Food and Agriculture Organization of the United Nations

Forest and Landscape Restoration Mechanism

Restoring Landscapes for Enhanced Livelihoods

Good Practice 3

Rainfall runoff water in the desert

Combating desertification through the use of unconventional water resources

HOW TO USE TREATED WASTEWATER

The use of treated wastewater (TWW) **can reduce the risks posed by drought and environmental pollution** by increasing the volume of water available for productive activities and landscape restoration and simultaneously reducing the quantity of untreated wastewater released into the environment. TWW is **usually available close to human settlements**, where it can be best put to economic use. TWW can be used **in nurseries and to irrigate woody plantations and pastures.**

Untreated wastewater discharged into a catchment

New technologies for treating wastewater for fertigation have demonstrated **the capacity to accelerate the restoration of carbon and nutrients in degraded soils, increase soil fertility and improve productivity.** Nevertheless, urban TWW, produced by phytodepuration plants or wastewater treatment plants for fertigation, is **secondary-quality water, which must be treated with care and managed safely** to avoid contamination and disease.

CONTEXT

Dryland forests are an invaluable resource for producing woodfuel, non-wood products and by-products, and fodder for livestock. They provide many environmental services, such as protection from soil erosion, which is particularly important in agriculture and desertification control. Growth and survival rates are low, however, because of the generally harsh climates as well as pressures from livestock grazing and human activities. In such dry environments, the safe use of TWW is an option that is increasingly being investigated and taken up, especially in urban and peri-urban areas in drylands.

About **80 percent of wastewater generated worldwide is still being discharged untreated** into water bodies or used unsafely for irrigation in agriculture. This is dangerous and can lead to **environmental pollution and pose risks for the health of farmers** because of contamination by bacteria, viruses, parasites and heavy metals. If treated and safely used, **wastewater, especially urban wastewater, can be a valuable resource** both environmentally (e.g. water conservation, nutrient recycling) and economically.

In recent years, innovative methodologies such as fertigation and constructed wetlands have allowed wastewater to be treated using high standards and without the need for high-energy inputs. These methodologies allow the resulting TWW to be used in forestry, agroforestry, landscape restoration and certain forms of agriculture.

The use of wastewater for fertigation can increase soil fertility while reducing the amount of sludge in wastewater treatment plants.

LOCATION: Methodologies and technologies for treating and safely using wastewater in drylands have been studied and implemented in Australia, Europe, Israel and North America. They have also been transferred to several developing countries, such as Argentina, Chile, Mexico and Peru in Latin America; Algeria, Egypt, Lebanon, Morocco and Tunisia in the Mediterranean and North Africa; the Gulf countries; and other countries in the Near and Far East, such as Pakistan.

TARGET GROUP: Farmers, smallholders, non-governmental organizations, local institutions and practitioners working with TWW, as well as decision-makers and private investors.

POTENTIAL DONORS: Interested donor countries and funding organizations such as the World Bank and the International Fund for Agricultural Development.

IMPLEMENTING ORGANIZATION: The Food and Agriculture Organization of the United Nations (FAO).

CLIMATE CHANGE: Climate change poses a serious threat to drylands. Increasing aridity could lead to the deterioration and oxidation of key soil nutrients, with a knock-on effect on soil fertility that reduces the growth and survival of vegetation and the animals depending on it. Such impacts, combined with increasing population and grazing pressure, pose serious risks to the livelihoods and food security of people living in drylands. Climate change, however, will have minimal impact on the production of wastewater produced in human settlements. TWW enables the nutrients to be recycled for productive purposes and frees up other freshwater for use in agriculture and landscape restoration.

ECONOMIC CONSIDERATIONS:

A constructed wetland in drylands that collects urban wastewater produced by 4000 inhabitants and generates TWW sufficient to irrigate three hectares of intensive forest plantation costs about US$150 000. Assuming an already-existing wastewater treatment plant, the total cost of fertigating a 10-hectare area is about US$70 000, including the irrigation system. **To be economically sustainable, TWW should be used close to the treatment plants** because the cost of pumping the wastewater over long distances can exceed the benefits of using it. Constructed wetlands and fertigation are sustainable means of reducing environmental pollution and desertification and increasing nutrient availability and the availability of water resources for forestry, agroforestry, landscape restoration and certain forms of agriculture.

REPLICABILITY AND UPSCALING:

TWW approaches have been deployed in a number of countries with differing climatic conditions and have always produced beneficial effects.

