

Pro-poor Intervention Strategies in Irrigated Agriculture in Asia

Issues, Lessons and Guidelines

Bangladesh, China, India, Indonesia, Pakistan and Vietnam



ADB

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Issues Lessons and Guidelines

What's this all about?

There is no doubt that the Green Revolution transformed the lives and livelihoods of millions of Asia's people. Between 1970 and 2000, annual cereal production in the region more than doubled to nearly 800 million tonnes, with most countries achieving self-sufficiency in the staple food grains. The threat of famine, never far away during the 1960s, receded over a period when the region's human population increased by roughly 60 percent. Rural incomes rose, city food prices fell—and the whole economy prospered.

But the rest is decidedly *not* history. Despite the achievements of the Green Revolution, poverty persists in Asia, which today contains the highest absolute numbers of poor people of all the world's developing regions—more poor people even than sub-Saharan Africa. Poverty is particularly deeply entrenched in South Asia, which is home to 44 percent of the world's poor.

The Green Revolution in Asia could not have happened without massive flows of water—irrigation water—to bring the best out of the new crop varieties and other inputs that were also made available to farmers. Nor would it have been possible without massive flows of investment capital to build new and expand existing irrigation schemes as well as to fund the provision of other infrastructure and services to rural areas, including research and extension. Today, the use of both surface and groundwater remains essential to Asian agriculture: 40 percent of the region's cropland is irrigated. Hundreds of millions of rural people across the continent depend on irrigation—including large and medium-scale canal systems—to earn a living from farming.

Irrigation, then, is an essential part of the package of technologies, institutions and policies that underpins increased agricultural output in Asia. Past experience shows that this package, although broadly beneficial to society, has not yet fully succeeded in banishing poverty. So, in the context of the UN millennium goal of halving world poverty by the year 2015, are there ways of making the package more pro-poor in the future?

In 2001, scientists at the International Water Management Institute (IWMI), in collaboration with national partners, launched a major 3-year study that set out to answer this question. Funded by the Asian Development Bank (ADB), the study explored the links between irrigation and poverty alleviation in six Asian countries. The aim was to examine the evidence regarding the effects of irrigation – and particularly its interaction with other components of the package – as a basis for drawing out lessons for policy makers, donor agencies and researchers.

The six countries included in the study were deliberately selected to encompass different policy and social settings. Three countries in rapidly growing but inequitable South Asia—India, Pakistan and Bangladesh—formed a contrast with two in East and Southeast Asia—China and Vietnam—where economic development has proceeded more fairly and with a third, Indonesia, in which irrigation development has been part of a large government-funded transmigration scheme. China, in particular, is a case in which irrigation and agriculture have developed in the context of a long-term national programme to eradicate poverty. The six countries also present contrasting models of the transfer of irrigation management from public agencies to farmer groups or private hands.



The study, which collected its own primary data rather than relying only on secondary data sources and the literature, was the most thorough of its kind ever carried out. Over 5,000 households in 26 irrigation systems took part in surveys during 2001 and 2002. The 227 professionals who worked on the study interviewed a cross-section of irrigation stakeholders, from farmers to local and national policy makers and practitioners. Thirteen workshops with over 700 participants were held to plan the research and discuss its findings. By virtue of its scope, its widely applicable results and the strength of its multi-disciplinary approach, the study provides a model for the design of future pro-poor projects.

Well fine, but what came out of it all?

Irrigation works, but...

The study's main conclusion is that irrigation does indeed reduce poverty—but there are plenty of ifs and buts. Irrigation can be pro-poor, poor-neutral or even anti-poor, depending on the accompanying circumstances.

The researchers found no evidence to refute the basic tenets of the Green Revolution. Generally speaking, irrigation has been tremendously effective in generating a variety of benefits (such as improvements in productivity, employment, wages, incomes and consumption expenditures) and alleviating poverty within the irrigated perimeter, where chronic poverty levels are 20 to 30 percent lower than in rainfed agriculture. This is essentially because access to good irrigation water takes the risk out of investing in improved seeds, fertilizers and pesticides, which then raise yields and hence incomes, even for small-scale farmers. The value of crop production is estimated to be, on average, twice as high in irrigated as in rainfed areas. Nor is there any doubt about the benefits of these larger harvests to consumers: the price of food has fallen (in real terms) in urban as in rural areas, boosting the purchasing power of the poor.

