

Expected Cash Returns From REAP: NPV and IRR Analysis

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There are two standard questions that need to be answered when considering investments or capital projects. “How much money will the investment make?” And, “What rate of return will be earned on the money invested?”

The purpose of this study was to analyze the REAP program offered by the American Jersey Cattle Association as a capital investment option.

Net Present Value (NPV) and Internal Rate of Return (IRR) analysis were used to examine the expected cash returns from REAP along with its costs. The expenses associated with REAP are well-defined by the AJCA in its program cost structure. Three features of the REAP program were identified to have the potential to provide herd owners with cash returns:

- Increased value from selling surplus animals as Registered Jerseys compared to selling non-registered animals.
- Increased lifetime profitability from animals that result from using the Jersey Mating Program (JMP) because the JMP can properly account for detrimental inbreeding effects when determining how a set of the breed's best males should be mated to a herd's females.
- Increased production from using the herd performance reports and genetic transmitting estimate reports included in the REAP program.

The expected cash returns and the timing of those returns were estimated using dairy industry information.

Net Present Value and Internal Rate of Return

Typical capital projects require an initial outlay of cash, which is then followed by a series of cash returns realized over a period of time. At some point in the future the project is terminated, and its salvage value is realized. The initial money used for the project carries an interest rate, whether the money is borrowed and has an actual interest rate, or comes from surplus cash and, therefore, carries an opportunity cost. Accurate analysis of capital projects requires procedures that account for:

- The amount of the initial investment,

- The amount and timing of the future cash returns, and
- The interest rate or opportunity cost of the invested capital.

To illustrate, assume \$1,000 is borrowed at 10% interest. This money is then invested in a project that is expected to return \$150 at the end of the year for each of the next 10 years. The project is expected to have no value at the end of the tenth year. The question that needs to be answered is, “Will receiving \$1,500 over the course of 10 years more than offset borrowing \$1,000 now at 10% interest?”

In order to determine whether a project should be pursued, and to compare the expected returns from any project to other possible projects, the expected future returns from each project need to be standardized into terms of their value today. In other words, it is necessary to determine the value today of receiving \$150 for each of the next ten years.

The returns from capital projects can be standardized using procedures that calculate the current, reduced value of each of the expected future cash returns—Net Present Value (NPV). If the resulting NPV is positive, the expected cash returns are more than enough to cover the initial money invested and its associated interest rate. If the NPV is zero, the discounted cash returns are expected to exactly cover the initial expense and required interest rate. A negative NPV means the project's expected stream of cash returns are not expected to cover the invested money and its interest.

Capital projects can also be analyzed by calculating the interest rate that will be realized from the expected cash returns. Instead of assigning an interest rate to the invested money, the amount and timing of the anticipated cash returns can be used to calculate a breakeven interest rate for the project. Referring to the example of investing \$1,000 in order to receive \$150 for the next 10 years, instead of assigning a 10% interest rate to the initial investment, the total of the discounted cash returns could be used to calculate the rate of return on the project. If the resulting interest rate is greater than the expected cost of capital, the project should be profitable. This interest rate is referred to as the Internal Rate of Return (IRR). When several investment options are available, those

with IRRs higher than the cost of capital can be ranked according to their IRRs to help determine which investments should be made.

The REAP Program

REAP bundles the AJCA's primary programs—registration, NAJ Equity fees, TPE and the Jersey Mating Program—into a single fee structure.

In addition to any up-front registration fees that may be incurred in order to make the entire herd registered, annual fees for the REAP program are as follows:

- Herd fee, \$100
- NAJ Equity fees, \$2.60 per cow or \$0.02/cwt. of milk sold (*for purposes of simplicity, the \$2.60 per cow fee was used in this cash flow and NPV analysis*).
- First 100 cows, \$10.75 per cow, plus
- Cows 101 to 300, \$8.75 per cow
- Cows 301 to 500, \$6.50 per cow
- Cows over 500, \$4.50 per cow

This NPV and IRR analysis of REAP used these specific, known costs of enrolling a herd in the program under the following assumptions.

- A 10-year project life. A 10-year project life balances the time required to realize herd improvements resulting from breeding program modifications with the difficulty of forecasting accurately too far in the future.
- 175-cow herd size, the average size of currently enrolled REAP herds.
- 5% annual growth in herd size, the average for currently enrolled REAP herds.
- 8% annual sales of breeding stock. DRMS-Raleigh statistics show an average of 6.5% of the milking herd is sold for breeding purposes. The typical dairy herd consists of as many heifers as milking cows, and herds generally sell as many heifers for breeding stock as cows. Therefore, breeding stock sales would equal 13% of the milking herd. However, the herd growth rate should be subtracted from the breeding stock sales because animals that are used to increase the herd size will not be available for sale.
- 9.5% interest rate.
- Beginning animal registration fees of \$20 per cow based on current AJCA registration fees.
- \$240 added income per animal sold for breeding purposes, both annually and when the herd is sold at the end

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PROGRAM BENEFITS

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- of the ten years.
- \$59 per cow increased lifetime profitability from JMP matings distributed over a three-year herd life per cow.
- 10% of the increased production due to TPE.
- 40% tax rate. This is a typical tax rate that includes all federal, state, and local taxes.

