

Introduction

The Cape Cod Cranberry Growers' Association considers the "Cranberry Bog Renovation-Innovation Program" to have been a rousing success, allowing for growers to renovate 160.5 acres of cranberry bog. In many cases, growers may not have been able to undertake these projects without the reimbursement of up to \$10,000 per acre. Other growers may not have been to take the necessary risk in trying new techniques or new varieties of vines without the grant money.

It is unfortunate that the nature of cranberry production is such that we will not have the most necessary data – reports on crop yields – until after the harvest of 2010 or 2011. Most cranberry bogs can not be expected to produce significant yields until the third year of growth. Using the evidence gained over the past two years, however, we can make some educated guesses about the success we expect from these projects.

- **Water Savings** – Through this program, 160.5 acres have been rebuilt. One of the main concerns about old-style cranberry bog that was built by hand is that the bogs are often sloped, leading to both over-use of water and creating dangerous and inefficient situations where one end of a bog must be covered with several feet of water while another end is not yet submerged. By leveling this amount of acreage, just within these projects growers should see a net gain of 100 acre-feet of water not being used. This is a substantial amount, equaling 32.5 million gallons, or roughly the amount of water used yearly per capita of six hundred people. Water use in cranberry production is not consumptive but as an industry we see tremendous opportunities with projects like this in furthering the good stewardship of the environment that cranberry growers already provide.
- **Increased Yield** – While we will not know the full extent of any yield increases until at least 2011, if not a year or two after that, we can easily estimate the gains that will be seen. Recipients of the cost-share money reported an average three-year average of 97 barrels per acre of bog. That is well below the state average from 2006-2008 of 143 barrels per acre.¹ With all 160.5 acres in this program having previously been planted with either the Early Blacks or Howe's varieties, or having been mostly populated with non-fruit yielding native varieties, it can safely be expected that the yields will increase dramatically. On the 112 acres that have been planted with Ben Lear or Stevens vines, we can look at the averages from these and safely suggest that these bogs should see a yield increase of more than double to approximately 206 barrels per acre. The other 48 acres that have been planted with new hybrid varieties are less easy to estimate. Using the most conservative data from plot trials in Wisconsin and New Jersey², it is estimated that these growers will see a more than three-fold increase in productivity off of their acreage, from an average of 4720 barrels to 15,234 barrels.
- **Increased Efficiency** – This is an extremely difficult topic to quantify and it is equally difficult to find any data to support it. Logic, however, would dictate that a bog with fewer ditches and a rectangular shape would be more efficient to manage

¹ 2008 and 2009 Cranberry Forecast, New England Agricultural Statistics Service, USDA.

² Integrity Propagation's website, <http://www.integritypropagation.com/Products.html>

than a bog that was built by hand around the existing landscape and which is divided by many ditches. A reduction in the number, width, and depth of ditches in a renovated bog should yield gains in the following areas:

- Efficiencies gained because ramps are no longer needed in order to cross ditches
- Efficiencies gained because machine operators do not need to turn as often on the bog
- Increased crop production because machines are not driving on the same path several times
- Increased yield because more square feet of the total bog area are planted and less area is used up as ditches
- Increased safety as machines and people are less likely to fall in ditches and less likely to move ramps for crossing ditches
- Possible decrease in insurance liabilities as farm becomes more safe
- Less water is needed to flood the bog – or really less water is needlessly filling ditches in order to flood the bog
- Less fuel and time is used as machines are used more efficiently
- Fewer ditches mean less time, money, fuel, and wear-and-tear on the cranberry vines due to cleaning ditches

Economics

The multiplier of the \$1.5 million grant can be felt throughout the industry, with growers having spent a great deal of money in hiring contractors to operate equipment, purchasing irrigation components, hiring temporary laborers, buying sand and other raw materials, renting equipment, and purchasing vines from other growers.