... Equity in basic resource endowments matters

The first 'but' is that there are winners and losers as regards the distribution of water in irrigation schemes. In large canal systems, poverty is far more prevalent at the tail end of the system where water supplies are less secure than in the middle or head reaches. This finding, true across most of the systems investigated in South Asia, provides policy makers with a simple guideline for targeting pro-poor interventions: aim for the tail and you will seldom go astray. In most canal systems, according to the study, redistributing water to tail reaches would greatly increase agricultural productivity

The country studies provide empirical evidence that the incidence and severity of poverty are significantly high in those settings where land and water distribution are inequitable, irrigation infrastructure is poorly managed, and farmers' access to production-enhancing technologies and support measures is very limited. Where these factors are favorable, the incidence of poverty is low.

throughout the system, particularly in the case of large-scale systems where canal water distribution across head-tail reaches is highly inequitable and groundwater is of variable quality.

Poverty is also found to some extent in the head reaches of



systems and is correlated with the unavailability or poor quality of groundwater as well as the supply of canal water. The middle reaches tended to be the areas where farmers did best.

Strongly correlated with inequitable water distribution is inequity in the distribution of land. This varied greatly between countries. In Pakistani systems studied, a significant proportion of households were landless (21-51 percent). Among land owners, 25 percent of large farmers owned 60

percent of land with 75 percent owning only 40 percent of land. Similarly, in Bangladesh (GK system), the wealthiest 2 percent of households surveyed owned 43 percent of the land. China, in contrast, had the lowest levels of inequitable land distribution. However, fragmented land holdings—typical of Vietnam and China—reduce efficiency of farming.

Land reform was the single biggest factor explaining the differences between the performance of Chinese and Vietnamese irrigation systems, which was relatively good, with that of systems in Bangladesh, India and Pakistan, where performance was poor. In the latter countries, governments had invested in irrigation without reforming the structure of agriculture and addressing the need to effectively redistribute land. In China and Vietnam, in contrast, investments in irrigation were accompanied by broader reforms in agriculture, including land reform. This created the conditions that enabled irrigation to benefit the poor.

The cases of China and Vietnam show that the productivity of irrigated agriculture can be just as good, if not better, on small farms as on large. Equity, in short, is good for economic growth as well as for the poor.

Inequities in the distribution of land and water lead to strong differences between countries and subregions in the extra value of production gained from irrigating rather than relying solely on rainfall. This figure, known as the net productivity benefit of irrigation (NPBI), ranged from US\$26 to \$602, with irrigation systems in China and Vietnam performing much better than those in South Asia. The scientists found lower NPBI in systems where average land holdings were larger and farming enterprises were less diverse.

How prevalent is poverty in irrigation schemes?

Across all the systems studied by the project, a significant proportion of households had incomes below specified national poverty lines. On average, around 38 percent of all households surveyed were in poverty during the study period. However, there were large variations across systems and countries, with poverty levels varying from around 6 percent to 65 percent. As expected, systems in China and Vietnam had much lower levels of poverty than systems in South Asia, where Pakistan had the highest levels. Especially, poverty was high among landless households, those with low level of productivity and among woman-headed households. The study results showed that equitable land distribution and increased productivity would have significant impacts on poverty. On average, a 5 percent increase in annual value of crop productivity per ha would reduce poverty by 1.65 percent

in local settings (this is equivalent to 2 percent poverty reduction for each US\$100 increase in value of crop productivity). Moreover, there would also be indirect impacts on poverty not only in local settings but also at the broader economy level. On the other hand, a 5 percent decrease in land inequity index (Gini Index) would reduce poverty by 2.05 percent. This significant impact of land distribution into small holdings is because small-scale farmers use labor and other inputs more efficiently than do large-scale ones.

The indirect effects of irrigation on poverty—that is, its effects through the impact on economic growth—were stronger than the direct productivity related local level impacts. Further, public-sector investment in large-scale irrigation tends to encourage farmers to invest privately in small-scale irrigation by sinking boreholes or digging wells—a phenomenon that is particularly pronounced in Bangladesh. Other private-sector businesses, such as input suppliers and processing enterprises, also tend to move in where irrigation is practised. All this contributes strongly to overall economic growth, often creating significant employment opportunities for poor people.