Scaling up requires good knowledge of the safe use of TWW, a policy framework that supports the use of TWW technologies, and good planning – for example, **TWW cannot be implemented at a significant scale if there is no sewerage network.**

Natural forest cover in drylands, comprising scattered Acacia trees and bushes

FOR MORE INFORMATION

www.fao.org/sustainable-forest-management/toolbox/modules/use-of-treated-water-in-forestry-and-agroforestry

www.fao.org/forestry/tww

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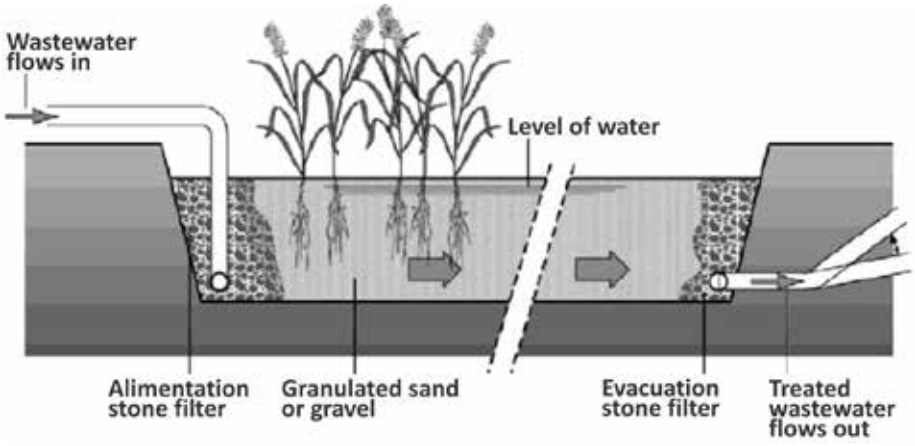
CHALLENGE

To reduce untreated wastewater discharge, sustain water resources and improve the environment in forestry and agroforestry systems.

METHODOLOGICAL APPROACH

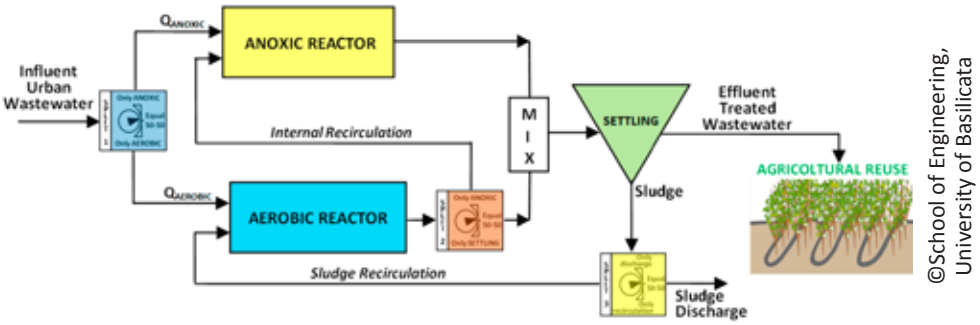
Constructed wetlands and fertigation are new, low-energy-intensive approaches to water treatment. Fertigation also improves soil quality and reduces the quantity of sludge in treatment plants.

- **Constructed wetlands** are comprised of a series of interconnected ponds filled with swampy plants, shrubs and other vegetation selected for their ability to filter impurities from water. Inflows are allowed to settle in these ponds for several months. The water that eventually emerges is filtered and ready for use in irrigation. Since the system uses only natural phytoremediation, it is likely to be sustainable and economically viable in rural communities.



Schematic diagram of a constructed wetland

- **Fertigation** refers to the use of water to simultaneously spread nutrients and irrigate. It can be carried out using freshwater injected with fertilizers, or with sewage produced in urban and peri-urban areas treated with small quantities of chemicals and filtered to allow natural bacteria to digest most of the dangerous pathogens. The resultant sludge, which is rich in nitrogen, phosphorous and organic matter, can be discharged and used safely.



Schematic diagram of a modified secondary treatment wastewater plant for fertigation

IMPACT

In the oasis of Brézina, Algeria, a constructed wetland produces high-quality TWW at almost no ongoing cost, which is used to irrigate a three-hectare forest plantation established for biomass production. The methodology is being replicated in the oasis of Taghit in the southwest of the country. In Morocco, a fertigation plant will produce water to fertigate 10 hectares of the Green Belt of Marrakech. In Tunisia, fertigation will be applied in a one-hectare olive tree plantation. In Egypt, TWW is used to irrigate the country's only forest plantation over an area of about 60 000 hectares.