9-9-2015

# A Historical Comparison of Heifer Replacement Costs

Matthew C. Stockton
*University of Nebraska-Lincoln*

Roger Wilson
*University of Nebraska-Lincoln*

AGRICULTURAL ECONOMICS
Institute of Agriculture and Natural Resources

September 9, 2015

agecon.unl.edu/cornhuskereconomics

# Cornhusker Economics

## A Historical Comparison of Heifer Replacement Costs

| Market Report | Year Ago | 4 Wks Ago | 9/9/15 |
|---|---|---|---|
| **Livestock and Products, Weekly Average** | | | |
| Nebraska Slaughter Steers, 35-65% Choice, Live Weight | 162.95 | 148.00 | * |
| Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb. | 267.78 | 275.55 | 248.96 |
| Nebraska Feeder Steers, Med. & Large Frame 750-800 lb. | 238.17 | 224.88 | 218.29 |
| Choice Boxed Beef, 600-750 lb. Carcass | 247.62 | 232.73 | 241.06 |
| Western Corn Belt Base Hog Price Carcass, Negotiated | 96.70 | 75.12 | 68.43 |
| Pork Carcass Cutout, 185 lb. Carcass 51-52% Lean | 101.43 | 85.67 | 85.09 |
| Slaughter Lambs, wooled and shorn, 135-165 lb. National | 161.25 | 156.44 | 155.64 |
| National Carcass Lamb Cutout FOB | 366.37 | 352.47 | 359.79 |
| **Crops, Daily Spot Prices** | | | |
| Wheat, No. 1, H.W. Imperial, bu. | 5.43 | 4.35 | 3.95 |
| Corn, No. 2, Yellow Nebraska City, bu. | 3.39 | 3.48 | 3.36 |
| Soybeans, No. 1, Yellow Nebraska City, bu. | 12.52 | 9.50 | 8.62 |
| Grain Sorghum, No.2, Yellow Dorchester, cwt. | 5.75 | 6.18 | 5.54 |
| Oats, No. 2, Heavy Minneapolis, Mn, bu. | 3.88 | 2.72 | 2.78 |
| **Feed** | | | |
| Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton. | 203.00 | 195.00 | 177.00 |
| Alfalfa, Large Rounds, Good Platte Valley, ton. | 90.00 | 85.00 | 85.00 |
| Grass Hay, Large Rounds, Good Nebraska, ton. | 87.50 | 95.00 | 87.50 |
| Dried Distillers Grains, 10% Moisture Nebraska Average. | 105.00 | 135.00 | 137.50 |
| Wet Distillers Grains, 65-70% Moisture Nebraska Average. | 36.00 | 41.00 | 45.75 |

*** No Market**

The value of heifer replacements is an interesting question which is affected by time (e. g. future cattle prices), animal longevity and the individual production and management system of the cow-calf producer. If we ignore the differences among producers we can study the effects that price and longevity have on the net value of replacement animals.

By using the simulation model *Heifer Value Cow-q-lator* (Refer to authors listed at the end of this newsletter for a copy) production information from the University of Nebraska's research herd at Gudmundsen Sandhill Laboratory (GSL) and current and historical price information, a series of scenarios were created to evaluate heifer replacement value for ready-to-calve heifers. The time of calving is late-winter early-spring period, February - March.

Using historical information implies that past prices are good predictors of future prices, which may or may not be the case. The base price of a 500 lb steer in the simulation was $203/cwt. A higher price was not used since today's prices are extraordinarily above average, as illustrated in Figure 1. This price was modified as described below for the following 10 years.

In the model, calves are priced in future years by using historical computed percentage changes in price. These computations were done using


USDA historical prices for 500 lb. steer calves. Cull cow prices were set at 44% of the 500 lb steer price. Calves were considered weaned and sold in November of each year. The $203/cwt price was a November price. In addition to price, costs were inflated using factors from the website usinfaltioncalculator.com (http://www.usinflationcalculator.com/inflation/historical-inflation-rates/) for the appropriate years using an $800/hd base costs.

The longevity of individual heifers was determined by randomly drawing samples from a representative herd of cows with an identical proportion of animals of each age to those of the historical average of cows born at GSL from 1987 to 2005. Calving rate was assigned randomly to be from 88% to 92% for each animal.

All returns are in net present terms accounting for the time value of money. There were many other biological and economic inputs and assumptions made to make this model operational and the detail is beyond the size and scope of this short article. However, the authors are more than willing to share this information upon request.

Two distinct analyses were completed. One to compare longevity effects on heifer breakeven value and the other to track annual breakeven values.

