



## Innovation Brief

on International Development Services

### *Achieving Sustainable Productivity of Irrigation and Drainage through Incremental Investments*

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#### ***A Malignant Equilibrium***

***The recent increase in food prices has shown how fragile is the world's food supply. Innovations in water management are needed to avoid hunger and malnutrition in the coming decades, especially in light of growing population, urbanization and poverty.***

This Brief is about improving the productivity and sustainability of irrigation and drainage systems to meet the steadily growing demand for food. Incremental Investment for Sustainable Irrigation (IIP) can help address this challenge.

Throughout the developing world there is a universal phenomenon in the irrigation sector that has continued for decades. It is the repeating cycle of externally-financed construction or rehabilitation of irrigation schemes followed by seriously inadequate maintenance of irrigation infrastructure. The results are rapid deterioration, growing losses in area irrigated, and mounting pressures for rehabilitation, while food security is jeopardized.

Such rehabilitation is often premature in that it is done before the end of the functional life of the infrastructure. Faulty design and construction and inadequate maintenance accelerate deterioration. This cycle is a kind of “**Malignant Equilibrium**”, because of its negative effects and self-perpetuating nature.

#### **Why doesn't adequate maintenance happen?**

In general, governments do not make adequate funds available for routine maintenance, incidental repairs and improvements. On average only 20% of O&M budgets are allocated to actual maintenance

works. Governments are often unable to raise sufficient funds from irrigation service fees. In public irrigation systems in Bangladesh, irrigation charges collected have equalled only 10 to 15% of O&M expenses. In Indonesia it is less than 10%.

Governments often employ too many staff, leaving fewer funds available for actual operations and maintenance (O&M). At the same time government staff may benefit personally more from expensive construction projects than from routine maintenance. Besides, farmers are reluctant to contribute to channel maintenance if higher-level canals are not properly maintained and the supply of water is unreliable.

In the project planning stage donors generally follow the practice of discounting the value of infrastructure over time. Planners assume a fast rate of deterioration and estimate a functional life-cycle of about 15 to 20 years. This practice of discounting assumes that, after 20 years, the costs of adequate maintenance versus premature rehabilitation are roughly the same. However, discounting fails to value the loss in productivity caused by deterioration.

#### **Effects of deferred maintenance**

The cycle of deferred maintenance, rapid deterioration and premature rehabilitation is a malignant equilibrium in the sense that it is a static, repeating condition that has progressively negative and wider effects, in terms of wasteful investments and repeating deterioration and loss of productivity.

Eventually, deferred maintenance will have noticeable negative impacts on performance, as structures break down or fill with silt. These cause

reduced efficiency and equity of water distribution and poor drainage. Ultimately these result in reduced cropping intensities and crop yields, and declines in income of rural people.

Inadequate maintenance furthermore produces low returns for investment. This pattern reinforces the common perception among farmers that maintenance of the scheme is the responsibility of the government.

#### **Premature rehabilitation and lack of compliance**

It has been estimated that 65% of funds spent annually on irrigation development is used for premature rehabilitation. In a World Bank study of irrigation rehabilitation projects it was found that nearly all of them were cases of deferred maintenance and had unsatisfactory O&M.

Loans for the irrigation sub-sector from multi-lateral donors include “legally-binding” agreements that the host government will increase budgetary allocations for O&M and that sufficient irrigation service fees will be collected. However, most governments simply fail to comply.

Behind the problem of inadequate maintenance are the problems of lack of control by water users over investment priorities, lack of accountability of agency staff and the fact that system ownership, financing, management and use are split between multiple parties.

#### **Serious consequences**

Secondary costs of premature deterioration and rehabilitation include increased government debt to donors, use of expensive foreign exchange for importing more food products, and relatively fewer government funds being available for other uses.

It has been estimated that in Asia the negative cost of inadequate maintenance is about \$275 USD/hectare (ha) because of lost productivity and the need for early rehabilitation. Conventional deferred maintenance and frequent rehabilitation cost 6 to 7 times more than preventive maintenance.

To grow more food there is a need to increase the productivity per unit of water delivered by improving irrigation management. Between now and the year

2050 the earth will gain another 90 million people per year. At least 60% of the additional food needed will have to be produced on irrigated land. China’s Ministry of Water Resources has estimated that 50% of future required increases in agricultural production can only be obtained through improved management of existing irrigation systems.

