

7. Water quality and assessment

The 2004 tsunami caused major changes to Aceh's coastal soils and water systems, leading to enormous impacts on agricultural productivity in some areas. In some areas delays in reconstructing irrigation/drainage channels meant areas remained waterlogged or were unable to access irrigation water. Some areas were waterlogged due to earthquake-caused subsidence. There was a general shortage of irrigation water in drought areas, and a lack of rainwater storage for rain-fed rice production. Some sites needed pumps to remove saline water and pump in fresh river water to dams; some dams needed cleaning and deepening. In some areas salt water had entered freshwater aquifers, so freshwater was not available from wells.

Tidal inundation

The earthquake and subsequent tsunami changed the coastline dramatically on Aceh's west coast. Areas that were once freshwater catchments became affected by high tides and saline groundwater, making them permanently unsuitable for agriculture. It is important to test salinity levels in well water before using it on crops. In areas where intrusion of seawater during high tides is a problem, it might be useful to install floodgates to protect agricultural land from inundation.

Drainage

After the earthquake and tsunami coastal drainage patterns in Aceh changed, particularly on the west coast, closer to the earthquake epicentre and more affected by the tsunami. Some land rose and other areas subsided, whilst sections of the coastal strip was scoured out by the force of the tsunami. Changes in coastal drainage closed estuaries in some areas; attempts to dredge them open to allow coastal drainage were not successful, possibly due to changed land levels from subsidence or uplift. In many areas some land became permanently unsuited to agriculture due to waterlogging. In areas with poor drainage, improving the irrigation and drainage systems is a key first step for successful agricultural production, so this is an important priority for local government and NGOs.

A common problem in crop growing areas after the tsunami was poor crop growth in the central part of a crop growing area. This mainly occurred where the central fields were the lowest elevation and hence a drainage basin for water from the outer fields. These areas accumulated salts which would dissolve into the first irrigation water.

Farmers need to drain water and accumulated salts from this low-lying area. Well constructed drainage channels that can carry water away from cropping areas will assist in removal of salty water from cropping areas.

Irrigation water quality

In the 2004 tsunami, seawater inundated wells and affected groundwater supplies in some areas. In dry seasons farmers need to use well water, so saline groundwater may affect vegetable production. It is important to assess water salinity levels to identify water too saline for crop production, and prevent crop failures. For instance, in the district of Bireuen, irrigated rice experienced more problems than dryland rice possibly due to salt in the river water used for irrigation. As a general rule the use of irrigation water with $EC_e > 1.5$ dS/m should be avoided, Water with an EC greater than 3 dS/m may cause crop damage.

How to test water salinity

http://www.dpi.nsw.gov.au/_data/assets/pdf_file/0006/168882/water-salinity.pdf

<http://www.dpi.nsw.gov.au/agriculture/resources/soils/salinity/general/measuring>

Irrigation water supply

Restoration of the irrigation supply system is vital to ensure farmers can plant crops like rice with certainty of irrigation to finish the crops through flowering and seed set. The irrigation system may need to be surveyed to ensure that levels have not been affected by earthquake or tsunami damage.

On the east coast of Aceh, rice crops that had established well in August 2005 failed to yield well in October due to insufficient irrigation water, which led to water stress and/or increased soil salinity due to lack of leaching.

In some areas, lack of coordination resulted in irrigation water being supplied to the wrong paddocks in some areas, so it is important to have good communication between farmers, extension staff, aid groups and water supply infrastructure. It may be necessary to pipe water from further inland until water salinity returns to normal levels. This may be a suitable project for NGOs.



Figure 11: A portable meter helps to identify salinity of irrigation water and ensure that crops are not affected by high levels of salt