EXECUTIVE SUMMARY

Water is the most important and limiting factor of production in the commercial forestry in South Africa. Commercial forestry uses water in two forms: evapotranspiration (ET) and streamflow reduction (SFR). The ET use refers to the total evaporative losses from forest stands which include transpiration from dry canopies, and evaporation from wet canopies and forest litter or the soil surface. The streamflow reduction use refers to the reduction in water yield from a catchment as a result of uptake of water by forest stands. Both uses--ET and SFR--are inextricably linked; a rise in ET is followed by a rise in SFR. A rule of thumb is that SFR is roughly one-tenth of the ET use. In terms of streamflow reduction, water use is estimated to be in the region of 1.4 billion cubic metres per annum--about 972.2 cubic metres per hectare per annum. This is roughly 8 percent of the total utilizable water in South Africa. The ET use will be roughly ten times of the SFR use. Water is thus an important input in the production process of commercial forestry.

Water is becoming a scarcer input over time, requiring a re-look at the water management approach. Over the years, increasing urbanization and industrialization, increased irrigated agriculture, and rising population have resulted into increased demand for water. This has brought out a change in the water management paradigm, which entails meeting water demand by using it more efficiently through re-allocation among existing and potential uses. It requires that water should be used according to economic principles and value of water should be used as a guideline in determining the most efficient use of water across industries. The new paradigm has taken roots in South Africa as well. South Africa which, being a water-stressed country, needs to use water resources more efficiently. Commercial forestry, being one of the major users of water, needs to take into account the value of water. It is an essential information for improving the efficiency in the allocation of water across different uses in the country. A review of the past research indicated that there are hardly any studies on the estimation of water values in the forestry sector in South Africa. This study will fill this void.

The term "value" in this report refers to the expected net benefits from the use of water. This does not signify a market-determined value that arises after a consensus between a willing buyer and a willing seller is reached. Theoretically speaking, the value of water, or willingness to pay for water, can be approximated from the area under its demand curve. However, this can be operationalized by various ways. One major problem in valuing water in commercial forestry is the absence of water markets as such. This required resorting to the knowledge of production economics. Two methods were chosen: (1) Residual Value (RV) Method, and the (2) Marginal Value Product (MVP) method. The residual value method is based on the premise that the residual value obtained as total revenue minus total cost, including the compensation for capital and management, is attributed to water. On the other hand, the marginal value product method is based on the assumption that water is rewarded according to its marginal productivity. Under this framework, the water values can be derived from the area under the marginal value product curve. Both approaches were used to estimate water values to selected sites of eucalyptus and pine in the eastern coast of the KwaZulu Natal Province of South Africa. The four eucalyptus sites included: Kia-Ora, Baynesfield, Tanhurst, and KwaMbonambi. The three chosen pine sites were: Richmond, Greytown, and Usutu. These two species were selected as they dominate South African forestry, especially on the east coast. Furthermore, although both species can be grown on pulpwood and sawwood regimes, only the pulpwood regime based rotations were selected for computing water values.

The typical information required for the estimation of water values was the relationship between water and yield of selected species (pine and eucalyptus). A group of experts at the Institute of Commercial Forestry and Council of Scientific and Industrial Research provided this information. The costs and price data for the study were obtained from the Forestry Economics Services (1996). The entire analysis was done in terms of constant 1996 prices (1996=100). For the seven selected sites of eucalyptus and pine, both methods—RV and MVP—were used to derive the values on ET water use. The values to SFR use were estimated using the MVP method only as the former was not applicable under the circumstances. A sensitivity analysis with respect to changing timber prices and costs was also carried out to provide insights to values under changing scenarios.

The estimated evapotranspiration (ET) water values by the Residual Value method for eucalyptus vary from 4 cents to 13 cents per cubic metre of water; 4 cents per cubic metre in low rainfall area such as Baynesfield and 13 cents per cubic metre in high rainfall area such as KwaMbonambi site. The average value comes to 8 cents per cubic metre. The ET value estimates by the Marginal Value product (MVP) method vary between 4 to 60 cents per cubic metre of water--4 cents for low-rainfall Baynesfield site and 60 cents for high rainfall KwaMbonambi site--the average being 31 cents per cubic metre. The ET value estimates by the MVP method are roughly 4 times of the estimates by the RV method. The RV method measures the residual net value attributed to water after paying for all other inputs in the production process; on the other hand, the MVP measures the value before other costs are paid off. The streamflow reduction values of water for eucalyptus vary from R 1.90 to R 4.44 per cubic metre--the average being R3.42 per cubic metre. These values are roughly 10 times of ET value estimated by MVP method and 40 times of the ET values by the RV method. Water value estimates for pine species are much lower than that estimated for eucalyptus. For example, the average ET value by RV method comes to 1.7 cents per cubic metre, and 15 cents per cubic metre by the MVP method. The average SFR value for pine is R1.79 per cubic metre. Interestingly enough, the water values for pine are well below the values for eucalyptus. The difference can be explained in terms of the growth pattern of two tree species; eucalyptus grows much faster and uses water more efficiently.

In brief, the value of water in commercial forestry depends upon the type of use--be it ET or SFR. The SFR use value is about 10 times that of ET use value. The results of this study can be used in multiple ways. Firstly, results can be used to evaluate whether tariffs charged or proposed are reasonable. For example, the calculated catchment management charge or which comes at between 0.5 and 2.5 cents per cubic metre per annum (Pegram and Palmer, 2001), is in line with the estimated values of water in this study. Secondly, water values can be used to decide on allocation of water for expansion of forestry as compared to expansion of other land uses. Here water values for other crops or other land uses are needed. Thirdly, water values can also provide guidelines for

evaluating which tree species should be located where for new projects (site selection). Fourthly, the information could also be used toward evaluating which tree species should be used for expansion at which sites (species selection).