“The study suggests that (public-sector) investments in large- and medium-scale canal irrigation schemes attract private-sector investments in irrigated agriculture and other related sectors.”

Management can make a big difference

The state of an irrigation system's infrastructure and, to an even greater degree, the way that infrastructure is managed, also strongly affect the impact of irrigation on poverty alleviation.



Not surprisingly, the study found irrigation can adversely affect poverty where its mismanagement leads to the degradation of either land or water resources. The commonest problems are waterlogging and salinization, both of which can force farmers to abandon their fields.

One crucial finding was that systems that have been transferred from public to private (or to semi-autonomous)

Charging for water benefits poor users

Annual charges for irrigation water varied greatly, from US\$4.60 to US\$67 per hectare. But they were considerably lower in South Asia than in Southeast and East Asia.

According to the study, South Asia's low water charges trigger a vicious circle of poor irrigation performance, leading to low agricultural productivity and the perpetuation of poverty. Fees in this region tend to disappear into central government coffers and are not earmarked for recycling to irrigation managers for investment in improved system performance.

Where fees were higher and a decentralized management system was in place, water delivery was considerably more equitable. High rates of fee collection in the systems studied (for example, 88% and 95% in Pakistan and Indonesia respectively) suggested that water fees are accepted by users.

management almost invariably perform better, in terms of improved O&M works, increased productivity and improved irrigation charge collection, than those remaining in the public domain. Intriguingly, the study found that 'reasonable' charges for water did not handicap poor farmers, since systems that were financially sustainable worked better in terms of delivering water equitably (see box). Participatory management styles were also strongly correlated with better performance, especially in settings where the underlying resource distribution (land) is less inequitable.

Water charging: How not to do it

The water charging system in Pakistan appeared particularly unfair. Because fees are based in part on cropping intensity, poor farmers with small plots of land pay more than large farmers. The former tend to double crop, whereas many of the latter leave parts of their land fallow. Small-scale farmers also have less access to canal water and must therefore buy large amounts of groundwater, which is about nine times more expensive than canal water.

The study suggested that Pakistan could switch its charging system either to a flat per-hectare rate or, better still, to a differential system in which everyone would pay the same for the first 2 hectares but farmers with larger amounts of land would pay more for each additional hectare after that. This option would be pro-poor charging system, annually redistributing some Rs 1,362 million (US\$21.7 million) largely in favour of smallholders.

“Overall, the study findings imply that the low level of charges, applied uniformly to all socio-economic groups of farmers, is disadvantageous to the poor, as it adversely affects system performance, which is one of the causes of poverty in South Asian systems.”

Reform can work

One of the most important messages to emerge from the study is that the reform of irrigation management seems to work. A note of caution must be sounded here, since in many cases it is still too early to judge the long-term results. But initial experiences suggest that reforms have brought some benefits to poor irrigation users. Grants made to new secondary or tertiary level organizations, set up to carry out operation and maintenance tasks, have created employment opportunities for landless labourers and small-scale farmers. More significantly, the decentralization of management and the increased spending on infrastructure maintenance have improved the reliability of water delivery, especially to the tail end where poverty is greater. The resulting productivity gains have raised the incomes of poor farmers. Other social benefits reported during surveys include the reduced theft of water, fewer disputes over water allocation, increased sharing of information among farmers, the empowerment of local communities, and less corruption on the part of irrigation officials.

In some countries, notably Bangladesh and Pakistan, respondents voiced concerns that the reform process will simply reinforce existing power differences between small-scale and large-scale farmers. And from India came reports

The study findings suggest that irrigation sector reforms, particularly in South Asian systems, are likely to be effective and benefit the poor where:

- i) landholdings are fairly equitably distributed;
- ii) socioeconomic differentiation among users or groups of users is less, and communities within systems are not very heterogeneous and incompatible (in terms of castes, classes, creeds and power structures);
- iii) benefits of irrigation to farmers are significant and irrigated agriculture is profitable;
- iv) there are incentives for managers and management organizations to improve service delivery; and there is commercial orientation of management institutions, and accountability mechanisms are in place;
- v) cost of canal irrigation is significant and linked to service delivery i.e., farmers incur higher irrigation charges, and O&M cost recovery/adequate funding is ensured; and
- vi) irrigation performance is linked to not only overall growth benefits but also benefits to the poor

Where such conditions are not favorable, it will take a relatively longer period of time for reform initiatives to be successful and effective. Enforcement of strict regulatory measures will remain crucial to avoid adverse impacts on the poor.

that the leaders of water user groups were 'operating more like contractors' for water services than farmer representatives. Also, there was a significant gender inequality in decision making bodies of newly created water user groups.