#### ***What should be done?***

**What if governments, donors, experts and farmers were to take a different, innovative approach to minimising the need for rehabilitation through small-scale, incremental investments that are demand driven and financed by farmers and governments?**

The aim would be to make recurring investments in irrigation scheme repairs and improvements while the maintenance needs are still small. Co-ownership of irrigation assets by water users and governments would prompt users to play a more proactive role in identifying repairs needed and motivate them to contribute significant levels of investment in the form of labour, materials or fees.

Experts have estimated that the annual net benefit of providing satisfactory funding for maintenance is \$75 to \$150/ha greater than what happens when only average inadequate levels are provided.

Surprisingly, for a scheme of only 20,000 ha, the net benefits of changing from inadequate to satisfactory maintenance would be between \$1 and \$3 million per year. It is predicted that the rates of return to satisfactory maintenance are potentially 40%.

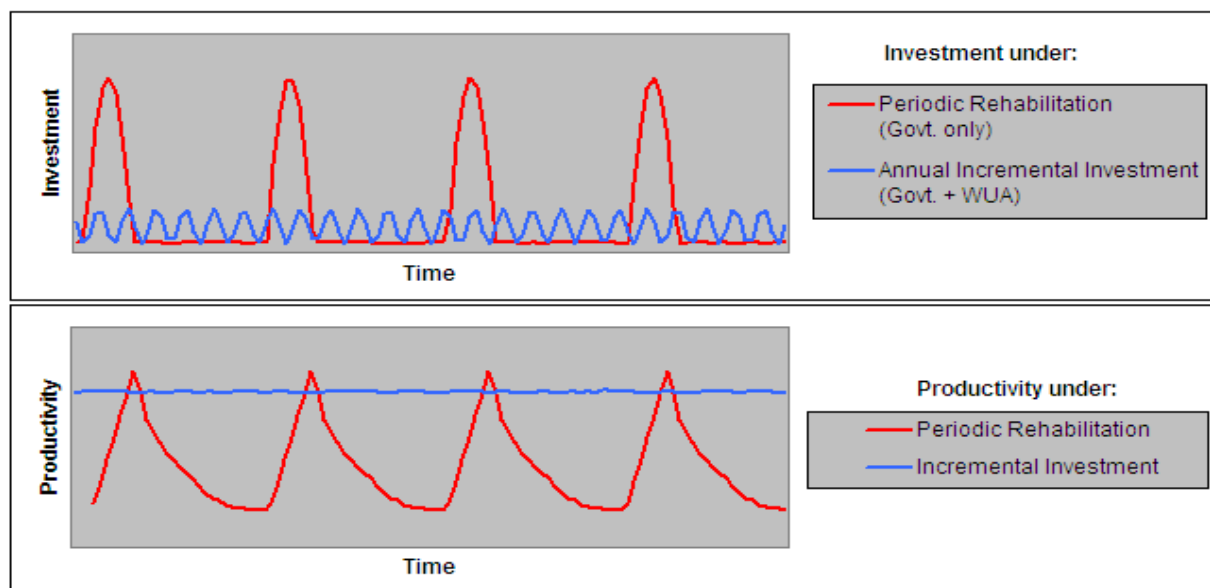
#### **Incremental Investment Program (IIP) for Sustainable Irrigation**

A program of incremental investment for sustainable irrigation (IIP) would replace large, periodic and externally-financed investments with annual and jointly financed ones with a higher level of local ownership. With IIP productivity is sustained while rehabilitation projects become far less frequent.

IIP concerns basic institutional restructuring. It requires policy, legal and/or regulatory issuances to ensure that IIP underlies recurring investments. The figure below displays contrasting patterns of investment and productivity typical of repeating rehabilitation versus incremental investment

paradigms. IIP has both a steady pattern of investment, greater farmer investment and much

less periodic loss of productivity.



**Patterns of Investment and Productivity for Repeating Rehabilitation versus IIP**

The main steps for adoption of a program to ensure sustainable irrigation & drainage through incremental investment are as follows:

- 1. Identify countries and locations where clients support adoption.** This should be in locations where there is agreement on an incremental investment program (IIP) between the government, donors, experts and water users.
- 2. Legally establish Water Users Associations.** WUAs are an essential part of the strategy. To function effectively they should be democratically constituted and have the legal authority to include all water users, adopt rules, apply sanctions and make contracts for services with third parties. The WUA or water users also have clear rights to use water and responsibility and authority to use and maintain infrastructure.
- 3. Establish Irrigation Councils.** Irrigation Councils are bodies set up at a district or sub-district level and consist of staff of irrigation, agriculture, environment, planning, regional or local government departments as well as representatives of WUAs or their federations. The mandate of the Irrigation Council is to establish the IIP, set up its procedures and oversee its implementation.
- 4. Mobilise funds for annual allocation.** An IIP Fund is established with the Irrigation Council, It should be replenished annually. Donors may provide funds initially but this should be taken over gradually

by national and local funding sources. The Fund is to be allocated for incremental repairs and improvements.

