



Manual for the Excel Spreadsheet - Costs to Raise Replacement Heifers

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The Penn State Costs to Raise a Replacement Heifer Spreadsheet (**CRRH**) is a flexible, simple Microsoft Excel spreadsheet that can calculate heifer raising costs for any type operation, feeding regime, grouping structure, or management.

The CRRH is separated into 10 worksheets defined and located at the right hand side of the screen. The worksheets are appropriately titled *Main Menu*, *Print Menu*, *Print Summary*, *Feed*, *Labor*, *Reproduction*, *Bedding*, *Health*, *Buildings*, *Equipment*, *Mortality*, and *Interest*.

The *Summary* worksheet is exactly that, a worksheet that summarizes all costs calculated in the other worksheets. The user DOES NOT enter any information in this worksheet. As cost figures are calculated in the other worksheets (i.e. *Feed*, *Labor*, *Reproduction*, *Bedding*, *Health*, *Buildings*, *Equipment*, *Mortality*, and *Interest*), these cost figures are automatically transferred to the *Summary* worksheet. When the user has completed the CRRH, all that is required is to print off the *Summary* worksheet to obtain printed copy of results.

The remaining worksheets (i.e. *Feed*, *Labor*, *Reproduction*, *Bedding*, *Health*, *Buildings*, *Equipment*, *Mortality*, and *Interest*) are located at the right hand side of the screen. These worksheets can be accessed for use, simply by clicking on the box that has the worksheet's name on it.

As a means of explaining how to use the CRRH, an example spreadsheet will be created in this manual. The example CRRH that will be created in this manual should provide the user with adequate training and information. The example CRRH file is a template. Thus the user, can type their information in place of the example data.

Start by clicking the worksheet *Feed*. As you can see the worksheet calculates feed costs to raise a heifer. Cells in the worksheet *Feed* colored yellow are the cells the user enters information in. Cells in the worksheet *Feed* colored aqua or mint, the user DOES NOT enter information in. These aqua and mint colored cells calculate costs given the information the user enters in the yellow colored cells.

Looking further at the worksheet *Feed*, we see that feed costs are broken into four age periods. These age periods are identical throughout the CRRH worksheets. These age periods are *Birth till Weaning*, *Weaning till 6 months of age*, *6 months of age till Age at first Breeding*, and *Age at first Breeding till Age at Pre-fresh*. The age period *Age at first breeding till Pre-fresh* can cause some confusion due to the definition of *Pre-fresh*. The age at pre-fresh is a user-defined age. It could be the age at first calving or it could be the age heifers are moved to the transition pen with close up dry cows. The user defines this age at pre-fresh.

Going back to the example CRRH that we are creating, let's define the length of our age periods. Located at cell **G21** is a yellow cell titled **Age at Weaning in days**. In the yellow cell we enter 35, corresponding to 35 days of age at which heifer calves are weaned. Located in the cell **O21** is a yellow cell titled **Age at first Breeding in months**. In the yellow cell we enter 14, corresponding to 14 months of age at first breeding. Located in cell **W20** is a yellow cell titled **Age at Pre-fresh in months**. As described earlier, this age is defined as the user sees fit. In our example CRRH, we enter 23.5, corresponding to 23.5 months of age at which heifers are moved in with close up dry cows.

Now that age periods have been entered, it is IMPORTANT for the user to hand calculate the length in days of each age period so when entering data for the age periods, the correct length of time for each age period is used.

In the example, we entered 35 in the G21 yellow cell titled Age at Weaning in days. In the O21 yellow cell titled Age at first Breeding in months, we entered 14. And in the W20 yellow cell titled Age at Pre-fresh in months, we entered 23.5. It is easy to calculate the length of each age period in days.

$$\begin{aligned}
 \text{Birth till Weaning} &= 35 \text{ days} \\
 \text{Weaning till 6 months of age} &= (6 \text{ months} * 30.42 \text{ days per month}) - 35 \text{ days} = 147.52 \text{ days} \\
 \text{6 months of age till age at first breeding} &= (14 \text{ months} * 30.42 \text{ days per month}) - \\
 &\quad (6 \text{ months} * 30.42 \text{ days per month}) = 243.36 \text{ days} \\
 \text{Age at first Breeding till Age at Pre-fresh} &= (23.5 \text{ months} * 30.42 \text{ days per month}) - \\
 &\quad (14 \text{ months} * 30.42 \text{ days per month}) = 288.99 \text{ days}
 \end{aligned}$$

Adding all of the age periods up we see that the CRRH example will incorporate a total rearing period of $(35 + 147.52 + 243.36 + 288.99) = 714.87 \text{ days}$.

