms, making cost effective drip irrigation available for a wider variety of crops.
4. To open the access of small farmers in the world to drip systems that fit small plots from 1/25 of an acre to one acre, resulting in increased agricultural productivity and food security.
5. To activate the public and private sector to implement major improvements in the global dissemination, promotion, and marketing of drip irrigation
6. To identify, develop, and globally disseminate effective strategies for applying drip irrigation to high water use extensively distributed crops like cotton and sugar cane.
7. To Identify, document, and publicize the need for changes in local, national, and global policies in areas critically to the expansion of watersaving irrigation, such as the implementation of rational price structures for irrigation water.

The present project will make it possible to achieve objective 1. and 2. above, and the activation of the global task force will initiate the process required to accomplish the remaining objectives.

IV The Global Task Force

The initial four members who have agreed to serve on the global task force are:

Paul Polak is founder and President of International Development Enterprises, a development organization that designs and mass markets affordable small plot irrigation devices such as Treadle Pumps and low cost drip systems

Sandra Postel is director of the water policy institute and served previously as Vice-President for Research at World Watch. Her book on global water policy, Last Oasis,

has been translated into 8 languages, and her recent book, *Pillar of Sand*, is likely to become the definitive work on global irrigation issues

Jack Keller formerly the head of the irrigation department of Utah State University whose book, *Sprinkler and Trickle Irrigation*, has set the standard for the field. He serves as senior advisor to the International Irrigation Management Institute in Sri Lanka, and has been a prime mover and problem solver for major irrigation projects in countries as wide ranging as Egypt, India, the Middle East, South America, and the United States.

Sir Colin Spedding is a widely respected agriculture expert who has published a wide range of books and articles on agricultural systems. He was formerly Director of the Centre for Agricultural Strategy and Pro Vice Chancellor of the University of Reading, and he serves as chairman committees such as the UK Register of Organic Food Standards, as well as having been special advisor the House of Commons Select Committee on Agriculture.

Fernando Gonzales Villareal is the senior irrigation advisor to the World Bank. He was a prime mover in the establishment of a national water users organization in Mexico, and in shifting control of a substantial part of the canal system from the government to the water users organization.

Part of the early deliberations of the task force will focus on broadening the membership of the task force, and incorporating social, geographic, and cultural perspectives on water scarcity and water saving irrigation.

V. Key Outputs of the Present Proposal

1. Completion and publication of 2-3 articles in professional journals to lay the intellectual foundation for the global initiative
2. Facilitation of the dissemination of the information in the articles to key policymakers and water professionals
3. Completion of the organizational meeting of the global task force, to revise the objectives of the global initiative for water saving irrigation, and produce a draft strategy for their practical implementation.

VI Functions and Roles of Global Task Force

The primary initial function of the task force will be strategy development. The task force will incorporate a broad range of perspectives, including those of water users and policy makers, in order to:

1. raise awareness among the international water policy and agricultural development communities of the great potential of this initiative to increase food security and income in poor regions
2. establish strategic partnerships for scaling up the initiative

3. craft a 5-10 year implementation plan.

VI. Dissemination Strategy

1. The articles will be used as a basis for presentations to water meetings attended by Postel and Polak, and by members of the Global Task Force, and by incorporation in processes such as the report of the World Commission on Dams, and the Global Water Vision.
2. The global task force will be the critical group developing and implementing strategy for changing public policy, and influencing key decision-makers in development institutions, the private sector, and governments. The membership of the global task force is designed to include individuals who command respect among the stakeholders we plan to influence. For example, Dr Keller is widely respected in the community of irrigation experts and in the irrigation private sector.
3. The Global task force will elaborate a strategy for dissemination, and Polak and Postel, will begin the process of implementation.
4. Included in the dissemination strategy will be national public forums and discussions focussing on water saving irrigation. We are making plans and identifying funding for Polak and Postel to participate in the first of these in India in the year 2,000.

VII. Impact on Marginality

1. The Global Initiative is designed to have major positive impacts on small and marginal farmers
2. Although three quarters of the farmers in developing countries cultivate less than five acres, existing water saving irrigation technology is too expensive to be affordable for poor farmers, and too large to fit the needs of their small plots
3. The recent development and application of affordable drip and sprinkler irrigation s by IDE in India, Nepal, and China, of affordable drip systems by the Yanshan Institute in China, the promotion of bucket kits by Chain Watermatics, and the initiation of marketing of a small farmer oriented drip system by the Israeli firm Netafim Sri Lanka, Vietnam, provides an encouraging beginning to the possibility of large scale adoption of water-saving, income enhancing irrigation by small poor farmers.

A key shift likely to be stimulated by the global initiative will be to devise practical strategies for changing from technologies like inefficient forms of conventional flood methods, to drip irrigation.

4. The papers to be written and disseminated by Polak and Postel will be a basis for building support among policy makers and planners for initiatives to scale up the dissemination of affordable small plot water saving irrigation technology for small and marginal farmers in developing countries

VI Budget

Budget Proposal

Cost Component	Calculations	Total
Consultancy Fees for Ms. Postel	6 weeks @ \$2800/week, including non-Denver office expenses	\$16,800
Travel and Lodging	1 trip East Coast US - Denver and Return @ \$750, food and lodging 10 days @ \$150/day	\$2250
Organizational Conference on Global Task Force	Travel for 6 persons at average \$750 each, food and lodging @ \$150/day (2 days), room rental @ \$1000/day, conference materials and planning @ \$1500	(\$9800)*
Publication Preparation Costs	Cost to prepare 2-3 articles and proceedings from organizational conference, including field program data collection/confirmation (as needed), word processing, scanning, courier/postage, preparation galleys, photocopy of proceedings	\$1750
Operations Support (Direct Costs)	Calculated at 5% of direct costs, for operations support to Ms. Postel by Denver Program Staff	\$1450
Administrative Overheads (Indirect Costs)	Calculated at 7.5% of direct costs, to cover office, computer, supplies, contract administration and miscellaneous	\$2175
TOTAL		\$24,425

Cost Sharing: IDE will be allocating 10 weeks of the President's time to this project, cost-equivalent estimated at \$16,800. Total IDE Headquarters staff time is estimated at \$2500, one-half of which is funded under other sources (see Operations Support above). Field staff time is estimated at \$2000.

* Funds to support the costs of travel for the initial organizational conference for the Global Initiative will be obtained from other sources