

The Replacement Decision Conundrum

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The asset replacement decision is always challenging. Numerous factors must be considered including purchase price, financing options, ownership costs, operating costs and salvage value. These factors make the replacement decision a balancing act. If an asset is kept too long, its salvage value decreases and it becomes increasingly expensive to operate (Table 1). Alternatively, if an asset is replaced too soon, it is too costly from an investment perspective.

This article details a simulation examining whether it is more profitable to replace a self-propelled forage harvester every 2, 3, 4... years. A spreadsheet was developed with: cash expenditures associated with owning/operating an asset (purchase price, interest/principal payments, taxes, insurance, housing, repairs, fuel, lubricants, labor), required equity return and salvage value. Annualized ownership and operating costs net of depreciation shield (amount depreciation saves in taxes) and salvage value were determined for each replacement strategy. The simulation used the following assumptions:

- Forage harvester purchase price was \$350,000.
- A \$350,000 loan (6.75% interest rate). Length of the loan:
 - 2-, 3-, or 4-year loan was used for 2-, 3-, and 4-year replacements;
 - 5-year loan was used for 5-, 6-, 7-, 8-, 9- and 10-year replacements.
- Operating costs (fuel, lubrication, repairs, labor) were determined using Iowa State University Extension's Ag Decision Maker Machinery Cost Calculator. Fuel was \$3.00/gallon; labor was \$12.00/hour.
- Ownership expenses of taxes, insurance and housing were \$3,500/year with a 10% pretax required rate of return on equity.
- IRS MACRS depreciation schedule for 7-year assets was used to determine harvester's depreciation shield.
- Salvage value was established per guidelines for combines/ forage harvesters in Farm Machinery Costs, on Iowa State University Extension's Ag Decision Maker publication.
- Marginal tax rate was 25%; capital gains tax rate was 10%.

Since operating costs increase with age/usage, each replacement strategy was tested using 3 usage levels: 100 hours a year (roughly 1,500 acs/year), 300 hours (~4,500 acs/year) and 500 hours (~7,500 acs/year). For each scenario, replacing assets every 5 years proved to be most cost effective. At 100, 300 and 500 hours, it would cost \$33.01, \$15.64 and \$12.37/ac respectively to own, operate and replace a harvester every 5 years (Table 2). It should be noted that the difference between annualized costs of the 4- and 5-year replacement strategies is small, \$2.97/ac for 100 hours of use.

This simulation only considered ownership/operating costs, depreciation shield and salvage value associated with the replacement decision. Other benefits not included in the analysis may easily compensate for adopting a quicker replacement strategy, such as enhanced harvest timeliness, adoption of more efficient technology and positive economic value associated with owning a newer piece of equipment. Making the correct replacement decision is complex and difficult. Any questions regarding replacement decisions should be directed to gregg.hadley@uwrf.edu.

References:

Edwards, William. *Machinery Cost Calculator. Spreadsheet, Version 1.2 & Estimating Farm Machinery Costs, File A3-29. PM-710. P2 (November 2009).* Iowa State University Extension Ag Decision Maker. www.extension.iastate.edu/agdm

Table 1. Average annual operating costs and salvage value associated with a \$350,000 self propelled forage harvester.

Replacement Strategy	Average Annual Operating Costs (Usage=100 hrs)	Estimate Salvage Value (Usage=100 hrs)
Replace Every 2 Yrs	\$9,120	\$234,500
Replace Every 3 Yrs	\$9,225	\$206,500
Replace Every 4 Yrs	\$9,330	\$182,000
Replace Every 5 Yrs	\$9,540	\$164,500
Replace Every 6 Yrs	\$9,645	\$147,000

Table 2. Annualized costs/ac associated with various forage harvester replacement strategies.

Replacement Strategy	After Tax Annualized Costs/Ac:		
	100 Hours Annual Use (1,500 acs)	300 Hours Annual Use (4,500 acs)	500 Hours Annual Use (7,500 acs)
Replace Every 2 Yrs	\$46.39	\$22.51	\$17.33
Replace Every 3 Yrs	\$40.84	\$19.74	\$15.32
Replace Every 4 Yrs	\$35.98	\$16.78	\$12.99
Replace Every 5 Yrs	\$33.01	\$15.64	\$12.37
Replace Every 6 Yrs	\$45.52	\$19.22	\$14.50