DESIGNING A MANGROVE RESEARCH AND DEMONSTRATION FOREST IN THE RUFIJI DELTA, TANZANIA

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Despite the growing body of literature on science and management of mangroves, there is a considerable knowledge gap and uncertainty at local levels regarding the carbon pool size, variability of carbon sequestration and carbon stocks within mangrove forests, mechanisms that control carbon emissions from degradation of mangrove forests, impacts of conversion to other land uses, challenges and opportunities associated with restoration practices and sustainability of ecosystem services. These concerns are valid globally, but they are particularly important in Africa due to limited research that has been conducted in the continent. The USDA Forest Service (USFS) and the Center for International Forest Research (CIFOR) have completed comprehensive studies on mangrove carbon in the South East Asia (SEA) and the Oceania (Donato and others 2011, Kauffman and others 2011) with financial support from the United States Agency for International Development (USAID) as part of its Sustainable Wetlands Adaptation and Mitigation Program (SWAMP). By drawing from the reported findings, lessons and experiences from SWAMP, inter-agency consortiums of academic and research institutions and conservation non-governmental organizations in Tanzania and Mozambique, with technical support from the USFS Center for Forested Wetlands Research and financial assistance of the USAID Africa Bureau, are developing the East Africa Mangrove Carbon Project (EAMCP). This initiative intends to support capacity development, advance scientific knowledge, and improve data collection in the areas of measurement and monitoring of carbon stocks and the impact of utilization and degradation in mangrove forests. Ultimately, EAMCP aims to provide scientific information and capacity to inform effective policy and management actions for the secured future of mangroves in East Africa. The consortium in Tanzania is utilizing the EAMCP opportunity to establish a mangrove research and demonstration forest in the Rufiji Delta (MRDF). This facility will be officially designated and sanctioned within the administering government agency, the Tanzania Forestry Service (TFS). The designation will entail recognition of the site as a special use area, where activities are aimed at research, demonstration, and training for capacity development of academic and scientific community, practitioners and managers, and communities.

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The Rufiji Delta, which is located about 150 km South of Dar es Salaam, contains the largest continuous mangrove forest in Tanzania and the region, comprising approximately 53,000 ha (Semesi 1992). Eight of the 10 mangrove species occurring in Tanzania are found in the Delta (Wagner and Sallema-Mtui 2010). Over 150,000 people inhabit the Rufiji Delta and its floodplain, the majority of who subsist on traditional fishing, cultivation, and extraction of mangrove wood products. Most of the mangrove logging that feeds other part of Tanzania as far as the islands of Zanzibar is done within the Rufiji Delta. The Delta is characterized by traditional shifting cultivation of rice that involves clearance of mangrove areas in the upper reaches where freshwater flooding prevails. The delta supports the most important fishery in Tanzania's coastline, accounting for about 80 percent of all wild-shrimp catches in the country (Masalu 2003). As one of the largest deltas containing the largest mangrove forest in East Africa, the Rufiji Delta offers an excellent site for research activities, allowing for ground-truthing of methodologies and management practices. The Delta provides a mangrove forest that is representative of the scale of a delta landscape, providing sufficient area for current and future uses, including long-term and large-scale experiments. The proposed area of about 9,200 ha of a single tract of mangrove forest is favorable for easy management and monitoring. The site includes the present main distributary of the Rufiji River, and other smaller branches and creeks, provide the capability to consider mangroves in a variety of both geomorphic and hydrologic settings. As the majority of mangrove species known to occur in Tanzania are found in the Delta, the area provides the opportunity to study each of the species, individually and in association with the other species. The site incorporates both a salinity and geomorphic gradient from the ocean front to freshwater floodplain margin. Freshwater areas are those where mangrove conversion to agricultural use is practiced. As such, it offers the possibility to address issues across a full environmental gradient, including agricultural



Figure 1— Approximate delineation of the MRDF in the north Rufiji Delta.

impacts and mangrove management demonstrations like site restoration of abandoned and existing agricultural lands, as well as feasibility considerations of limited use. The proposed site includes harvesting disturbance that could be used for research. The presence of wood cutters provides an opportunity to engage them to develop and test sustainable management practices like comparing the impacts of selective and clear cutting. The proposed site is readily accessible, and is adjacent to an existing field station at Nyamisati Village that will facilitate operational logistics related to research and training, including availability of office space, stores, boats and local laborers, and lodging accommodations. The field station has a great potential of being elevated to a regional mangrove information center.

The MRDF has three core objectives: 1) To improve, share and apply scientific knowledge on assessment of carbon stocks, restoration and sustainable use to support the conservation of mangrove ecosystems; 2) To strengthen and build capacity for integrated mangrove management institutions and strategies, and empower dependent local communities to engage in decision-making and management that conserves, restores and sustainably uses mangrove ecosystems; and 3) To enhance mangrove forest resource governance by encouraging integrated management programs and conservation investments that are ecologically and socio-economically sound. The general approach for the MRDF is to develop mangrove assessment and monitoring capabilities, implement experiments and develop tools to address utilization and management issues. Presently, research on mangrove ecosystems is derived from individual studies, usually conducted on independent sites. Accordingly, there is no basis for accumulating information from individual studies on a given forest site. When studies are conducted on the same forest area there is greater efficiency in the work and investigators are able to address more complex questions because of the linkages to other studies on the same site. A common research area also provides an excellent basis for management demonstrations (e.g. silvicultural practices) and training activities because of the well-established interdisciplinary data sets that can be made available. Establishment of this research forest has a high-likelihood for persistence after the initial project; properly implemented, the facility will leverage additional projects.

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