# Jaltol

# A Quasi-Experimental Approach to Evaluating Watershed Interventions

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## About the MEL Toolbox

The MEL toolbox simplifies scientific methods for grassroots practitioners to effectively monitor, evaluate, and learn from watershed management interventions in India. It compiles existing methodologies into an accessible format to support impact assessments that are robust despite limited resources and short project timelines. By strengthening evaluation capacity, the toolbox enables users to maximise the benefits of watershed interventions. As a living document, it will evolve through testing with partner organisations and the inclusion of new methodologies to enhance MEL practices.

This document is Part 4 of the MEL Toolbox series. Click to view Part 1, Part 2 and Part 3.

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About WELL Labs

Water, Environment, Land and Livelihoods (WELL) Labs co-creates research and innovation for social impact in the areas of land and water sustainability. It collaborates with partners to design and curate systemic, science-based solutions to enable a high quality of human life and nurture the environment. WELL Labs is part of the Institute for Financial Management and Research (IFMR) Society. Editorial Review Ananya Revanna, Syed Saad Ahmed

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## About EDF

A global nonprofit, Environmental Defense Fund collaborates with governments, NGOs, research and academic institutions, corporates and others to support and advance India's vision of shared, sustainable prosperity. It combines scientific and economic foundations, a broad network of partnerships and a pragmatic approach in support of India's ambitions.

### What is the approach?

Jaltol is a ready-to-use web app designed to assess the impact of watershed interventions on rabi crop acreage.

#### How is it useful?

It helps assess the impact of interventions on rabi cropping by providing insights into water access.

#### Who can use it?

Anyone with a basic understanding of the intervention location, cropping seasons, and computer use can utilise it. Researchers and organisations can also download the data for further analysis.

## What is Jaltol?

Jaltol is a ready-to-use web app designed to assess the impact of watershed interventions on rabi crop acreage—the land cultivated in winter. It follows a difference-in-differences (DID) approach in which changes in a treatment group over time are compared with changes in a control village over the same time period.

### Data source

Jaltol utilises IndiaSAT remote sensing data, which provides rabi crop acreage (double cropping) post-2017 at 10 m resolution. The IndiaSAT datasets, created by the Indian Institute of Technology Delhi, aim to improve land use land cover (LULC) classification. Currently, the data can be generated for any sub-district in India based on the request.

#### Impact metrics

Jaltol helps evaluate the impact of watershed programmes on both water access and economic prosperity, as changes in rabi crop acreage are influenced by both factors. It is particularly useful for assessing interventions aimed at enhancing water availability at the village level, such as check dams, farm ponds, and farm bunds.

## How it Works

#### **1** Select intervention village

The user selects a village where a specific watershed intervention, like check dams or farm ponds, has been implemented.

## **2** Automatic selection of control village

The app finds a village with similar topography within a 5 km radius of the intervention to serve as a control. This helps account for the effects of rainfall, making the comparison more robust.

The user should validate the selected control village based on field knowledge and local context, as there may be other confounding factors that lead to differences between the two villages.

## **3** Download analytics

The system collects data on the rabi crop acreage for both the treatment and control villages, covering periods before and after the intervention.

## **Advantages**

#### Controls for confounding variables

If a control village properly accounts for confounding variables, the comparison of treatment and control villages can isolate the effect of the treatment. Confounding variables can be difficult to remove, making the selection of the control village a key component to isolate the effect of the treatment. Increasing the number of villages in the treatment and control may help with this issue because variables that are potentially confounding can be negated on average if the assignment of villages into treatment and control can be considered a random (or as-good-as random) process.

#### **Open source**

Jaltol's model and maps are open-source, making it more accessible.

#### **High resolution**

Jaltol utilises high-resolution (10 m) IndiaSAT land use maps that account for seasonal variation, show cropping frequency, and are available throughout the year, enabling detailed analysis over time.

#### Transparency

The data behind the plots can be easily downloaded and used for further analysis.

#### Limitations

#### Poor control village selection

The effectiveness of the between-village, between-time comparison depends on identifying a control village that is similar to the treatment village. Differences in rainfall, hydrogeology, agricultural practices, economics, or other social characteristics of the villages may invalidate the comparison. The rule for automated selection in Jaltol focuses on rainfall and topography.

#### Accuracy of input maps

The methodology relies on maps that are still under improvement, which limits their ability to accurately detect changes in rabi crop acreage over time.

#### **Region-specific**

Jaltol is not suitable for mountainous regions where the topography is highly heterogeneous.

#### **Requires ground truthing**

The current maps require partial onground validation.

# How is the Comparison Between Treatment and Control Calculated?

**Pre-intervention period:** Data is collected on rabi crop acreage in both the treatment and control villages before the intervention is implemented.

**Post-intervention period:** Data is collected on rabi crop acreage in both the treatment and control villages after the intervention.

**First difference (time):** The change in rabi crop acreage is calculated for each village from before to after the intervention. This accounts for time-related effects that impact both villages.

**Second difference (village):** The change observed in the control village is subtracted from the change observed in the treatment village. This isolates the effect of the intervention.



**Difference-In-Differences Estimation** 

Time

## Demonstration

## Step 1

Visit https://jaltol.app/ and click on the 'Assess Impact' tab.

# Step 2

Select the district, sub-district, and village where the intervention is being implemented. This will display the village's LULC map, along with a time series of land cover and rainfall changes over time.



Figure 1: Selecting the district, sub-district, and village after clicking the 'Assess Impact' tab on jaltol.app.



Figure 2: Land use land cover map of the selected village with a time series showing land use land cover and rainfall changes over time.

## Step 3

Click on 'Compare' to automatically select a control village with similar topographic features. The system will compare land cover between the treatment and control villages, and conduct a time series analysis. All generated layers and raw data used in the plots can be downloaded with a single click for further analysis.



Land Cover Change Over Time



Figure 3: Land cover and rainfall comparison between the treatment and control villages, along with a time series analysis.

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