In the first, two herd types were identified. The first used a high replacement rate (HRR) of nearly 24% first calf heifers (2 years old). The second used a lower replacement rate (LRR) herd where 2 year olds only comprised 18% of the herd. Table 1 has the detailed percents of the whole herds and enumerates the differences by animal age. This comparison made it possible to measure the value difference of a herd with an average age of 4.64 years to one with an average age of 4.92 years. Please note that averages say nothing about variation which might also affect the outcome. This topic is left for another time.

Table 1. Herd composition by age

| Cow Age | Herd Type | | Difference |
|---|---|---|---|
| | HRR | LRR | |
| 2 | 24% | 18% | 6% |
| 3 | 16% | 17% | -1% |
| 4 | 16% | 17% | -1% |
| 5 | 12% | 12% | 0% |
| 6 | 9% | 10% | -1% |
| 7 | 8% | 8% | 0% |
| 8 | 6% | 7% | -1% |
| 9 | 4% | 5% | -1% |
| 10 | 4% | 5% | -1% |
| 11 | 1% | 1% | 0% |

The second experiment was used to determine the effect of the price cycle, by tracking the discounted breakeven value of heifers annually. The values themselves were not intended to be representative of anyone in particular but do represent the interaction of costs and revenues by year based on price and costs trends. Figure 1 illustrates the calf price data normalized to 1983 prices (real prices) using the CPI.

Each year's simulation represents a total of 5,000 individual cows of a specific age and size drawn at random from a statistically accurate representative herd of the GSL cattle. A total of 18 simulations were performed for the first analysis with an additional 36 simulations for the second experiment.

**Results**

In Experiment 1 only those years where a peak or low in heifer value was observed in the HRR herd

were compared with accompanying LRR points. The peak years were 1965, 1976, 1987 and 1997 while the low years were 1963, 1974, 1980, 1994 and 2001. In both cases it is unknown whether the 1963 and 2001 results are actual low values since the data is only a small segment of a continuous series. The average difference in heifer replacement value for the LRR verses the HRR herds at peak heifer breakeven values averaged $200.15/hd. The average breakeven difference for the low valued years was a negative 5.73/hd. Table 2 lists the annual differences as well as the average results.

Table 2. Difference in breakeven values for peak and low value periods of the lower 18% replacement rate (LRR) herd to the higher replacement rate

| Peak Years | Value Difference of Replacement Heifers of LRR vs. HRR | | Low Years |
|---|---|---|---|
| | | 36.49 | 1963 |
| 1965 | 177.25 | | |
| | | (41.62) | 1974 |
| 1976 | 263.85 | | |
| | | (52.63) | 1980 |
| 1987 | 164.92 | | |
| | | 8.88 | 1994 |
| 1997 | 194.57 | | |
| | | 20.20 | 2001 |
| Average | 200.15 | (5.73) | |

Figure 2 shows the graphical results of Experiment 2, the simulated heifer values by year. All of the values were obtained using only the HRR herd for the years of 1960 through 2004, 45 separate simulations. The long term average breakeven value for replacement heifers bought/raised during the study period was $1,379.36/hd. These heifer values, listed in Table 3, ranged from a low of $64.75 in 1980 to a high of $3,153.44/hd in 1976 with the years 1975, 1977 and 1978 near the $3,000/hd level.

Looking at the frequency of breakeven values provides useful insight into the effects of the market on breakeven value. Four percent of the time heifer values were less than $100/hd, Thirty one percent of the time they were valued between $100/hd and $1,000/hd. Fifty one percent of the time they were valued between $1,000/hd and $2,000/hd. Seven percent of the time they were valued between $2,000/hd and $3,000/hd. The remaining 7% of the time they were valued at $3,000/hd or slightly higher (Table 4).

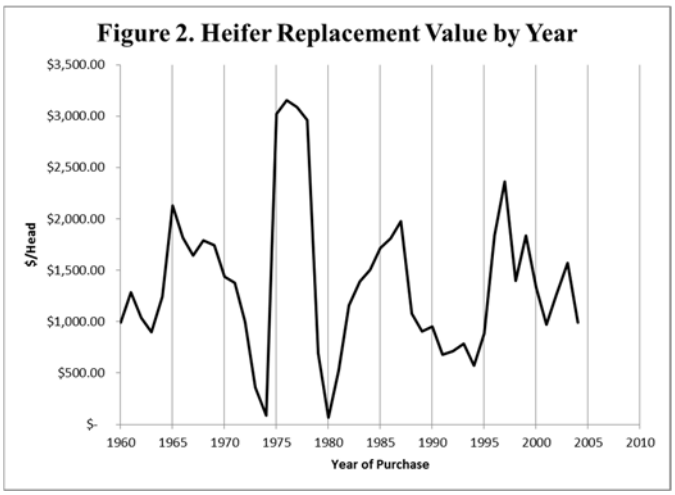


Table 3. List of Replacement heifer breakeven values using only the HRR scenario listed by year and in net present value terms