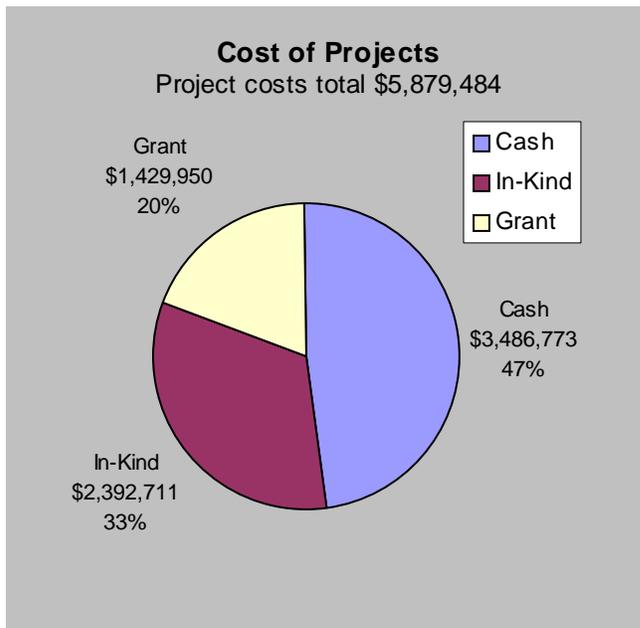


Figure 1 Cost of Projects

The total cost for all projects was \$5,502,538 with cash costs accounting for approximately sixty percent of the total and the remaining costs, or value, stemming from in-kind contributions. Recipients contributed over \$2 million of their own labor, equipment, and resources such as sand and vines in the process of rebuilding their bogs. These in-kind costs, over \$14,000 per acre, have long been something that many cranberry growers did not accurately keep track of. The cash portion, at just below \$3.2 million, allowed for growers to spend \$2,725,871 in local businesses. These businesses range from irrigation suppliers to heavy equipment contractors; from equipment rental companies to sand

and gravel operations. Sixteen companies received over \$20,000 in business; nine of those were paid over \$50,000 during the course of this program, helping to service an average of five different projects each.

As the following chart indicates, over \$1.25 million dollars was spent hiring equipment operators, truckers, and other contractors. Within that total were jobs for several hundred dollars and other jobs that cost over \$100,000. Some forty different companies or individuals received payment for that type of work in association with this program.

Cranberry growers also spent over a half-million dollars in irrigation components, mainly to the benefit of two suppliers in the region. In addition, growers rented over \$60,000 worth of equipment and paid nearly \$200,000 to area businesses for sand and stone.

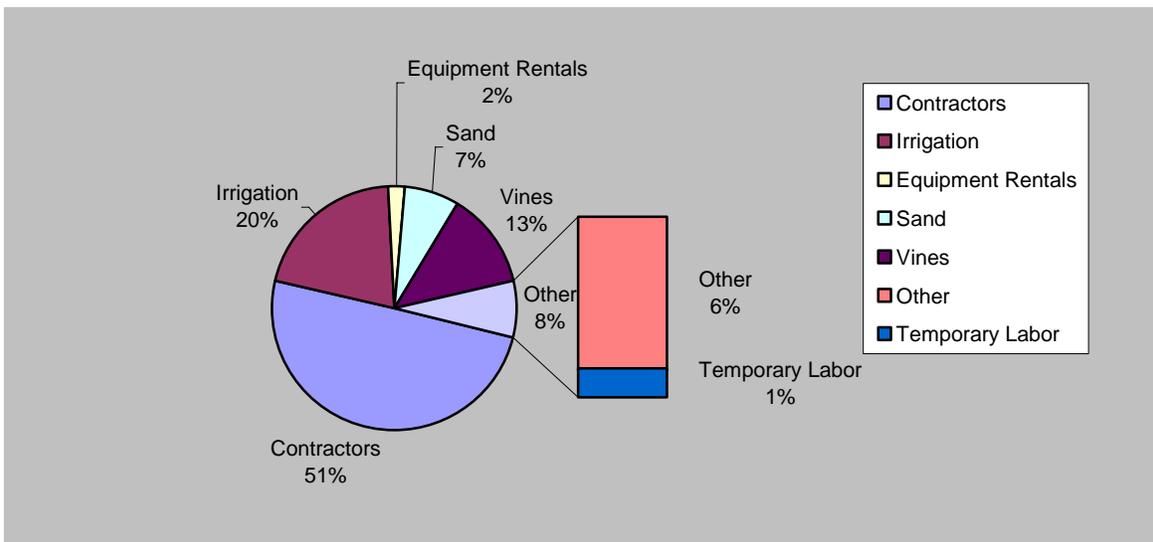


Figure 2 Breakdown of cash expenses for local businesses

Throughout this project, cranberry growers who received money spent over \$2.7 million directly into the local economy, through hiring local workers and equipment operators and by purchasing goods from area businesses. This amounts to 38% of the total value of the entire program and approximately \$13,000 per acre. While total cash expenses were over \$3 million, not all was used in local businesses, with most of the expenditure coming from vine material purchased from New Jersey and Wisconsin.

