Bangladesh

# Impact Assessment of Jamuna Multipurpose Bridge Project on Poverty Reduction

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## Outline and Objective

The Jamuna runs through the center of Bangladesh, bisecting the country into the eastern and western halves. It used to pose a bottleneck to land transport in the country, hindering the smooth transport of agricultural products grown in the granaries in the west to major consumption centers in the east, such as Dhaka and Chittagong and bringing economic and social losses to farmers in the west. One of the objectives of the Jamuna Multipurpose Bridge Project (JMBP) is to eliminate this bottleneck to east-west transport by constructing a bridge over the Jamuna and, thereby reduce regional disparities between the country's eastern and western regions. In this evaluation, hypotheses were postulated in the transmission channel of project impact and tested by comparing various economic and social indicators in the villages on the eastern and western sides of the river before and after the project. Based on this comparison, the project impact was estimated and policy implications were presented.

| Project name | Loan Agreement | Loan Amount | Completed |
|---|---|---|---|
| Jamuna Multipurpose Bridge Project on Poverty Reduction | June 1994 | 21,562 million | June 1998 |
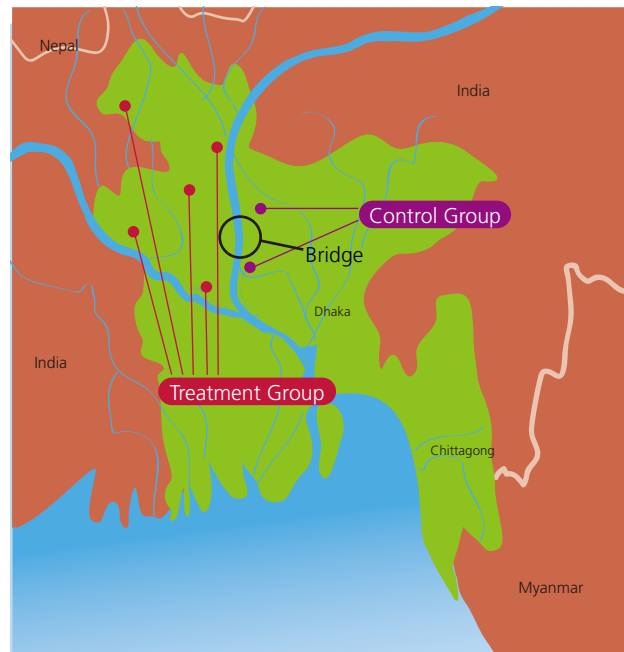


## Evaluation Methodology

### 1. Postulating Hypotheses

For the immediate impact of JMBP, the following impact channel was postulated: JMBP reduces transaction costs and this effect leads ultimately to (income and non-income) poverty reduction through various channels. To identify the process whereby lower transaction costs will lead to poverty reduction, the following 4 hypotheses were postulated.

### 2. Impact Estimation

These hypotheses were tested by analyzing primarily the indicators pertaining to (agricultural and non-agricultural) income-earning activities of households. Specifically, comparison was made in changes in indicators before and after the project between the treatment group of villages that benefited from the project and the control group of villages that did not benefit from the project (Figure 1). This is called the difference-in-difference estimation method (Figure 2). In this exercise, the treatment group and the control group are defined as follows:
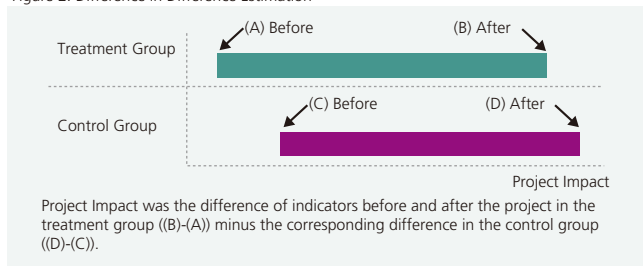
Treatment group: 5 villages (926 households) in the northwestern side of the Jamuna
Control group: 2 villages (220 households) in the eastern side of the Jamuna

(a) Impact on prices: An increase in sales prices of agricultural crops; a decrease in the price of agricultural inputs (such as fertilizer)
(b) Impact on trade: a decrease in product transport cost; an increase in product sales volume
(c) Impact on income and poverty: an increase in household income; an increase in consumption and a decrease in poverty indicators
(d) Impact on non-agricultural activities: a boost in non-agricultural activities in villages

Figure 1: Transmission Channel of JMBP Impact



Figure 2: Difference in Difference Estimation



Project Impact was the difference of indicators before and after the project in the treatment group ((B)-(A)) minus the corresponding difference in the control group ((D)-(C)).

