This paper aims at presenting the application of Implicit Stochastic Optimization (ISO) and Artificial Neural Networks (ANN) for deriving daily operating rules for a reservoir system located in semiarid Brazil. The case study is the Coremas – Mãe D’água water system, which is composed of two interconnected reservoirs and is located in Coremas City, Paraíba. The region supplied by those reservoirs suffers from lack of water and consequently there is a great necessity of a better management of its water resources. The ISO procedure consists of optimizing the reservoir system for possible inflow scenarios and then analysing the optimal outcomes in order to generate operating rules. Unlike the common use of regression equations relating reservoir releases to initial storage and predicted inflow, this study makes use of ANN to develop reservoir hedging rules relating end-of-period reservoir storage to initial storage and other system’s variables. After the establishment of the ISO-ANN rules, they were tested over a new series of inflows and the outcomes were assessed by means of sustainability criteria. The ISO-ANN rules were shown to be superior to the so-called Standard Linear Operating Policy (SLOP) and equivalent to the results derived by deterministic optimization taking the same inflows as perfect forecasts for one year ahead. As a result, the ISO-ANN rules, which require information only on the initial reservoir storage and forecast of inflows for five days ahead, may be useful in the decision making process for the operation of water systems in semiarid regions.