Recipients of money through this program reported a cumulative three-year average yield of 97 barrels per acre on the bogs they would be renovating. Using a four-year average of the prices paid for cranberries, this resulted in a growers being paid at a rate of approximately \$4,462 per acre at the old level of production, which is simply unsustainable today. First Pioneer Farm Credit’s American Cranberry Cost of Production Study, 2004-2006 Crop Years found a weighted cost of production of \$4,084 per acre.³ The problem with the nature of cranberry production is that if a bog does not yield well

³ First Pioneer Farm Credit, *American Cranberry Cost of Production Study, 2004-2006 Crop Years*, pg 18.

and has structural problems, the costs on a per acre basis are still largely the same. In fact:

A key feature of expenditures for growing cranberries is that many of these input costs are relatively the same (“fixed”) per acre, regardless of how many barrels are harvested from that acre. For example, frost protection costs the same per acre regardless of whether yield was 100 or 300 barrels per acre. Additionally, variable inputs such as labor, fertilizer, chemicals, etc., appear not to correlate with yield.⁴

With conservative estimates of yields reaching 250 barrels per acre when these renovated bogs achieve maturation, it is clear that growers will be able to afford inputs into other bogs that lag in production, new technologies which will allow for ever-greater water and fuel conservation, and continued hiring of local employees. All of these benefits to the farmer have a tremendous impact on the surrounding economy; in Southeastern Massachusetts a healthy and thriving cranberry industry has a massive impact on the whole region’s wealth.

Statistics

While renovating weak cranberry bogs is really the only way to see dramatic improvement in yields, it is an expensive endeavor. With this grant we hoped to identify ways in which cranberry growers could renovate bogs more cheaply as well as more efficiently, using innovative techniques or technologies to do so. In most cases, growers were still spending a substantial amount of money on these projects. This was caused by a variety of factors but two things that caused a dramatic rise in the costs was the severe spike in fuel costs for much of the first part of 2008 and the continued high price for sand, an integral component to successful cranberry bog construction or renovation.

It is important for us at CCCGA to be able to see if renovating a cranberry bog is something that has grown so expensive as to essentially price out smaller growers who do not have as many resources available as might a larger company. In fact, six of the ten smallest growers on a total acreage basis had projects with expenditures above the median per-acre cost. For the industry to continue to thrive, it is important that all

| Acres | Total Cost | Cost per Acre |
|--|-----------------|-----------------|
| 2 | \$34,321 | \$17,161 |
| 1.66 | \$31,650 | \$19,066 |
| 8.7 | \$191,040 | \$21,959 |
| 2.37 | \$52,612 | \$22,199 |
| 7.71 | \$185,685 | \$24,084 |
| 1 | \$25,403 | \$25,403 |
| 14.5 | \$376,946 | \$25,996 |
| 4 | \$110,393 | \$27,598 |
| 1.5 | \$42,881 | \$28,587 |
| 1.1 | \$31,731 | \$28,846 |
| 3.65 | \$116,951 | \$32,041 |
| 29 | \$952,064 | \$32,830 |
| 4.14 | \$136,281 | \$32,918 |
| 4.76 | \$157,895 | \$33,171 |
| <i>Median cost per acre = \$33,317</i> | | |
| 3 | \$99,951 | \$33,317 |
| 4.8 | \$166,570 | \$34,702 |
| 5.13 | \$178,873 | \$34,868 |
| 5.5 | \$196,823 | \$35,786 |
| 2.5 | \$94,216 | \$37,686 |
| 4.8 | \$181,311 | \$37,773 |
| 5 | \$201,920 | \$40,384 |
| 2.25 | \$91,093 | \$40,486 |
| 2.5 | \$104,189 | \$41,676 |
| 10 | \$451,862 | \$45,186 |
| 7 | \$318,526 | \$45,504 |
| 9.83 | \$577,406 | \$58,739 |
| 4.8 | \$284,769 | \$59,327 |
| 5.3 | \$317,568 | \$59,919 |

Figure 3 Cost per acre for 29 participating projects

⁴ First Pioneer Farm Credit, *American Cranberry Cost of Production Study, 2004-2006 Crop Years*, pg 17.

cranberry growers are able to renovate and have bogs which produce at a rate which surpasses the cost of production.

It appears that the cost per acre for renovated bogs does not hinge on the size of the renovation relative to the total acreage farmed, as it is only minimally weighted toward favoring larger growers who will have a larger amount of cranberry bogs relative to any one renovation project.⁵ This would seem to make sense as the larger growers have a greater ability to pool their own resources or absorb the cost of equipment than do smaller growers. The other advantage, which is not clear with this data however, is the larger grower's ability to leverage debt against their assets. With renovations costing as much as they do, this could very well be an important factor in the industry in the future and further proof that we need to explore low-cost options for renovating cranberry bogs.