In general, though, water user groups appeared to be learning their jobs well. Most of them are 'single-issue' groups at present and may need to become multifunctional, with a greater commercial orientation, in the future.

The speed of the reform process appeared to influence its success. Reform should be neither too fast nor too slow. In some cases, reforms had been more successful on paper than on the ground. Speedy reform tends to deny new institutions the time they need to mature and become sustainable.

Most reform policies were intended to save the exchequer money and did not contain specific measures intended to alleviate poverty. Making reform more explicitly pro-poor may help secure even better outcomes from reform processes in the future. Irrigation reform should be explicitly mentioned as a pro-poor policy in poverty reduction strategies.

Social and institutional aspects matter too

The project identified several social factors that correlated strongly with poverty in irrigation schemes. Households headed by women were worse off than those headed by men in most settings. People with low education levels tended to be poor, as did large families. Poverty was also typical of households lacking opportunities to diversify income sources or having only one income earner.

The study confirmed that several other factors in the agricultural support system are important for pro-poor irrigation. These include access to inputs, notably high-yielding crop varieties, and the availability of advice and information from extension services or non-governmental organizations (NGOs). Also vital to poverty eradication are factors that encourage small-scale entrepreneurs, such as opportunities to diversify into higher-value crop or livestock products or to add value through processing, and access to markets for surplus produce.

Various approaches to improving the efficiency of water use had been tried. Researchers have shown that technologies such as zero-till, precision irrigation, precision land levelling or the broadbed-and-furrow method can reduce water use by 20 to 30 percent and raise crop yields by 15 to 20 percent. While these technologies may be attractive to small farmers, they have not so far been widely adopted. Here as in other technological fields, much will depend on strengthening the pro-poor orientation of research and extension services, some of which still seem disinclined to take the small-scale farmer seriously as a client. This is particularly true in the more

traditional rural areas of India, Bangladesh and Pakistan.

Lastly, development and donor agencies can do their part to sharpen the pro-poor focus of the irrigation projects they support or execute. The researchers found that equity and poverty considerations were seldom reflected in project proposals or properly taken into account in project evaluations. A review of donor past project reports, for example, revealed the tendency—especially typical of development banks—to review projects purely for their compliance with financial criteria, such as the completion of infrastructure works to budget and on schedule and the performance of consultants and borrowers. Although overall projected benefits were usually taken into account, the distribution of those benefits was not.

Who can learn from whom?

As a whole, South Asia has much to learn from experiences in East and Southeast Asia. In these latter regions, irrigation management and other support services are more incentive based and relatively more equitable, and the agriculture productivity and the benefits of irrigation are higher as a result. China and Vietnam have adopted a “distribute first” approach to land and irrigation water, and rural development as a whole. South Asia, in contrast, has adopted a “grow first” policy in which distributional issues have largely been ignored. As a result, irrigation has not benefited poor people nearly as much as it could have in this subregion.

So... what's the bottom line?

What does the study tell us about the social and economic context of irrigation and how investments might work for the benefit of the poor in future?

Several observations and conclusions are presented below. These are followed by more general lessons and related guidelines for policymakers, donor representatives, NGOs and researchers involved in irrigation-related interventions for poverty alleviation.

Observations and conclusions

- Although irrigation can help fight poverty, it is more successful if basic inequities in land distribution, which are closely linked to

“Unless reforms are sharpened with a pro-poor focus, the poor (in South Asia) are likely to be bypassed, as in the past.”

water rights, are addressed. Improvements in land equity will improve water equity. The following are among important action imperatives and conditions for successful asset creation and land reforms for the poor: give chronic poor people enough productive land to sustain a family; don't allow land holdings to become fragmented as this leads to inefficient farming; use irrigation reform as an entry point for land reform; simplify procedures for transfer of land ownership and set up a central database of land records; avoid placing a heavy debt burden on the chronic poor people who are given land (or assisted to purchase land through loans); ensure unambiguous title to distributed land with no disputes over ownership rights; and complement land redistribution with support services, including credit and technology.

