Pro-poor Interventions in Irrigated Agriculture

Issues, Options and Proposed Actions

Indonesia

Indonesia made impressive gains in economic growth and reducing poverty until it was hit by the South-East Asian financial crisis in 1997. Huge public investments in irrigation during the 1970s and 1980s led to the country becoming self-sufficient in rice in 1984. But, the government struggled to maintain the large network of irrigation systems, and so introduced irrigation fees, and irrigation management transfer (IMT) reforms to some major systems in 1999, to try to cover operation and maintenance costs. The performance of transferred systems improved overall, but institutional issues still need to be addressed.

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Pro-poor Interventions in Irrigated Agriculture in Indonesia:

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Introduction

Reducing poverty is a major development goal. But to achieve this, we need to answer some basic questions. What contribution does irrigated agriculture make to reducing poverty? How does the performance of irrigation systems impact upon poor men and women? Have recent irrigation reforms improved access to water and lifted the poor out of poverty? And, what practical actions will give the best return on investment in terms of alleviating poverty?

This briefing[1] answers those questions in the context of Indonesia. It is one of a series produced by the project 'Pro-poor Intervention Strategies in Irrigated Agriculture in Asia', which took a holistic approach to understanding poverty, in order to identify practical, pro-poor interventions. In-depth, multidisciplinary studies were carried out in each of six Asian countries, and primary data was collected from 5,408 households in 26 irrigation systems using a standard set of methods, to provide new insights that are valuable contributions to the fight against poverty.

Overview: Context and Country-specific Issues

Until 1996, Indonesia made impressive economic progress. Economic growth rates of over 6% per year on average between 1987 and 1996 saw the average per capita income reach US$1,200. But, the financial crisis which began in South East Asia in 1997 hit the country's economy hard. Consequently, poverty levels rose from 11% in 1996 to 20% in 1999. And, though they have fallen considerably since, they remain much higher than during the pre-crisis period.

Indonesia's economic growth depended, largely, on improvements in agriculture—especially in irrigated agriculture. Around 4.5 million hectares were brought under technical irrigation between the early 1970s and the early 1990s. By 1980, investment in irrigation accounted for more than half of public expenditure, with publicly funded irrigation accounting for 85% of the irrigated area and 75% of the country's rice production. The main aim of irrigation was to increase rice production and make the country self-sufficient in rice. This was achieved in 1984.

Irrigation led to huge gains in productivity. In Java (the country's most densely populated island) rice yields in irrigated areas are now much higher than in rainfed areas—by 2 tonnes per hectare. Use of high-yielding varieties (HYVs) and fertilizer contributed to these gains. Plus, irrigation allows a greater number of crops to be grown per year on the same area of land. So, the average cropping intensity (the proportion of land planted in a year) is also much higher in irrigated areas (150%) than in rainfed areas (100%).

Despite the gains made, basing agricultural development on increased rice production did not necessarily benefit the rural poor, and little emphasis was placed on sustainability. Poverty alleviation, agricultural commercialization, crop diversification and farmer participation in irrigation management were largely ignored by the irrigation-development programs.

Currently, low rice prices and increased production costs are eroding farm incomes. Other key problems are unclear water rights, poor infrastructure, and limited access to production inputs, as well as lack of information about new production technologies, and unreliable information about markets.

Small landholdings (which average less than 0.5 hectares) are also increasing poverty levels, as is the fact that land is inequitably distributed. Overall, 57% of agricultural landowners occupy only 27% of the total amount of agricultural land available, while 73% of the land is held by only 43% of landowners. Landlessness is also a problem, especially in Java. Between 1960 and 1965, attempts were made to address this by redistributing land. But, no land reforms have been

undertaken since then. So, in 1993, about 9.05 million households (31.5% of rural households) were virtually landless.

What's more, the country's irrigation infrastructure has been slowly deteriorating since 1984, when self sufficiency in rice was achieved. After this, the government found itself having difficulty meeting the costs of O&M in the new or reformed irrigation systems.

A number of reforms were implemented to address this, including the introduction of an Irrigation Service Fee (ISF) to cover costs. Initially, these reforms attempted to increase farmer involvement by making Water User Associations (WUAs) responsible for fee collection in small systems of less than 500 hectares. Fees were then paid to a government agency and returned to the system in the form of a budget.