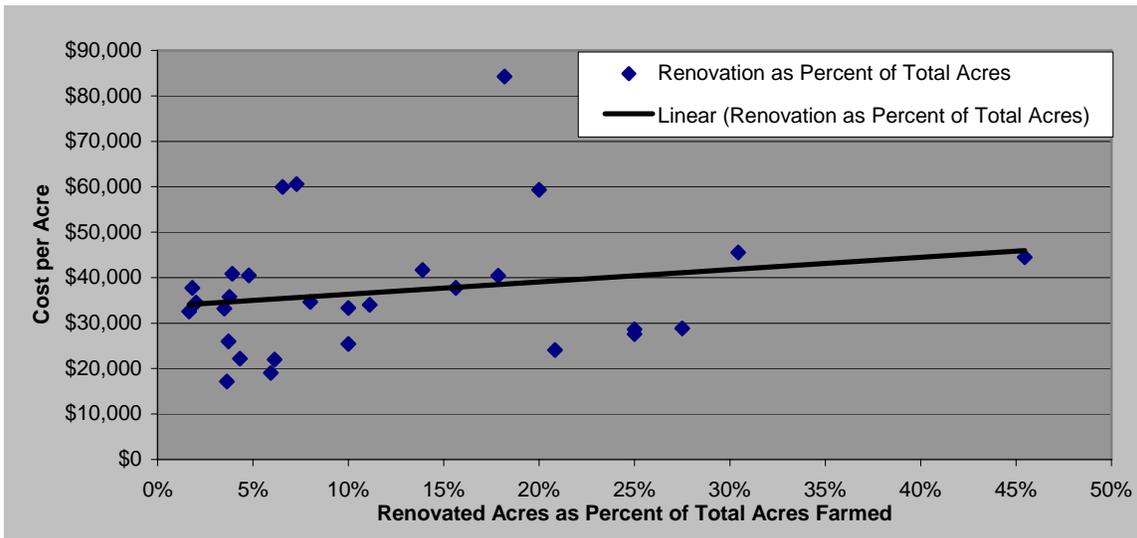


Figure 4 Renovated Acres as a Percent of Total Acres Farmed

These numbers begin to tell us something about the nature of renovations but to dig a little deeper, we wanted to look at the cash spent on these projects. In-kind contributions like a grower's own time and resources helps provide a more clear the picture of the true costs of renovation but many growers said afterward that they had never assigned a value to their own time or their own vines and they were astounded at how high the true cost of the project was. The following chart shows cash expenditures as a percentage of the total cost of the project.

⁵ Massachusetts Cranberry Cost of Renovation Study, First Pioneer Farm Credit, pg. 5

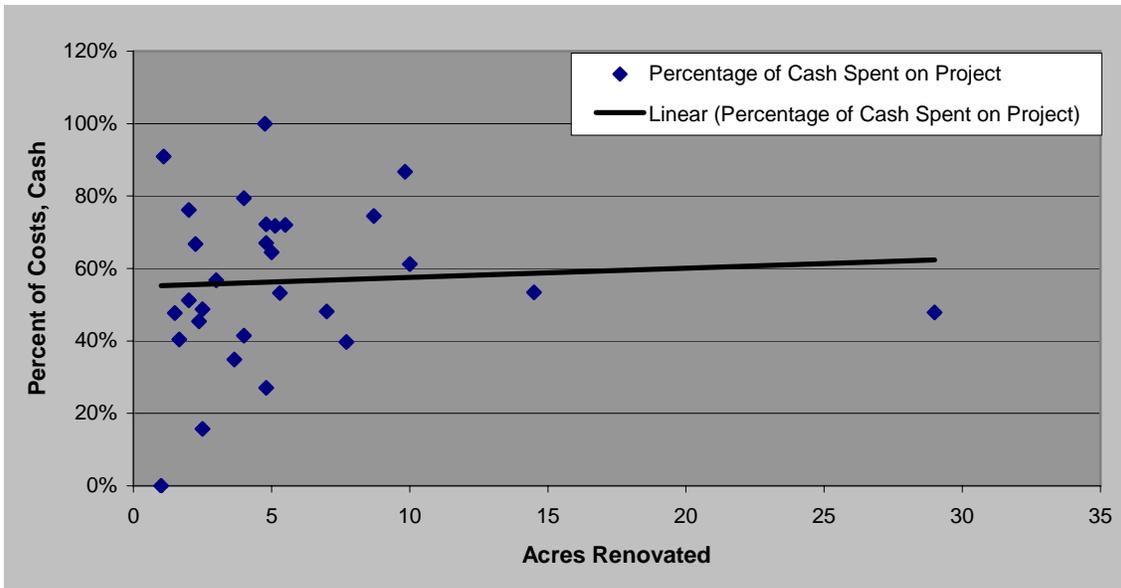


Figure 5 Cash spent on project as percent of total cost, relative to size of renovation (Correlation Coefficient of 0.063)