- Throughout the region, more effort needs to be put into learning from experiences of land and irrigation reform in other countries. Specifically, South Asia, where reforms have not yet taken root, needs to learn not only from experiences of countries like China but also through more effective action research. Unless reforms in this subregion are given a sharper pro-poor focus, the poor are likely to be further marginalized.
- The objective of poverty reduction must drive the processes of policy formulation, institutional development and irrigation reform, not be a by-product of them.
- Off-farm jobs and related training may be the best ways to alleviate poverty where irrigation isn't pro-poor or even possible.
- The delivery of inputs to farmers in irrigation systems needs to become more equitable. At present, many State-run services are inefficient or deprived of adequate resources—and some are still not sufficiently oriented towards the needs of poorer farmers. Farmer organizations, including water user groups, could be formed or adapted to fulfil the function of input provision. The private sector should also be involved.
- Diversification into higher-value crop and livestock products is an important plank in poverty eradication as well as an attractive option for saving water that may be needed for other sectors (tourism, industry, domestic use). Diversification can only occur if farmers have access to sources of new knowledge and technology. Again, this implies strengthening extension services and targeting them towards the needs of poor farmers.
- Efforts should be made to speed up the adoption of water-conserving technologies. This is yet another reason for

reforming and strengthening extension services, particularly where these remain focused on 'traditional' approaches to water use, which may seem profligate by today's more demanding standards.

- The process of reform in irrigation management needs to continue, but not too fast and not too slow. Decentralized management seems to work, but mechanisms for sustaining it need to be put in place. Irrigation institutions need to integrate their central task of irrigation management with other functions, especially input delivery.
- Financially self-sufficient irrigation systems are good for equitable water delivery. Charges to users should reflect real operation and maintenance costs. A pro-poor charging structure needs to be put in place. Irrigation managers should move away from a "first come, first served" approach to a "first pay, first served" approach.

Lessons and guidelines

From the study findings, six broad lessons can be identified for the consideration of government policy makers, representatives of donor and development agencies, and others charged with reducing poverty. Some of these are linked to the 10 intervention guidelines (Guidelines 1 to 10) listed at the end of this summary.

- **On the whole, irrigation reduces poverty, as measured by household income.** The incidence of such poverty is 20–30 percent higher in rain-fed areas than in irrigated areas. See Guideline 2
- However, the pro-poor impact of irrigation differs significantly from one setting to another. The extent of benefits to the poor depends on factors such as land distribution, the quality of irrigation management, the availability of inputs and support services, and water and agricultural policies. Thus, **investments in irrigation can be strongly pro-poor, neutral or even anti-poor.** In South Asia, several influencing factors, notably land equity and



irrigation governance and management arrangements, have been unfavourable. So, despite large investments in infrastructure and related inputs and services, the poverty-related impact of irrigation in that subregion has been mixed—and certainly not as good as in China and Vietnam. See Guideline 1.

- Despite the overall poverty-reducing nature of irrigation, **income poverty persists in most irrigation schemes.** Poverty levels are highest in low productivity areas, downstream sites (the "tail"), and areas where canal water is in short supply and the quality of groundwater is poor. Poverty also tends to afflict the landless and uneducated, women, as well as people whose farms have low productivity. Income poverty, which may be either chronic or seasonal, tends to be high in areas where irrigation systems perform poorly. See Guidelines 1, 2 and 4.
- **Irrigation systems managed by public agencies tend to perform poorly.** The underlying causes are inadequate funding, lack of incentives for good management, and weak monitoring and accountability mechanisms. On the financial side, irrigation charges to users in South Asia are often too low or improperly structured, collection costs are too high, and the fees collected from users are not actually channelled back into local-system operations and maintenance. There are indications, though, that **performance is improving in irrigation systems where management functions have been transferred to local user groups and private service providers.** See Guidelines 5, 9 and 10.
- In South Asia, institutional reform in the irrigation sector is moving at a snail's pace and only on a limited basis (e.g., mostly at the tertiary 'canal' level but not much at higher levels). In many cases, these changes are proceeding without the prior elimination of basic constraints that have so far prevented poor people from fully enjoying the benefits of earlier irrigation investments. **Irrigation governance reforms will help the poor only if they are carried out as part of a broader set of pro-poor changes**—changes that address issues such as fair sharing of resources, including for poor women, and higher agricultural productivity and profitability. There are indications that the irrigation-sector reforms of recent years have improved infrastructure maintenance, made water distribution fairer, and boosted agricultural production and productivity. However, significant measurable benefits to the poor are not yet visible. See Guidelines 3 and 5.
- Irrigation investments typically centre on the creation of physical facilities and institutions and on their economic performance in terms of aggregate costs and benefits. **Almost no attention has been paid to poverty considerations or to the longer term sustainability of the new infrastructure and organizations created.** See Guidelines 2 and 7.

