

Tools to assist in animal tissue composting system design and mixture formulation

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Motivation:

- Increasing number of farms considering the composting of on-farm mortality and increasing number of small butcher shops also needing an alternative to rendering, which has become expensive and (or) unavailable.
- Simplify planning of a compost system.
- Competition for sawdust has led to consideration of other feedstocks, but how to best include them into a composting recipe is not always clear. Price is a consideration.

Overview:

Spartan Animal Tissue Composting (ATC) System Planner is an Excel application that assists in designing a composting system using a static piling approach, including facilities and material flow in batches. The spreadsheet has been designed for composting animal tissue accumulated as whole carcasses (on-farm, live animal businesses) or as animal tissue co-products (animal processing operations).

There are four general composting systems or methods which may be used to compost animal tissues in static batches: piled in bins, open piles adjacent to one another, piles that overlap slightly, and windrows. Static means that animal tissue and compost materials are mixed and left to stand motionless or idle for a planned period of time.

Spartan Compost Optimizer is an Excel application that simplifies planning a compost mix.

The application uses Excel's Solver to automate the process of developing or formulating a compost recipe. The amount of materials to be used in a compost mix are determined based on meeting compost performance constraints (a.k.a. nutrient balance, compost characteristics, or compost conditions) while minimizing cost. Materials constraints are set to limit the amount of specific ingredients that can be used in the mix. Performance constraints or targets can be set for percent moisture, carbon nitrogen ratio (C:N), and bulk density.



System Requirements:

- Version.** You must have Microsoft Excel 2002 or later to run either application.
- Security.** Both spreadsheets contain macros, so MS Excel's security must be set to moderate or low to allow the macros to function. To change the security setting select Tools > Macro > Security from Excel's main menu and set security to moderate or low. Depending on your security setting, Excel may ask you whether to enable or disable macros when you open the file. Macros must be enabled for the application work operate correctly.

Solver. *Spartan Compost Optimizer* requires the Solver Add-in that is included with MS Excel. Solver is not installed during the default installation of Excel so it may need to be added to your configuration of the program. To determine if Solver is installed, select Tools from Excel's main menu. If Solver is installed, it will be included in the Tools menu. If Solver is not present on the Tools menu, it can be installed by selecting Add-ins from the Tools menu or from the Excel installation disk. For additional installation details, search the Excel help system using the keyword "Solver".

Key Features:

The Excel workbooks contain instruction worksheets and comments in cells containing the names of requested input measures.

Spartan ATC System Planner

- One or more different animal operations may be included
- One or more systems may be evaluated at one time
- The user may select the "target animal tissue density"
- Animal production information is entered in order to estimate rate of animal tissue accumulation
- System dimensions are derived using your best reasoning, or by "trial and error" so that "volume needed in the system per desired time" is equal to or slightly greater than the "effective volume" of the bin, pile, or windrow.
- Based on animal tissue accumulation rate (amount per time) and the selected system size, flow through the system is provided as batches.

Spartan Compost Optimizer

- Up to 8 materials may be selected for use in a compost mix from a drop-down list
- Materials in the list are contained in a library of materials which can be edited by the user.
- Composition and cost may be modified at any time
- Amount of material per batch may be constrained
- The user may chose performance constraints for C:N, %H₂O, bulk density, and cost
- The compost recipe may be manually changed at any time
- Recipe may be in lb., yd³, or number of loader buckets
- Printable reports are intended for on-farm use

Figure 1. Example of worksheet used in *Spartan ATC System Planner* to determine the material flow and size of a static pile animal tissue composting systems.

Figure 2. Example of worksheet used in *Spartan Compost Optimizer* to select materials to be used in a compost mix, based on C:N, %H₂O, bulk density, and cost.

Usefulness:

Spartan ATC System Planner has been used by Extension when helping farms (animal production operations) and others (animal processing operations) develop plans for implementing composting to manage animal tissues

Spartan ATC System Planner has been used by the Natural Resource Conservation Service awarding contracts under the Environmental Quality Incentives Program (EQIP), offering animal producers and processors financial and technical help to install or implement structural and management conservation practices.

Spartan Compost Optimizer has been used less. Improvements in the program continue to be made. In the future, Michigan and other states may allow commercial and cooperative composting ventures, who will appreciate more the information about varied feedstocks and the least-cost formulation feature.

Critical review of both tools is welcomed.