But, the system wasn't transparent. Farmers were unable to see how much of the fee was being returned to them and had no real say in how it was spent. So, fee-collection rates were low. Also, the policy was implemented from the top down, under pressure to achieve targets. So, the foundations of these reforms were not properly laid. Plus, low levels of farmer participation limited their effectiveness.

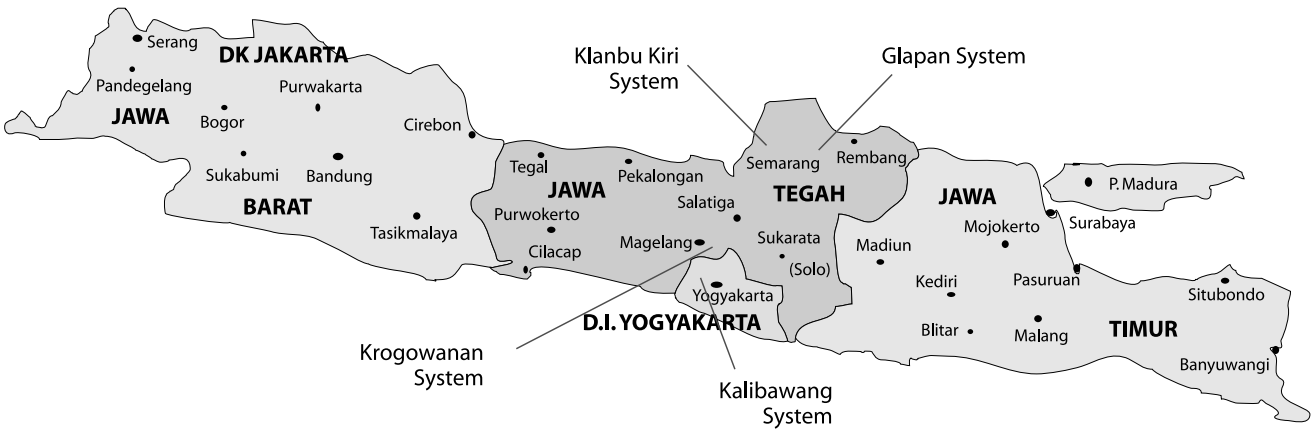
Therefore, in 1999, the Irrigation Management Turnover program (IMT) was introduced in four provinces in Java, to hand over the management of a number of large- and medium-scale systems (greater then 500 hectares) to their users. These newly reformed systems were organized into three tiers. At the tertiary level, each system is managed by a *WUA*, while at the secondary level management falls to a *WUA federation* (WUAF). The primary level of each system is managed by the government with inputs from a *group of WUAFs*. All assets in the systems still belong to the state, but WUAs and the WUAFs are responsible for system management and O&M, as well as fee collection.

In systems which have not yet been transferred, WUAS still manage only the tertiary level. Public sector agencies manage all other levels.

To assess the impacts these reforms had on irrigation system performance, poverty, and relevant institutions, and to identify concrete pro-poor interventions, IWMI and the Center for Rural and Regional Development Studies (CRRDS), Gadjah Mada University, Yogyakarta, conducted a comprehensive study of four irrigation systems in Java. Two of these systems (Klambu Kiri and Glapan) remain under state management (see Box and Figure 1). Management of the other two, however, (Krogowanan and Kalibawang) has already been transferred to WUAs as part of the IMT reform program.

In all, 1001 households were surveyed—901 from the four irrigation systems selected and 100 from surrounding rainfed areas in 2001-2002. Poverty was measured using the income poverty lines specified by the government for each of the four areas (see Box).

Figure 1. Location of selected irrigation systems on the island of Java.



Characteristics of the four irrigation systems studied.