The study findings suggest a number of guidelines that should be of use to policymakers, donor agencies, and others involved in irrigation projects. Ten of these are summarized below.

Guideline - 1. From the outset, development and donor agencies should actively incorporate equity and poverty-alleviation goals into the irrigation projects they design, fund

and execute. Indeed, the potential to alleviate poverty should be the main criterion of selection for irrigation-related projects. But it should be remembered that irrigation will not be a complete antidote to rural poverty in Asia.

Guideline - 2. Poverty assessments, as well as analysis of constraints to and opportunities for poverty alleviation, should be undertaken at the project appraisal and design stages. An explicitly pro-poor approach implies systematic identification and targeting of poor communities and disadvantaged subgroups for new investments. Projects should be tailored to respond to local causes and conditions of poverty. No single intervention model fits all situations. The costs and benefits to the poor (as well as to the environment) should likewise be key factors considered by project monitors and evaluators.

Guideline - 3. Investment packages for irrigated agriculture should go beyond irrigation per se. Other support services and inputs (including information and technology) that help farmers diversify both crop and non-crop production should be included. Public-private partnerships are a vehicle for delivering these services in integrated manner to reduce the cost of access by the poor farmers.

Guideline - 4. The management of surface water and groundwater should be integrated. This enhances productivity and reduces water shortages and inequities at the irrigation system level. Productivity is influenced by both the quantity and quality of water resources.

Guideline - 5. The performance and sustainability of canal irrigation systems can be improved through changes in governance and management. There is a need to move forward with institutional reforms. This can only be done if related issues, such as low agricultural productivity and profitability and inequities in resource distribution, are also addressed. In reform implementation, it is important to differentiate and prioritize geographical locations according to underlying conditions and socio-economic compatibilities of water user groups. The reform models be designed according to local conditions, and 'one model fit for all situations' approach should be avoided. Further, participation of the poor men and women should be ensured, not only in O&M works, but also in decision making through their adequate representation or through creating separate groups of the poor.

Guideline - 6. The success in the implementation of projects, whether they relate to new infrastructure or institutional reform, depends on adaptive learning and action research—which should be emphasized in implementing interventions.

Guideline - 7. Irrigation projects and their pro-poor impacts must be sustained long after the implementation phase has ended. In this regard, sustainability issues need to

be emphasized and dealt with at the design stage of interventions. Likewise, mechanisms for monitoring benefits and costs should be developed with the long term in mind.

Guideline - 8. The knowledge base on poverty at small geographical scales (such as the subdistrict or irrigation system level) is weak and sometimes flawed. It needs to be strengthened. Donors, in partnership with national agencies and NGOs, could help create poverty maps and indicators for use at these local scales.

Guideline - 9. The vital role of public institutions in fighting poverty must not be forgotten. Governments continue to serve as major initiators, regulators and facilitators in the implementation of pro-poor interventions, including those in irrigated agriculture. However, they cannot be expected to be all things to all people. Public agencies should forge strong partnerships with the private sector, NGOs and poor communities.

Guideline -10. Poor rural women and men, as well as managers of irrigation-related organizations, need to be empowered through training, information sharing and awareness building. Poor women have benefited where policies, institutions and infrastructure development have been sensitive to their needs. Therefore, it is important that poor women are involved in the design of irrigation interventions and their implementation. They should also be actively involved in the decision making processes of water user groups, in line with socio-cultural practices.



Note: For references, please see project country briefings, project country reports and project and summary and synthesis report.

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