Irrigation Financial Tool

<u>Purpose</u>

The purpose of this tool is to help Virginia's field crop producers determine whether it is economically advantageous to install an irrigation system on their farm. Users will input basic information about their farm, including county location, size of farm, and soil type. The tool will then output financial information about their proposed system including installation costs, operating costs, and additional income from irrigation.

<u>How it works</u>

This tool works by estimating crop growth under typical rainfed conditions for the user's location, comparing it to the maximum growth that could be obtained with irrigation, and then determining the additional yield and income obtained from avoiding water stress through irrigating. Users input information pertaining to their farm including location, crop type, and irrigated area. The tool then uses historic data on location-specific precipitation to determine typical water deficit throughout the growing season. This deficit is then used in a regression equation based on crop growth simulated with the AQUACROP model to estimate yield under rainfed conditions. This rainfed yield is compared to the maximum yield that could be obtained with irrigation (also from the AQUACROP model) to estimate the additional yield from having irrigation. Lastly, the tool will use this difference in yield, along with historic price data, to compare the income earned for a rainfed and irrigated crop each year.

Each irrigation system has a different costs and benefits associated with it. By using peer-reviewed resources and extension articles, operating costs and investment information was obtained for each type of irrigation system. This information is stored in the tool as cost per acre-inch of water applied; this allows operating costs to vary with the amount of water applied to the field. This allows the tool to accurately calculate operating costs for maximum growth of crops. Because we can't predict what specific rainfall amounts will occur over the next 10-20 years, or what the exact costs for a system will be, the tool repeats its calculations many times in a process called "Monte Carlo Simulation" to get a range of feasible costs and benefits for the user's farm conditions. All cost and benefit information is then presented in charts and graphs. Explanations of how to use the tool to obtain this information can be found below.

<u>Instructions</u>

1. The tool runs on a macro-enabled Microsoft Excel spreadsheet. When you open the file, you may see a warning that says "Security Warning: Macros have been disabled." Click the button to the right of this warning that says "Enable content." If that warning does not appear, macros can also be enabled by doing the following: File > Options > Trust Center > Trust Center Settings > Enable all macros.
2. Click on the tab along the bottom called "Instructions" to see step-by step guidance.
3. The "Tool" tab is where users input information about their farm and basic financial information. When a cell is selected, additional information will pop up with further instructions. Once all information is entered, users should click the "Calculate" button to obtain results. At any time, users can navigate back to this tab and change any farm or financial information and click "Calculate" for new results.

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4. Next, users should navigate to the "Results Summary" tab. Here users will see a basic overview of cost and benefit information.

5. The "Detailed Cost Results" tab shows more detailed information about the cost of purchasing and maintaining an irrigation system. This includes a range of estimates for operating costs and investment costs. If users are unclear as to what a value represents, they can move their mouse over the value and a more detailed explanation will pop up.

6. The "Detailed Benefit Results" tab shows more detailed information about the potential economic benefits of purchasing an irrigation system. This includes a range for each estimate of lost income. Users can move their mouse over each value to see more detail about what that result is describing.