Instructions for using the Robot Parlor.xlsm Spreadsheet for comparing the economics of robotic milking systems versus parlors

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In order to run this spreadsheet effectively, you will need to "enable macros on your computer. If you were not prompted to "Enable Content" when you first open the spreadsheet, then you will need to change your "Macro Security" level to "Disable macros WITH notification". Then, save the spreadsheet and open it again, and this time enable macros at the prompt. The spreadsheet is best used with a Windows-based PC and Microsoft Excel 2010 or 2013.

The spreadsheet is protected to minimize the chance of deleting the formulas accidently, but it does not use a password.

General Overview

The spreadsheet is designed to compare different scenarios compared to a base scenario. The default data is for a 120-cow dairy operation currently milking in a tie stall barn and considering looking at alternative milking systems. It contains default data for six scenarios, adding:

1) A freestall barn only, continuing to milk in the original tiestall barn, with some labor savings and milk production increases,
2) A freestall barn and installing a retrofitted double-8 parlor in the old barn,
3) A freestall barn and a new double-8 parlor,
4) A freestall barn and two robots,
5) A freestall barn in the first year and then adding the two robots five years later, and
6) A freestall barn and retrofitted parlor in the first year and then replacing the retrofit parlor with a new parlor five years later.

The spreadsheet should also work for other situations such as where you currently have a parlor and just want to expand and convert to robots, and for other herd sizes.

In addition to the six scenarios described above, the spreadsheet also contains default data for:

7) A 60-cow tiestall dairy operation considering installation of a robot.

The calculations for all seven scenarios are contained in the spreadsheet, but only the base scenario is visible when the spreadsheet is first loaded. A form will appear with boxes to check which scenarios you wish to view. The scenario "Barn, then robots later" is related to the freestall barn scenario, so if you select that scenario the freestall barn column will also become visible. If you select "Retro parlor, then new parlor later", both that column and the retrofit parlor column will appear.

Operating Information

The operating information considered includes:
- Labor changes
- Milk Production, Herd Health, Reproduction, and Milk Quality Changes
- Feed Costs and Intake Changes
- Culling and Herd Replacement Changes
- Utilities and Supply Changes for Milking
- Milking System Repairs

All of the data is entered in "Data Entry" sheet, in the yellow cells. That sheet also shows the bottom-line results in row 72, labeled NET ANNUAL IMPACT. Those values show how each scenario compares to the base scenario after valuing the labor savings and the milk production changes, calculating the debt payments, and considering the operating expenses you entered. Rows 74 and 75 also show how the two robot scenarios compare to the two parlor scenarios.

The two columns with the delayed robot or parlor installations (columns G and H) are mostly blank down to row 37 because their inputs are taken from the entries in columns C-F. The investments and the financing information for those two scenarios do need to be entered separately, however. Enter that information in the rows below row 37.

Rows 78-79 shows the breakeven labor rate where the robot scenarios and the retrofit parlor or the new parlor have similar profitability.

Detailed operating cost calculations are located in the Operating sheet.

Feed Costs

Changes in total mixed ration (TMR) dry matter intake per day (DMI) are based on the user-entered changes in milk per day using dairy NRC intake calculations. Enter the cost per pound of TMR dry matter in B27. Typically a certain amount of highly-palatable pelleted feed is fed in the robot booth to encourage the cows to enter. Enter the amount of this feed and the extra cost per ton in rows 28-29 in the robot scenarios.

Herd Size Increases

The spreadsheet is probably easiest to use and interpret for situations where the herd size remains the same as in the base scenario. However, small herd size increases can be modeled by entering the anticipated milking herd size increase in row 8 of the Data Entry sheet. The costs for the additional cows included in the spreadsheet include:
- Feed
- Replacements
- Labor
- Other expenses

Business Planning Horizon and Asset Useful Lives

The useful lives of the parlors and robots are entered in rows 43 – 49 of the Data Entry sheet. The freestall barn and the new D8 parlor are assumed to last for the entire 30-year planning horizon entered

in B6, so a separate useful life is NOT entered for those assets. The 30 years is fairly arbitrary but was arrived at by assuming that the robots would last 15 years and that the barn would need to be amortized over the lives of two sets of robots to be economically feasible. The 30-year life can be changed by the user, but then the robot and parlor useful lives and the financing calculations in the Main sheet will need to be reviewed carefully so that values such as the loan balance and robot salvage values are reasonable. That is, you would probably not replace the robot in, say, year 16 if the planning horizon is only 20 years. In the column G scenario where the first set of robots is not installed until year 5, the first set of robots is assumed to last 15 years while the second robots are installed in year 20 and only last for 10 years.

Investment Requirements, Financing, and Annual Cash Flows

The Cash Flow Graph sheet shows the after-tax annual cash flows projected over the planning horizon. For scenarios where there is additional investment later in the time horizon such as robots or the new parlor installed in year 5, it is assumed there will be another down payment (data entry sheet row 57), which reduces the new debt accordingly. . The equity contributions show up as downward dips in the annual cash flows.

The loan terms are set at 80% of the useful life of each asset, so for example the loan is 12 years on the robots if the useful live is set at 15 years. The cash flows are adjusted over time using the annual inflation rate entered in B68.

Main Sheet

The timing of the investments and financing are detailed in the Main sheet. The information displayed can be changed using the pull down menu in row 83. Rows 84-125 displays the results.

The cash flow values shown there will normally be the after-tax annual cash flows that incorporate the facility changes, operating inputs, investments, financing, and taxes. It is useful for error-checking to use the box in row 83 to view only one of the components that making up the net cash flows, such as interest paid on debt.

Depreciation

Internal Revenue Service MACRS depreciation rules are followed in calculating tax depreciation by year, which reduces the income tax on the additional operating income and so increases after-tax cash flows. The robots and parlors can be depreciated either at a declining rate over 7 years or at a straight-line rate over 10 years. The barn can be depreciated either at a declining rate over 10 years or at a straight-line 15-year rate. In some scenarios you will notice a slight dip in the cash flow graph when the depreciation deduction is exhausted. Debt interest is tax-deductible while principal payments are not, which is also reflected in cash flow declines in some years.

Sensitivity sheet

The Sensitivity sheet contains graphs to compare how milk production impacts, investment requirements, and the business' planning horizon affect the results. You can compare two of the seven scenarios simultaneously. Use the boxes at the top to select the two scenarios you wish to compare.