It cannot be stressed enough to keep your age period lengths in mind when entering information into the CRRH. The spreadsheet will not check age period lengths. Users may round these numbers up or down for ease of use.

Looking at the **Feed** worksheet, column **A** contains names of feed ingredients; column **B** contains feed ingredient prices on a per pound basis. Under each age period, the user is required to enter the length of time in days that a particular ingredient is fed and the amount that is fed per day. When entering the number of days that an ingredient is fed, please keep in mind the length of your age periods previously calculated.

The example CRRH, we see ingredients entered. In this example, the user knows the prices per pound of their Heifer TMR (total mixed ration) **A12**. In some cases it may be necessary to enter each ingredient, amount of that ingredient, and price of that ingredient of a TMR if total price per pound of the TMR is not known.

There is a row for pasture as a feed ingredient. While it is difficult to measure pounds of pasture consumed per day, it may be best to estimate a cost per heifer per day on pasture and use that figure. Ask your local extension agent on methods to calculate pasture costs. As you can see CRRH is set up for this method of calculation, *A15*.

With different weaning systems and feeding management the *Feed* worksheet is different for every user. The flexibility that the spreadsheet offers should accommodate most users. Spend time with the *Feed* worksheet, it will prove very valuable.

Moving on to the next worksheet *Labor*, we notice it is set up very similar to the *Feed* worksheet. Labor activities are entered in column *A*, with hourly rate required for that activity located in column *B*. Under each age period we notice 4 pieces of information required. It was felt by the developers of the CRRH that it is more practical to measure labor as a group activity than on an individual basis. Thus, the CRRH requires the user to enter labor on a group basis and CRRH takes it down to an individual level.

Looking under an age period, we see it is required that the user enter number of heifers the activity was performed for, time required of the activity, days between activity or frequency of activity (daily, weekly, monthly), and the period of days that the activity is performed for the group of heifers. For an example, a farm milk feeds calves; it takes the farm 45 minutes to feed 10 calves, that is performed once daily, and calves are weaned after 35 days. So under the *Birth till Weaning* age period, we would enter 10 heifers, 45 minutes for time of activity, 1 for days between activity, and 35 for days in group.

This flexibility allows users to group several activities together such as feed, clean, and bed calves into one activity and still receive an accurate calculation on labor costs for that activity.

It is important to note, please keep in mind the length of your age periods when entering information. Also under the days between activity column, if an activity is performed twice daily a user would enter 0.5 in the days between the activity. If an activity is performed once daily; the user would enter a 1 in the days between the activity column. Once a week, the user would enter a 7 in the column. Twice a week, the user would enter a 3.5 in the column. Once monthly, the user would enter 30.42.

Look at the example CRRH example. Under the *Birth till Weaning* age period, we can see that they are currently feeding and bedding 13 calves, twice a day, and that requires 60 minutes. They are weaning at 35 days at which time they clean the individual's pen (1 head, 30 minutes, performed once every 35 days, for a period of 35 days).

As often a surprise to many users is the cost of labor to raise a heifer. Labor ranks as the second highest expense besides feed. Therefore it is necessary to spend time with the *Labor* worksheet to accurately evaluate a user's labor input to possibly improve productivity or explore other alternatives.

The **Reproduction** worksheet calculates the costs associated with breeding of the heifer. Opening up the **Reproduction** worksheet, the user will see the worksheet is divided into two sections. Both sections' costs are associated with the age period **Age at first Breeding till Pre-fresh** on the **Summary** worksheet. The worksheet contains a section for calculating artificial service or natural service.

The artificial service section requires the user to enter the cost per dose and number of doses of synchronization agent and semen. If professional arm service charges apply they are also entered along with any miscellaneous costs associated with the artificial service.

The natural service section requires the user to enter a cost for the sire. This cost figure is obtained by taking the purchase price of the sire minus the estimated salvage price of the sire upon disposal. Interest is automatically calculated on this investment. The user is required to enter feed amounts and price per pound of feed for the service sire. Unlike the **Feed** worksheet, the user must enter a single figure that covers cost per pound of the entire ration along with the pounds of ration consumed per day. This feed cost for the service sire is then multiplied by the user's age at pre-fresh for their heifers. The user is also required to enter the number of heifers serviced a year. This may include multiple services per heifer if known by the user. The user also has the option of entering a miscellaneous cost charge per heifer for the natural sire to cover additional costs such as bedding costs, labor, or housing.

The CRRH example shows the use of both artificial service and a natural service sire. The example uses two doses of synchronization agent and one artificial service before heifers are penned with a natural sire to catch any missed conceptions. The natural sire was purchased for \$700.00 and the example farm expects to sell the sire at disposal for \$750.00. Thus the negative \$50.00 in cell **F16**. The example farm is actually making money on the purchase. However, due to opportunity costs, an interest cost is still calculated. The natural sire is eating 50 pounds of feed a day costing \$0.0124 a pound for the feed. The CRRH example estimates the natural sire will catch 50 missed conceptions a year.