Results

Based on the above assumptions, *the 10-year project yielded a NPV of \$52,000 and an IRR of 64%*. Obviously these returns result in a recommendation that a herd fitting this profile should undertake the REAP project unless other mutually exclusive opportunities exist that will result in NPVs greater than \$52,000 or return more than a 64% IRR.

One of the primary variables in the scenario used is whether the herd will be dispersed after 10 years. Many herds continue in operation under the same ownership for 20 or 30 years or even longer. *Calculating the NPV and IRR without the herd salvage value at the end of 10 years resulted in a NPV of \$19,000 and an IRR of 54%*. The REAP program is still a good 10-year investment for Jersey owners not intending to sell their herds.

Some herds have obtained outstanding production levels without using the TPE program. These herd owners may want to analyze the program solely from the returns of adding value to their annual sales of breeding stock and increased lifetime profitability from using JMP recommendations. These two features of REAP result in an NPV of \$7,500 and an IRR of 32%. The REAP program remains a recommended program for producers who think they may only benefit from the JMP and added value of annual breeding stock sales.

However, if a herd only intends to use the JMP or capitalize on annual animal sales, the NPVs for these individual programs are negative, and the IRRs are less than the cost of capital. REAP would not be a recommended program for such herds.

Cash Flow Returns From REAP Program Features

While the REAP program includes many benefits, three specific features can be tracked to increasing cash flows for the herd owner. However, as is typical with most capital projects, the cash inflows do not begin until after significant cash out-

flows have been incurred. With the REAP program, because of the lag caused by generation intervals, some cash inflows are not fully realized until after several years of enrollment in the program.

Inbreeding Control. JMP has the longest time lag between incurred cost and cash returns of any REAP feature incorporated into the NPV analysis. This is simply because of the generation interval between when cows and heifers are mated using JMP recommendations and when the resulting offspring enter milking herds and the mating benefits are realized. This analysis assumes that by year 4, 25% of the entire milking herd will consist of cows resulting from year 1 JMP mating recommendations, and that by year 7, the entire herd will consist of cows resulting from JMP mating recommendations.

This NPV analysis combines per lactation profitability increases with a gradual phase-in of JMP-advantaged cows entering the milking herd. Therefore, cash inflows realized from using JMP aren't seen until Year 4, and full cash inflows are not realized until Year 7 of REAP enrollment. Using the average 175 cow herd that is growing 5% per year, the cash inflows from the JMP portion of REAP were calculated.

In Year 6 and thereafter, the cash inflows from JMP exceed the annual REAP fees.

Sales For Dairy Purposes. Enrolling a herd in the REAP program will not lead to an immediate price premium when selling cattle for breeding stock. A herd will need time before the performance programs included in the REAP package begin to build the pedigrees of their animals to the point of commanding selling prices higher than grade cattle. For the purposes of this cash flow analysis, the Registered Jersey price premium was phased in as one-third of the price premium in year 2, two-thirds in year 3, and the full price premium in year 4 and after.

By Year 3 and thereafter, the premium prices from cattle sold as breeding stock cover the entire cost of participating in the REAP program.

Salvage Value. The same price differentials between Registered and grade Jerseys outlined above can be applied when the herd is dispersed. Because a herd generally consists of as many calves and heifers as cows, a 175-cow herd with a 5% growth rate will have 542 Jerseys in 10 years. The \$240 per head premium will

generate \$130,080 if the herd is sold at that time.

Increased Production. The most difficult part of the cash flow analysis was assigning how much of the increased production is due to participation in the DHIR program. In other words, do the features of DHIR lead to higher production, or do the higher producing herds enroll in the DHIR program? In either event, the fact that DHIR herds have higher production is irrefutable. On one hand, it would be a mistake to credit all of the increased production to the DHIR program. On the other hand, it would also be erroneous to assume that the DHIR program does not offer any tools or incentives to increase production. In addition, using the JMP should also lead to higher production.

For the purposes of this cash flow analysis, 10% of the additional production was credited to the REAP program. However, the benefits from being enrolled in performance programs will not be realized immediately. The returns from the increased production were phased into the cash flow analysis: 25% of the 10% production increase in year 3, 50% in year 4, 75% in year 5, and 100% in year 6 and after.

By Year 4 the net cash realized from the increased production covers the entire cost of the program.

Summary

The AJCA's REAP program provides Jersey owners the opportunity to increase their income from owning Jersey cows. As herds become even more commercially oriented, this NPV and IRR analysis indicated that, over time, the combination of all of the benefits in the REAP program can increase cash flows for Jersey herds and at a rate that exceeds virtually any expected cost of capital.

Even if herds do not plan to disperse in the near future, the REAP program can supplement their operational cash flows. However, in order to maximize their returns from participating in the REAP program, herds need to take advantage of more than just one of the program's features. Herds that plan to just use the JMP or just market excess animals for breeding stock will not be maximizing their investment in the program.

If you are interested in an NPV and IRR analysis of REAP's potential returns for your herd situation, contact me or your AJCA-NAJ Area Representative.