	Klambu Kiri	Glapan	Kalibawang	Krogowanan
Management	Government agency	Government agency	Transferred(IMT)	Transferred(IMT)
Size of system (hectares)	21,475	18,248	6,454	813
Rainfall (mm)	2,092	2,458	2,291	2,065
Water adequacy/shortage	Short	Short	Adequate	Abundant
Condition of infrastructure	Good	Poor	Very good	Good
Source of water	Surface water	Mainly surface water	Mainly surface water	Surface water
Average farm size(hectares)	0.99	1.08	0.30	0.39
Range of farm sizes (hectares)	0.56-1.14	0.62-1.09	0.28-0.40	
Rice yield (kg/hectare)	3,966	1,947	4,827	3,087
Number of crops grown	6	3	11	15
Major crops	Rice, mungbean, soybean	Rice, mungbean	Rice, vegetables	Rice, soybean, maize, vegetables
Poverty line (Rp[1] per person per month)	76,785	74,007	84,062	79,358
Poverty line in purchasing power parity terms (US$/day)	1.04	1.00	1.14	1.08

[1]US$1 = 8,671 rupiah.

The climate in the study areas is monsoonal, resulting in three cropping seasons. More than 80% of annual rainfall occurs during the first cropping season (the rainy season) which begins in October/November. The second begins at the end of the rainy season (February/March) and is known as dry season 1 (DS 1). This is followed (in June or July) by dry season 2 (DS 2).

Key Study Findings and Outcomes

Agriculture, Irrigation and Poverty

Over the four systems studied, levels of landlessness ranged from 14% (in Krogowanan) to 27% (in Klambu Kiri). But, land is extremely scarce. So, average household landholdings were small in general, varying from 0.30 hectares in Kalibawang to 1.08 hectares in Glapan (see Box). In the four systems, the average landholdings of poor households were smaller (0.16-0.53 hectares) than those of non-poor households (0.37-0.58 hectares).

What's more, land is distributed inequitably. Gini coefficients for landholdings (where 0 indicates that all households have equal areas of land, and 1 indicates that one household owns all the land) varied from 0.37 (in Krogowanan) to 0.58 (in Glapan). The average Gini coefficient for the four systems was therefore high (0.54), indicating a high level of inequity in land distribution.

The study's results suggest that access to irrigation significantly raises farm incomes. Researchers compared the net values of crops produced in irrigated plots with those produced in rainfed plots (to calculate the benefits of irrigation). Productivity was found to be higher in the irrigated plots, with irrigation benefits (Figure 2) ranging from around US$125 (in Klambu Kiri) to US$329 (in Kalibawang). Rice yields per hectare were highest in Kalibawang and lowest in Glapan (see Box).

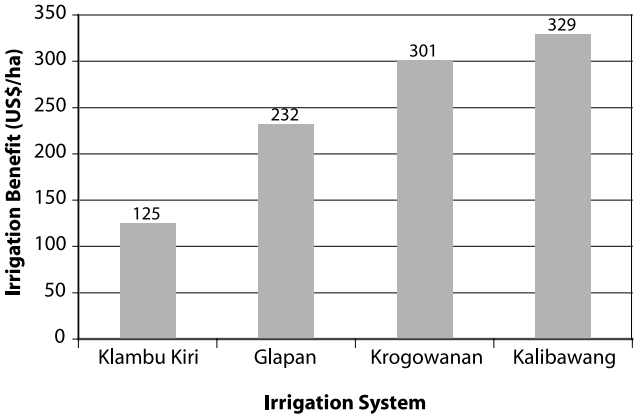


Figure 2. Benefits of irrigated farming over rainfed farming, in terms of net crop values (US$/hectare).

Income from crops accounts for a significant proportion of household incomes—from 38% to 75% in the systems studied. But, crop-derived income was most important in the larger irrigation systems (Klambu Kiri and Glapan, 75% and 54%, respectively), where income sources were less diversified. In fact, both these systems are dominated by rice cultivation, which accounts for between 52% and 91% of farmers' income from food crops.

By contrast, households in the smaller systems (Kalibawang and Krogowanan) obtained their incomes from a more diverse range of enterprises and crops. And, because farmers in these systems grew higher value crops in most seasons, the benefits of irrigation were higher than in Klambu Kiri and Glapan (see Figure 2).