The **Bedding** worksheet is arranged very similar to the **Labor** workbook. The developers of CRRH felt it was more practical to enter bedding materials on a per pen basis than to have the user break down the amounts on an individual basis. Like the **Labor** worksheet, at the end CRRH calculates the amount and costs on an individual basis. The user is required to enter the bedding and price per amount of bedding. In the individual age periods, the user enters the number of heifers per pen, the days between bedding (i.e. once per day, once a week), and the number of days that the bedding is used for that age period. For example, a pen of 10 heifers receives 500 pounds of sawdust bedding, once a week for 60 days. The user would then enter 10 heifers in the number of head yellow cell, 500 pounds in the amount, 7 days between beddings, and for a period of 60 days in the appropriate age period.

Looking at the example CRRH, under the age period ***Birth till Weaning*** we can see that a pen of 1 heifer receives 20 pounds of sawdust, twice a week (every 3.5 days) for a period of 35 days.

As mentioned previously, it is important to keep in mind the length of a user's age periods, to receive accurate bedding cost calculations.

The ***Health*** worksheet not only calculates health costs to raise a heifer but also is an excellent way to evaluate a user's heifer health protocol. The user enters the name of the health treatment in column A followed by the cost per dose and number of doses in the appropriate yellow cells for the designated age periods. Health checks and pregnancy checks can also be included in the appropriate age period. Labor to administer these health items is NOT included in this ***Health*** worksheet, but is entered in the ***Labor*** worksheet. Charges by veterinarians for services are included in the ***Health*** worksheet.

The CRRH example contains a simple but useful ***Health*** workbook for user's reference.

The worksheet titled ***Buildings*** calculates building cost per heifer. Similar to the ***Labor*** and ***Bedding*** worksheets, data is entered on a group basis and CRRH breaks the costs down to an individual basis.

The user enters a building in column A, followed by its current value in column B. A building's current value is calculated through straight-line depreciation. The user in order to calculate a straight line depreciated current value for a building takes the original purchase or building price and subtracts the salvage value for the building at the termination of its expected life. Most permanent buildings are assigned a 30-year life expectancy. The user takes the purchase or building price minus the salvage value at the end of its life expectancy and divides this figure by the building's life expectancy. This yields an annual depreciation charge. For example: a new barn is purchased for \$60,000. It is expected to have a 30-year life and at the end of those 30 years, it will be worth \$15,000. Thus the annual depreciation charge would be $(\$60,000 - \$15,000) / 30$ years equals \$1500.

The annual depreciation charge is \$1500. So lets say the barn is 5 years old, the user would enter $(\$60,000 - (5\text{years})(\$1500)) = \$52,500$ in the ***value cell*** along with 30 years – 5 years = ***25 years*** in the ***years left*** cell.

A lot of times barns will hold heifers of various age periods. The user then must take the depreciated value and multiple that by a percentage of use by heifers of a specific age period. For example, lets take the barn previously calculated, \$52,500 current depreciated value. Twenty percent of the barn is occupied by heifers of the age period ***Weaning till 6 months of Age***. So in the value cell the user would enter $\$52,500 * 20.0\% = \$10,500$.

The user is required to enter the number of heifers utilizing the barn for a designated age period and the number of days in the age period that heifers are utilizing the building. Again it is important to keep in mind a user's age period lengths when entering number of days. **Repairs, Interest, Insurance, and Tax** are also included in the calculation on a percentage basis.

What occurs if a building has outlived its life expectancy? The user enters an annual repair charge in the value cell followed by a 1 in the years left cell. Remember to make the **Repairs** cell, **F8**, a 0% in this scenario.

The CRRH example, we see that this farm utilizes a green house structure for heifers up till breeding age followed by use of a depreciated out barn for heifers of the age period **Age at first Breeding till Age at Pre-fresh**. The green house used for heifers birth till breeding had an original building price of \$68,000. At the termination of its 30-year life expectancy, the owners expect it to be worth \$0. The remaining portion of the worksheet is straightforward and should provide useful reference.

The worksheet titled **Equipment** calculates building cost per heifer. Similar to the **Labor** and **Bedding** worksheets, data is entered on a group basis and CRRH breaks the costs down to an individual basis. The user will notice it is the exact same layout as the **Buildings** worksheet. The user will also use the exact same methods of calculation of data to be entered in the yellow cells.

