Combating desertification through the use of unconventional water resources

**HOW TO USE TREATED WASTEWATER**

The use of treated wastewater (TW) 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. TW is usually available close to human settlements, where it can be best put to economic use. TW can be used in nurseries and to irrigate woody plantations and pastures.

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 TW, 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 TW 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 TW 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.
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.

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.

- **Constructing 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.

- **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.

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.