## 1. Changes in Household Income

In the treatment group, incomes increased significantly from grains other than rice and non-grain crops, such as vegetables, while comparable increases were not observed in the control group. In addition, incomes from trading activities and non-farming wage labor also increased in the control group. These findings indicate that there were balanced increases in agricultural and non-agricultural incomes.

| Household Income | Treatment Group | | | Control Group | | | Estimated Project Impact ((B)–(A))–((D)–(C)) |
|---|---|---|---|---|---|---|---|
| | 1997～1998 (A) | 2003～2004 (B) | Difference (B)–(A) | 1997～1998 (C) | 2003～2004 (D) | Difference (D)–(C) | |
| Agricultural Income (US$) | 523 | 622 | 99 | 536 | 581 | 45 | 54 |
| Non-agricultural Income (US$) | 707 | 790 | 83 | 717 | 699 | −18 | 101 |
| Total Household Income (US$) | 1,230 | 1,412 | 182 | 1,253 | 1,280 | 27 | 155 |
| Household Size (No.of Person) | 5.45 | 5.3 | −0.15 | 5.4 | 5.31 | −0.09 | −0.06 |
| Per capita Income | 225 | 266 | 41 | 232 | 241 | 9 | 32 |

## 2. Changes in Prices of Agricultural Crops

There was a general rise in the prices of agricultural crops in the treatment group.  Improved access to markets raised bargaining power, and farming shifted to high-value crops. While the control group also saw increases of their crop prices, they were smaller than in the project group.

Assessment of these findings points toward poverty reduction among the households benefited from the project and a shift in the crop pattern to higher-value crops as impacts brought about JMBP. As JMBP had a significant impact on raising household incomes, it also may suggest that the construction of a bridge in the downstream of the Jamuna would contribute to poverty reduction in the households deriving benefits from such a project. In response to a shift in the crop pattern (toward higher-value crop production), infrastructure development in cold storage facilities could further increase impacts of JMBP.

| Crops (Taka*1/Maund*2) | Treatment Group | | | Control Group | | | Estimated Project Impact ((B)–(A))–((D)–(C)) |
|---|---|---|---|---|---|---|---|
| | 1997～1998 (A) | 2003～2004 (B) | Difference (B)–(A) | 1997～1998 (C) | 2003～2004 (D) | Difference (D)–(C) | |
| High-yield variety rice | 210 | 286 | 76 | 237 | 282 | 45 | 31 |
| Wheat | 294 | 411 | 117 | 329 | — | — | — |
| Jute | 325 | 374 | 49 | 369 | 346 | −23 | 72 |
| Sugar cane | 55 | 50 | −5 | 201 | — | — | — |
| Oilseeds | 478 | 811 | 333 | 464 | 600 | 136 | 197 |
| Pulses | 369 | 555 | 186 | 753 | 800 | 47 | 139 |
| Potato | 133 | 185 | 52 | 133 | — | — | — |
| Onion | 432 | 444 | 12 | 364 | — | — | — |
| Spices | 273 | 1,045 | 772 | 287 | 303 | 16 | 756 |
| Vegetables | 191 | 255 | 64 | 285 | 296 | 11 | 53 |
| Others | 217 | 600 | 383 | — | — | — | — |

*1 Currency in Bangladesh
*2 A weight measure in Bangladesh

## 3. Feedback of Evaluation Results

In December 2006, a workshop was held to share results of this evaluation with ADB, the World Bank, both of which cofinanced this project, the executing agency, and other relevant organizations. The participants made extensive comments on the design of impact evaluation and the need to make detailed analysis. While this study focused on impact on the beneficiary households, some participants made a comment that since a broad geographical region benefited from the project, measuring and analyzing impacts on the entire economy was on the agenda for further evaluation. It was also pointed out that the evaluation of similar projects should be conducted with a baseline study before the project.


Participants in the workshop

## 1. Selection of Treatment and Control Groups in Large-Scale Infrastructure Projects

Since large-scale infrastructure projects bring benefits to a broad region, it is difficult to select a control group that did not received benefits from such projects. In this evaluation, villages in the eastern side of the Jamuna were selected as the control group. However, the opening of the Jamuna Multipurpose Bridge may have brought benefits or losses to this region as well. In that case, Difference in Difference estimation may have underestimated or overestimated true impacts. Therefore, how to select the control group in the impact evaluation of large-scale infrastructure projects is on the agenda for further study.

## 2. Refining Impact Evaluation Methodology

It is not appropriate to compare means of household data in each village because there is heterogeneity of households in a given village. In estimating project impacts, the evaluation methodology could be refined further by comparing households with similar characteristics between the treatment and control groups.