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SUSTAINABLE AQUACULTURE FOR A SECURE FUTURE

Title: Levee pond design model

Author: E.W. Tollner
University of Georgia,
Athens, Georgia, USA

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Abstract: The levee pond model is an Excel® spreadsheet that computes a volume balance on a levee pond. The model is organized into the following pages: Directions and overview, table of contents, input, pond model, results and principal spillway. The design is based on answers to 15 key questions on the Input page. Each question has guidance in the form of a comment that becomes visible when clicked upon. The model computes a volume balance on the pond as shown in a drawing on a "Drawings" page. The model is designed to assist competent NGO personnel in helping small to medium producers.

After completing the initial inputs, proceed to the "Results" page. Maximum, Average and minimum pond volume changes based on net Inflow and net Outflow are computed. The pump in rate with zero pump out is used to determine the water balance required to satisfy evaporation, seepage and rainfall. One iterates on the pump in rate to achieve the desired near zero target for net outflow volume change. Volume changes based on net outflow should be zero to positive for the pond not to lose volume. Values on the results page are copied from the "Pondmodel" page that shows detailed computations. Most users would not be concerned with the computational details.

Volume changes based on net inflow should approach the volume change target set based on the level of management anticipated. After achieving the initial water balance, one adjusts both the pump in and pump out rates to achieve the desired volume change targets. The pump in rate exceeds the pump out rate by the initial volume balance in order to preserve the initial volume balance. Adjust these inputs until the desired volume changes are achieved based on net inflow. One may then proceed to the "Principal SW" page for a pipe-riser spillway design.

The intent of the levee pond model is to develop a complete volume balance on a pond with

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a recirculation target, which may range from 0 to any number of volume changes per month. The recommended procedure is to first set the output pump rate to zero. One may then determine the inflow pump rate necessary to balance seepage, rainfall and evaporation In a given climatic region, based on net monthly net outflow as shown on the “Pondmodel” page. Monthly rainfall and evaporation are used in the monthly balances. Soil seepage is included, which should be determined from a soils analyses or seepage tests. Volume balances on net input should be near zero to have a sustainable pond. Next one may determine the pump out rate and pump in rates to meet the volume change target. This process begins by inputting a trial pump out rate. Input the initial pump in rate determined above, plus the trial pump out rate for the new trial pump in value. The volume balance based on net output should be near the volume change target. Maximum, average and minimum volume ratios are reported, based on monthly ratio computations. The principal spillway design is included. There is no watershed supply; therefore an emergency spillway was not included.

If springs or stream flow are not adequate for your desired pond size and management, one may wish to consider a watershed pond or a hillside pond for water harvesting. Another model, “Hondurascatchmentpond” is available for this application. Water harvesting is dependent on diverting runoff from a watershed collection zone to the pond. The design of the watershed pond or hillside pond is very site specific. You are strongly encouraged to consult with a competent pond designer. Ask a local NGO representative for help.

Experience suggests that valleys with available springs are the best levee pond candidates. Valleys frequently have soils of adequate clay for sealing purposes. Elevations above 1000 m become problematic for finding springs. In Latin America, there seems to be a correlation between both coffee and rice production with water availability. Areas with nearby hardwood forests tend to bode well for water availability.

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