| Year | Heifer Simulated Net Present Value | Year | Heifer Simulated Net Present Value |
|---|---|---|---|
| 1960 | 990.06 | 1983 | 1,389.50 |
| 1961 | 1,283.27 | 1984 | 1,505.24 |
| 1962 | 1,041.90 | 1985 | 1,720.26 |
| 1963 | 897.74 | 1986 | 1,812.42 |
| 1964 | 1,246.67 | 1987 | 1,977.78 |
| 1965 | 2,132.59 | 1988 | 1,076.13 |
| 1966 | 1,819.73 | 1989 | 907.36 |
| 1967 | 1,644.71 | 1990 | 950.06 |
| 1968 | 1,793.66 | 1991 | 677.43 |
| 1969 | 1,744.55 | 1992 | 715.14 |
| 1970 | 1,439.24 | 1993 | 785.93 |
| 1971 | 1,376.79 | 1994 | 572.72 |
| 1972 | 1,001.15 | 1995 | 886.11 |
| 1973 | 357.42 | 1996 | 1,840.01 |
| 1974 | 90.59 | 1997 | 2,361.83 |
| 1975 | 3,017.91 | 1998 | 1,401.01 |
| 1976 | 3,153.44 | 1999 | 1,837.53 |
| 1977 | 3,086.85 | 2000 | 1,331.10 |
| 1978 | 2,964.28 | 2001 | 970.60 |
| 1979 | 694.66 | 2002 | 1,272.40 |
| 1980 | 64.75 | 2003 | 1,567.88 |
| 1981 | 523.11 | 2004 | 989.21 |
| 1982 | 1,158.35 | | |

Table 4. Percent of Breakeven Value for Replacement Heifers by Dollar Amount Range

| >0 | >=$100 | >=$1,000 | >=$2,000 | >=$3,000 |
|---|---|---|---|---|
| <$100 | <$1,000 | <$2,000 | <$3,000 | <$3,160 |
| 4% | 31% | 51% | 7% | 7% |

**Conclusions**

Preliminarily the LRR (replacing less cows, cows with longer productive lives) increases the breakeven values for replacement heifers during peak breakeven value periods but has little or no effect (perhaps even a negative effect) during periods of low breakeven values. If two producers have the same production costs and cow productivity, the producer who has a lower replacement rate can afford to pay more for replacement animals during times when those animals are going at a premium, but not so when breakeven values are low. It should be remembered, however, that the degree of the difference in breakeven values is not just affected by replacement rate or average herd age, but is likely a result of the combination of cows in different age groups. That is, the productivity of a particular cow will vary over her life time which ultimately affects which costs and which revenue she will capture. Therefore, different combinations of cows of varying ages during different price and cost trends will have varying effects on the actual observed breakeven value.

It is apparent from Figure 2 that there are periods of high breakeven values and low breakeven values. Looking at Table 3 they appear to come in groups for the most part. This is consistent with the idea of a cyclical price stream.

Like the accompanying cattle market where large price swings are observed, a huge difference among some adjacent years in breakeven value is evident. For example those of the 1974 to 1975 period where breakeven value is close to $3,000 higher in 1975, or the 1978 to 1979 crash where breakeven value drops by nearly $2,200. Ironically these large variations can potentially make or break producers, providing those selling/buying at the right times large windfalls and the reverse being true for those with unfortunate timing.

What is also evident is that breakeven values are affected by events (i.e. the Nixon price freeze, the recession of the late 70's etc.). A more current example is the bovine spongiform encephalopathy (BSE) incidents and the effects of the 2012 drought.

Ultimately these results show that while breakeven values are likely to be grouped (occur sequentially for 2 or more years), they have moved rapidly from year to year. This type of volatility makes it vital that producers use prudence and be careful in observing market conditions and pricing patterns.

Matthew C. Stockton, (308) 696-6713
West Central Research & Extension Center
University of Nebraska-Lincoln
mstockton2@unl.edu

RogerWilson,
Budget Analyst Farm Management
Dept. of Agricultural Economics
University of Nebraska-Lincoln
402)472-1771
rwilson6@unl.edu