The user enters a piece of equipment used for heifer rearing in column A, followed by its current value in column B. As with a building's current value, a piece of equipment's current value is calculated through straight-line depreciation. The user in order to calculate a straight line depreciated current value for a piece of equipment takes the original purchase price and subtracts the salvage value for piece of equipment at the termination of its expected life. In the equipment worksheet, the user will incorporate many more life expectancies due to different pieces of equipment and their multiple uses. The user takes the purchase price minus the salvage value at the end of its life expectancy and divides this figure by the equipment's life expectancy. This yields an annual depreciation charge. For example: a new skid steer is purchased for \$20,000. It is expected to have a 12-year life and at the end of those 12 years, it will be worth \$5,000. Thus the annual depreciation charge would be $(\$20,000 - \$5,000) / 12 \text{ years} = \1250 .

The annual depreciation charge is \$1250. So lets say the skid steer is 3 years old, the user would enter $(\$20,000 - (3\text{years})(\$1250)) = 16,250$ in the **value cell** along with 12 years – 3 years = **9 years** in the **years left** cell. Equipment's life expectancies vary with users, due to different uses and operators. It is important that the user spends time and truly calculates the expected life expectancy of a piece of equipment on their operation.

A lot of times equipment will be used for heifers of various age periods, cropping, and even lactating cows. The user then must take the depreciated value and multiple that by a percentage of use by heifers of a specific age period. For example, lets take the skid steer previously calculated, \$16,250 current depreciated value. Lets say, ten percent of the skid steer's hours are used by heifers of the age period **Weaning till 6 months of Age**. So in the value cell the user would enter $\$16,250 * 10.0\% = \$1,625$. It is very important that the user spend time to calculate an equipment's percent usage for not only the heifer rearing operation if other activities occupies the equipments hours, but the percent usage per age period.

The user is required to enter the number of heifers utilizing the piece of equipment for a designated age period and the number of days in the age period that heifers are utilizing that piece of equipment. Again it is important to keep in mind a user's age period lengths when entering number of days. **Repairs**, **Interest**, and **Insurance** are also included in the calculation on a percentage basis.

What occurs if a piece of equipment has outlived its life expectancy? The user enters an annual repair charge in the value cell followed by a 1 in the years left cell. Remember to make the **Repairs** cell, **F8**, a 0% in this scenario. When calculating equipment's annual repair charge, remember to include oil, filters, hydrolyic fluid, along with similar items. It is always easy for the user to only focus on the big repairs (axels, engines, wheels, buckets) and overlook the little everyday items.

The CRRH example demonstrates a user's equipment worksheet. Similar to the **Buildings** worksheet, examples of depreciated current values, life expectancies, percentage use by age periods, and annual repair charges are all incorporated into the worksheet.

It is also noteworthy to mention, that feed planting, harvesting or storage devices (combines, planters, bunkers, silos, bins) are not included in the **Equipment** worksheet. The costs of these items should have been incorporated into the feed market values in the **Feed** worksheet. However, items used to unload feed (silo unloaders, carts, skid steers, wagons) should be included in the **Equipment** worksheet. The same should be mentioned concerning building amenities such as headlocks, chutes, scales, or gates. These should have been included in the building's current value in the **Buildings** worksheet.

The **Mortality** worksheet calculates costs associated with death of a heifer. Mortality costs are calculated through the use of a percent death loss by age period and a market value at the beginning and end of an age period. The user enters dollar values based on market values for heifers similar to the user's at birth, weaning, 6 months of age, age at first breeding, and age at pre-fresh. Again as explained previously, age at pre-fresh is user defined. The market values are entered in the appropriate yellow cells for the designated age periods.

A percent death loss is also entered in the appropriate yellow cells based on the user's death loss for the designated age periods (i.e. ***Birth till Weaning, Weaning till 6 months of age, 6 months of age till Age at first Breeding, and Age at first Breeding till Age at Pre-fresh***).

The ***Interest*** worksheet calculates the interest costs or opportunity costs associated with a user having capital invested in a heifer versus a relative risk free investment such as a government savings bond. The user enters an appropriate percent return that they feel they could achieve if capital was not invested in a heifer but in a relative risk free investment. The percent return is entered in the appropriate yellow cells for the designated age period. The ***Interest*** worksheet calculates very similar to the ***Mortality*** worksheet using a heifer's market value. However, the ***Interest*** worksheet in addition to using a heifer's market value uses the costs calculated by the previous worksheets (i.e. ***Feed, Labor, Reproduction, Bedding, Health, Buildings, Equipment, and Mortality***) in its interest calculation.

The CRRH provides an informative ***Mortality*** and ***Interest*** worksheet for user reference.

While this manual and the example CRRH provides detailed instructions on use of the provided CRRH template, questions may still occur with variation in user's heifer management and structure. Please feel free to contact Matt Gabler, Dr. Peter Tozer or Dr. Jud Heinrichs with further questions.

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