The incidence of poverty in rainfed areas is much higher than in irrigated areas. Around 41% of households live on or below the poverty line in irrigated areas, as compared with 59% in rainfed areas. Depth of poverty (how far people fall below the poverty line) is also higher in rainfed areas than in the irrigated areas. So, poor men and women in rainfed areas are generally poorer than those in irrigated areas.

Overall, poverty rates were similar among systems, ranging from 37% in Kalibawang to 44% in Krogowanan. Within the irrigation systems, poverty was found to be related to household size, the number of non-working dependants per household, the gross value of non-perennial crops produced per hectare, the gross income from perennial crops, the size of landholdings, and the location of households within systems.

Poverty rates also varied across the head, middle and tail reaches within individual systems (Figure 3). They were highest in the tail reaches of Klambu Kiri and Kalibawang and the head reaches of Glapan and Krogowanan. Overall, the incidence of poverty was lower in the middle reaches of the systems. This corresponds with generally higher rice yields per hectare—and higher average household incomes—in the middle reaches. Importantly, and contrary to common perceptions, poverty was not necessarily lower in areas closer to the source of water (i.e., the head reaches).

These location-related differences were more pronounced in larger systems (such as Klambu Kiri and Glapan) where head-tail inequities in water distribution (and thus differences in productivity) were also high. The reasons for such head-tail inequities include conveyance losses, sedimentation in canals (which reduces their capacity), water theft at head reaches, the poor state of the infrastructure, and unsatisfactory management practices. Plus, these systems simply weren't designed to provide enough water. So, less than 20% of the water required for crops is available in dry season 2 (DS 2; see Box).

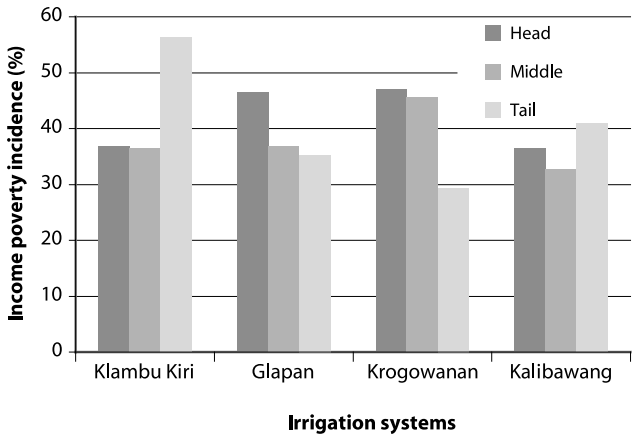


Figure 3. Income poverty (%) at head, middle and tail reaches of the four irrigation systems. Overall, poverty was lowest in the middle reaches.

Further analyses showed that poverty is often lower in areas where farmers grow a higher diversity of crops. Researchers calculated a 'crop diversification index' (CDI)[2], which takes into account the number of crops grown per year by a household, and the total value of those crops. They then used this CDI to compare crop diversification in different areas.

Crop diversification was much higher in irrigated areas than in rainfed areas (as CDI values were 1.06 and 0.49 respectively). Within irrigated systems, there

[2]CDI is defined as gross value of crops produced * number of crops grown during a year by household *i*, divided by the average of the gross value of crops produced *number of crops grown for the entire sample.

was more diversification in Kalibawang and Krogowanan than in Klambu Kiri and Glapan. In these cases, CDI was below average in Klambu Kiri (0.83) and Glapan (0.75) and above average in Kalibawang (1.57) and Krogowanan (1.23). The incidence and severity of income poverty was generally low in locations with a high CDI (Figure 4).