- 5. Agree on IIP Fund operating principles and procedures.** The Irrigation Council prepares a plan for IIP funded activities. This includes proposal preparation by WUAs or WUA Federations<sup>1</sup> (WUAFs), criteria for eligibility and selecting proposals, project implementation and technical evaluation.

The criteria should be designed to encourage WUAF to meet agreed standards of performance and accountability. The following are possible examples of eligibility criteria for WUAF:

- a) *Establish constituent WUAs with a legal status,*
- b) *Collect irrigation service fees at an agreed rate,*
- c) *Pay an appropriate fee for its membership in the "IIP Fund Network"<sup>2</sup>,*
- d) *Build a capital reserve fund at an acceptable rate,*
- e) *Implement an O&M plan satisfactorily,*

<sup>1</sup> A Water Users Association Federation is an organisation consisting of multiple Water Users Associations, the former existing at a higher hydraulic level (such as secondary or distributary canals) and the latter at a lower level (such as tertiary canals or watercourses).

<sup>2</sup> The IIP Fund Network consists of all WUAFs and government agencies involved.

- f) *Receive satisfactory rating in Irrigation Management Audit, assessing performance and accountability,*
- g) *Submit reports satisfactorily after IIP FUND grants were received.*

The Irrigation Council makes an arrangement for periodic submission of proposals to the IIP FUND by all eligible WUAF. After this they are reviewed and selected by the Irrigation Council. The following are examples of requirements for proposals:

- a) *Simple design with cost estimate,*
- b) *Joint investment by WUAF members,*
- c) *Description of specific benefits from the project,*
- d) *Signatures of WUA members supporting the proposal,*
- e) *Local government certifies feasibility of the proposal,*
- f) *Proposal submitted to IIP FUND Proposal Review Committee,*
- g) *WUAF has prepared an asset management plan for maintenance and upgrading which justifies the proposal.*

The irrigation agency provides engineering support to WUAF in preparation of designs for incremental repairs and improvements.

Proposals could be assessed according to agreed criteria, such as the following:

- a) *Extent of benefits for farming community,*
- b) *Technical and economic feasibility,*
- c) *Share of WUAF or WUA members who support the proposal,*
- d) *Share of total cost/ labour/ materials to be contributed by WUAF members (demonstrating the extent of its own investment),*
- e) *Justification why the project cannot be implemented by the WUAF/WUA alone,*
- f) *Costs are within the IIP funding limits.*

**6. Review and select proposals.** Proposals from all eligible WUAF are prepared following the guidelines given. In accordance with the funds available the IIP Fund Proposal Review Committee selects proposals for implementation.

**7. Implement IIP projects.** WUAFs selected obtain notification and an initial payment to start implementation. Final payment is made upon satisfactory completion of the project.

**8. Implement Investment and Management Audits.** After implementation, the local government and irrigation agency evaluate each IIP funded project according to the agreement. Inspection of IIP

Fund projects is part of the annual Irrigation Management Audit. This Audit concerns the examination of, technical, institutional, and financial aspects of the WUAF's scope of work. Satisfactory evaluation means that the WUAF may submit new proposals in the next phase.

#### **9. Change IIP Fund into a revolving fund.**

Depending upon local capacity and the size of irrigation systems, eventually the IIP Fund could change into a revolving fund managed by each WUAF. Some WUAF may establish their own Capital Reserve Fund and use it for periodic repairs and improvements. The IIP may evolve into a rolling fund where it shifts from a grant to a credit system. However, if the government is able to mobilize sufficient capital for the IIP Fund for the long-term, then it could remain as originally designed.

**10. Measure and report on the results.** This is essential for the learning process and will promote national support for the IIP approach.

#### **Our Invitation**

Euroconsult Mott MacDonald (EMM) is ready to assist national and local governments, donors, technical assistance agencies and water users associations to design and implement Incremental Investment for Sustainable Irrigation.

We have experience in all aspects needed to make IIP a success, including institutional restructuring, developing water users associations, building the capacity of irrigation agencies and local governments for IIP; developing technical and financial support services for farmers, and monitoring and evaluation.

***We invite you to contact us to explore opportunities to work together to apply IIP.***

#### **You are welcome to contact us about this subject through:**

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