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Science brief from the ZEF-UNESCO project on Sustainable Management of Land and Water Resources in Khorezm, Uzbekistan

## Afforestation of degraded cropland – Co-benefits of C sequestration in Uzbekistan

The essential role of trees and forests in combating land degradation and easing poverty has been recognized worldwide. The conversion of degraded cropland to tree plantations can locally generate fuelwood, fruit, fodder and timber, while regionally contributing to land restoration by replenishing nutrient stocks of exhausted soils, lowering soil salinity, and reducing wind erosion. Integrating trees into the agricultural landscape was also recommended in Uzbekistan, by the National Action Programme (NAP) to Combat Desertification in 1999.



Degraded cropland in Yangibazar, Khorezm, spring 2004

### C sequestration via afforestation

The Kyoto Protocol allows non-Annex I countries, such as Uzbekistan, to participate in the global C sequestration efforts by selling credits gained from afforestation via the Clean Development Mechanism (CDM). The degraded cropland areas in Uzbekistan, which are being withdrawn from agricultural production at the annual cost of about \$12 mln<sup>1</sup>, are potentially suitable for afforestation projects under the CDM using appropriate salt-tolerant, multipurpose tree species.

In the context of a German-Uzbek research project (<http://www.khorezm.uni-bonn.de/>) we evaluated the prospects of C sequestration through the afforestation of degraded irrigated areas in the Amu Darya River lowlands. In the study region of Khorezm, tree plantations consisting of Euphrates poplar (*Populus euphratica* Oliv.), Russian

<sup>1</sup> World Bank for Reconstruction and Development. 2002. Global condition of environment. Tashkent



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olive (*Elaeagnus angustifolia* L.), and Siberian elm (*Ulmus pumila* L.), were experimentally grown on two hectares (ha) of degraded cropland for five years. An initial irrigation of 80–160 mm yr<sup>-1</sup> (compared to 800–1000 mm yr<sup>-1</sup> demand for cotton production) enabled the establishment of trees during the first two growing seasons. Thereafter, the plantations relied on the shallow saline groundwater table, characteristic for Khorezm.



Tree plantations established on degraded cropland, Yangibazar, Khorezm, spring 2006

The accumulation of above- and below-ground woody biomass (in tree stems, branches, and roots) measured up to 35 t ha<sup>-1</sup> after the first two years, with over 17 t ha<sup>-1</sup> of C captured. The plantations were gradually thinned over the next three years by about one half of the initial planting density to harvest fuelwood, fodder and fruits. In the 5<sup>th</sup> year of afforestation, the C sequestration in woody biomass amounted to approximately 20 t ha<sup>-1</sup>.

Assuming 5–10% of degraded lands within the irrigated area that are potentially suitable for afforestation in Uzbekistan (ca. 215–430 thousand ha), the C stock in the plantation biomass would range between 5 and 9 million tons; this figure represents a 40–70% increase in the currently reported C stock in forest biomass in Uzbekistan (12.4 million tons), although it does not consider that natural calamities or illegal logging may potentially reduce the biotic C pool.

In addition, research findings have shown that the conversion to tree plantations enriches the soil organic C (SOC) stocks thus improving soil fertility. On our experimental site, the SOC stocks in the upper 0.4 m layer increased by 20% in just five years after planting; this equates to 8 t per ha or 2–3 million tons of C overall.

## Potential earnings

Revenue from afforestation can accrue in the form of payments from Certified Emission Reductions (CERs). Under the CDM guidelines for afforestation, if tree plantations were established on marginal lands in Uzbekistan (supposedly, 5–10% irrigated area) and based on the World Bank price for CDM credits of USD 3.5–4.35 per ton of CO<sub>2</sub> (about USD

15 per ton of C), gross earnings would range between 0.5–1.1% of GDP (based on 2006)<sup>2</sup>. Although prices for CERs from forestry are lower than for other emission reduction schemes, such as those associated with the oil and gas industry, there is a significant potential for CDM afforestation projects to contribute to global CO<sub>2</sub> emission reduction efforts, while additionally promoting ecologically and economically beneficial land use systems at the local level.

## Promoting local development

While tree planting in abandoned areas does not compete with other land use systems, farmers are often hesitant to invest in afforestation, due in large part to the long-term horizon for financial or ecological benefits to accrue from trees. The NAP has laid the foundation for encouraging conversion of unproductive areas to tree plantations in Uzbekistan. While there exists explicit legislation on the protection of forests, further legal and institutional support is needed for encouraging local and foreign investment in afforestation activities. For example, current legislation supports fruit tree growing, which can only be feasible on fertile, adequately irrigated lands. Incentives such as (degraded) land tax exemption and water allocation for plantations would be another step to motivate farmers' participation in afforestation projects for reclamation of degraded lands, generation of useful non-timber products and achieving co-benefits of C sequestration.

## Recommended for further reading:

Khamzina A., Lamers J.P.A., Vlek P.L.G. 2008. Tree establishment under deficit irrigation on degraded agricultural land in the lower Amu Darya River region, Aral Sea Basin. *Forest Ecology and Management* 255 (1): 168–178. doi:10.1016/j.foreco.2007.09.005.

<sup>2</sup> CATIE. (2007). Guidebook to Markets and Commercialization of Forestry CDM projects: Centro Agronómico Tropical de Investigación y Enseñanza (CATIE).

## IMPRINT

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