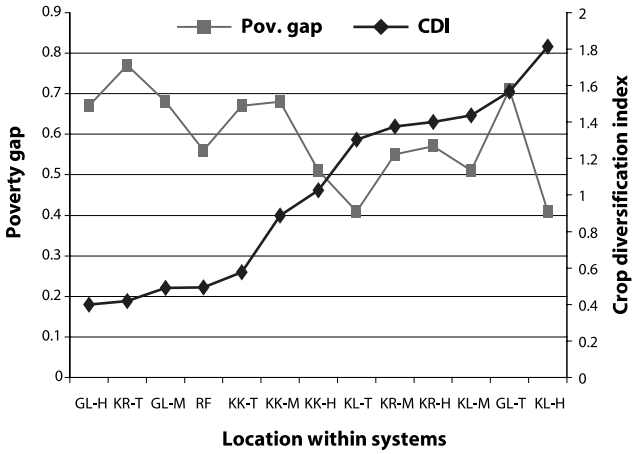


Figure 4. Crop diversification index (CDI)[2] and severity of poverty (the degree to which incomes fall below the poverty line) in the head (H), middle (M) and tail (T) reaches of different systems. GL=Glapan, KR= Krogowanan, RF=Rainfed, KK=Klambu Kiri, and KL=Kalibawang.

Irrigation Charges

Several criteria are used to determine irrigation charges at the tertiary level of systems in Indonesia. These include the area cropped/irrigated, crop type, crop productivity, location, level of service and users' capacity to pay. Consequently, charges are reasonably equitable.

Users also benefit from the fact that variations in canal-water allocations are accounted for in the charging systems. So in non-transferred Klambu Kiri, for example, tail-end farmers pay lower irrigation fees than users in other reaches—because they generally receive a lot less water. In fact, over 70% of tail farmers in that system reported that only up to 24% of their field was irrigated in DS 2, while about 57% of tail-end farmers said they received no water at all during that season.

Farmers in the middle reaches of the transferred Krogowanan system also offer a good example of how the charging system is based around users' capacity to pay. So, because the income they obtain from crops is the highest in the system, they pay most for irrigation.

Impacts of Irrigation Reforms

A key aspect of Indonesia's irrigation sector reforms was the idea that the user groups involved would be autonomous, self-supporting and able to collect and manage the revenues generated by ISF. But, in the two transferred systems studied (Kalibawang and Krogowanan), the results have been mixed.

Importantly, WUAs were intended to function democratically—to ensure that water users had a 'voice'. But, the establishment process has tended to be 'hijacked' by village officials and other influential community members. The study found that most WUA members knew that the associations were supposed to provide them with a forum to air their views. But, the meetings intended for this purpose were rarely held (e.g. one per season) and, even when they were held, few members actually bothered to attend.

What's more, central government still exerts considerable influence over the systems' management. The smooth running and turnover of the systems is therefore being limited by clashes of interests among the various government departments involved. This said, the transferred systems do have more autonomy than those that have not yet been transferred, and overall their performance is better. So, on the whole, it is still too early to judge whether or not IMT will increase the prosperity of the farmers affected.

However, IMT definitely has affected irrigation-financing mechanisms and improved fee-collection rates. In the Kalibawang system, for example, collection rates increased from 59% in 1998/99 (before transfer) to 79% in 1999/00 (after transfer), and reached 90% by 2000/01.

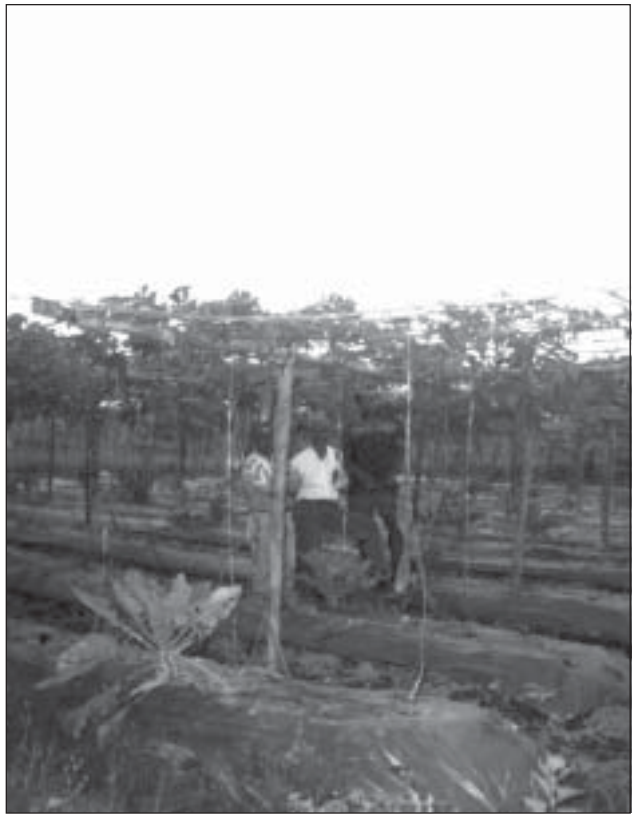
The scheme also recognizes that the fees raised by the WUAs will not necessarily cover all the costs associated with their part of the network. So, if insufficient funds are raised, WUAs can request government aid. In the Kalibawang system, for example, the average annual cost of routine O&M is around Rp[3] 112,000/hectare (US$12.92/hectare). Farmers pay for the repair and maintenance of the primary canal up to a ceiling of Rp 20 million. If the repairs cost more than this, they can request funds from the government.

