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A Tool of Future Trans-Boundary Water Sharing to Facilitate Land Use Transition and Poverty Alleviation in the Okavango River Basin

XIALIN WANG, ERNST-AUGUST NUPPENAU

Justus-Liebig University Giessen, Inst. of Agricultural Policy and Market Research, Germany

Abstract

The Okavango River Basin (ORB) integrates three countries of southern Africa: Angola, Namibia and Botswana. Due to a poverty of the upper-catchment in Angola and Namibia, agriculture and charcoal production are prioritised for development so that the pristine forest landscapes tend to be fragmented by agriculture intensification and charcoal commercialisation, which may accelerate extract conflicts with water needs in the Botswana Delta. So far there is no such an integrated basin management that considers both trans-boundary water sharing and poverty alleviation via a sustainable transformation of land-uses. This study aims to design an innovative ecological-economic tool for representation of decision-making at the basin level in the context of payment for ecosystem services (PES), of which water volumes as Eco-System-Services (ESS) are preserved by upper-catchments benefiting the Delta, in return, payment from the Delta serves as compensation for benefit losses of the upper-catchments. We develop a spatial model of water flows in the upper-catchment of ORB from these aspects: 1) water allocation and sharing is identified as 188 successive dynamic units; 2) water availability and abstract is optimised with its economic productivity in each of all sub-basins where communities benefit from production activities through water extract over four selected land-uses: honey-producing in the forest, grazing on the grasslands, charcoal-making in the shrubs and crops in fields; 3) by introducing water pricing, the marginal utility of water is presented as monetary value to link livelihood benefits with ESS, therefore under which price the total benefit losses might be minimised; 4) livelihoods support with regard to the land-use transition is accommodated with the monetary compensation when ESS buffer will be reserved. The results indicate a water pricing institution, of which, on the one hand, a beneficial ESS will be potentially secured through the land-use change from deforestation to forest occurs; on the other hand, as a beneficiary of the ESS, the Delta will gain a retaining water provision which is even less influenced by seasonal difference of stream flows. Furthermore, the results suggest that under the wet-season water subsidy honey production has high potential to offset benefit losses of reduced intensive agricultural production.

Keywords: Livelihood benefits, payment for ecosystem services