The survey shows that farmers in the Kalibawang system pay the highest irrigation charges per year (Rp 158,635 to Rp 177,678/ha). But the WUA in this area has been running well, and so has a lot of influence. Because of this, cost recovery has improved and the overall performance of the system is better.

Organizational activities, such as irrigation-fee levying, are routinely carried out.

Overall, farmer participation, water distribution, canal maintenance, ISF collection, cost recovery and water-related conflicts were generally better in the transferred systems (Kalibawang and Krogowanan) than they were in the non-transferred systems (Glapan and Klambu Kiri). Among the transferred systems, performance was better in the water-adequate Kalibawang system than in the water-abundant Krogowanan system.

While early indications are that IMT and/or PIM has benefited water users, certain issues need to be resolved. Specifically, infrastructure needs to be improved, as does the management capacity of users. In systems such as Klambu Kiri and Glapan, which haven't yet been transferred to farmers, management procedures also need to be clarified and made more transparent. Specifically, it should be made clear who is accountable for water allocation and distribution, as these issues are causing conflict among users.



Recommendations and Interventions

Redesign Irrigation Systems and Encourage Agricultural Diversification

Crop diversification improves the incomes of poor farmers, helping to alleviate poverty. But, the irrigations systems in place are not designed to support this. So, redesigning these systems would help to alleviate poverty. At the same time, appropriate approaches and technologies should be promoted to encourage agricultural diversification and realize the pro-poor impacts of irrigation.

Improve Ministerial Commitment to Irrigation Reform

Indonesia's irrigation reforms lay the foundations for improvements in people's standards of living. But, changes need to be made to ensure that irrigation-sector reforms proceed smoothly. There have been political differences and clashes among higher authorities over the transfer of irrigation management to farmers and district-level irrigation financing. So interdepartmental coordination and political commitment at the national level need to be improved.

Train Government Officials

Capacity building is needed for government officials, to help them address and implement newly introduced irrigation laws and policies. Local government officials should also be helped to understand, interpret, and implement the new policies effectively.

Train WUA Members

Farmers and WUAs lack the capacity and knowledge needed to manage the secondary and primary levels of systems. So, they need training, and a number of management tools:

- *O&M manual*—Before IMT was implemented, WUAs were supposed to follow national O&M directives from central government (which were not always carried out). Now, after IMT, each system should have its own O&M manual, developed with the full participation of WUA members, to provide specific guidelines for running and maintaining that system.

- *Asset management plan*—Because the condition of irrigation-system infrastructure affects water

deliveries, an asset management plan should be developed to improve the maintenance of canal infrastructure, gates, etc.

- *Information system*—Data and the information base related to water resource management remains weak. Data on water resources, water flows, water distribution, cropping patterns, crop yields, infrastructure and assets should therefore be recorded, to allow regular monitoring of system performance and O&M planning by WUAs and government agencies.

Build Partnerships and Strengthen Inter-sectoral Linkages

Local partnerships need to be promoted to support pro-poor irrigation and agribusiness development. Partners should include the state, the private sector, and civil-society organizations such as universities, and non-governmental and community-based organizations. Local-level inter-sectoral linkages also need to be strengthened, to raise productivity and increase the poverty alleviating benefits of irrigation investment. Links should be created among village unit cooperatives (KUDs), extension workers, rural banking institutions, markets and produce-storage systems.

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Full references for the information presented in this briefing are contained in the above reports.

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