The average cash expenditure on these projects was 59%, ranging from 16% to 100%. The median cash expenditure is 57%. Eleven of the fourteen projects above the median cash expenditures were for renovations of fewer than six acres, suggesting that these that the smaller growers need to spend more in cash in order to renovate. The correlation coefficient of 6.3% would suggest that the opposite, that the larger a renovation is the greater percentage of the total value will have to be made up in cash expenditures. This would make sense that with larger projects there will be a greater opportunity to hire outside help. But this only tells part of the story, and a more important figure might be the amount of cash needed for a renovation project relative to size of the farming operation. Below you can see that, as would be expected, when the size of the farm increases, the less cash one will need up front to complete a renovation project.

Conclusion

This program has been extremely successful in allowing for projects that may not have been undertaken to be completed and in the course of the two years in which it has been ongoing, there have been several positive developments.

- Through the grant, the industry has received a much-valued economic boost, with growers spending more money than might have otherwise. In a time when many of the contractors hired had seen non-cranberry related work drying up in the housing and earth removal sectors, this program can be seen as the precursor to any economic stimulus spending.
- Eighteen of these projects included the installation of drainage tile in the bog to allow for better drainage as well as subsurface irrigation. This should have a positive impact on the development of those bogs while also allowing for increased savings in water usage as the plants may have some uptake of water from the root zone as opposed to coming solely from rain and traditional irrigation. As a relatively new technique in cranberry cultivation, it should help us develop a more clear understanding of the effectiveness of this technique.
- Three projects in particular are going to receive more focus as they begin to enter full production because of the low costs needed for renovation. These projects did minimal removal of bog material, opting instead to rototill the existing bog and then spreading a thinner than normal layer of sand on the bog. As the cost of running equipment or hiring equipment operators increases and sand continues to be an expensive commodity, reducing either or both has tremendous advantages in making renovations more practical.
- The planting of nearly fifty acres in new hybrid varieties that could have a tremendous increase in yield. Watching these bogs as they develop will be important to gain a better understanding of how these varieties react to true field conditions on a commercial scale.
- Renovation of existing cranberry bog has intensified since 2007. In 2009, Ocean Spray funded a fly-over of North American cranberry growing regions to obtain better GIS data layers. They identified over 700 acres of renovated cranberry bog in Massachusetts.

As per our contract, we will follow up with these projects over the next five years and continue to compile information about the bogs and their production. Following this report is a series of charts that help illustrate some other aspects of the program as well as photos showing the renovations.



CCCGA Cranberry Bog Renovation- Innovation Program Participants

| Grower | Acres | Total Cost | Grant Amount | Cash Expenses | In-Kind Cont. | Cost per Acre |
|-----------------------|--------------|--------------------|--------------------|--------------------|--------------------|---------------|
| Barry Card | 1 | \$25,403 | \$7,050 | \$0 | \$25,403 | \$25,403 |
| William Morrison | 1.1 | \$31,731 | \$11,000 | \$12,296 | \$19,435 | \$28,846 |
| Wood Family Cran. | 1.5 | \$42,881 | \$14,180 | \$20,431 | \$22,450 | \$28,587 |
| Cedar Meadow Cran. | 1.66 | \$31,650 | \$15,760 | \$12,780 | \$18,870 | \$19,066 |
| Benson's Pond | 2 | \$34,321 | \$17,161 | \$26,146 | \$8,175 | \$17,161 |
| Spring Rain Farm | 2 | \$168,556 | \$20,000 | \$86,288 | \$82,268 | \$84,278 |
| Double M Cranberry | 2.25 | \$91,093 | \$20,860 | \$60,843 | \$30,250 | \$40,486 |
| Dana Miller Cranberry | 2.37 | \$52,612 | \$22,150 | \$23,902 | \$28,710 | \$22,199 |
| GSW Cranberries, Inc. | 2.5 | \$104,189 | \$25,000 | \$50,773 | \$53,416 | \$41,676 |
| Bog Hollow Farm | 2.5 | \$94,216 | \$25,000 | \$36,867 | \$57,350 | \$37,686 |
| Rock Village Cran. | 3 | \$99,951 | \$30,000 | \$56,701 | \$43,250 | \$33,317 |
| Gilmore Cranberry | 3.65 | \$116,951 | \$31,790 | \$51,947 | \$65,004 | \$32,041 |
| Carl Hubacheck Cran. | 4 | \$110,393 | \$20,000 | \$45,728 | \$64,665 | \$27,598 |
| Standish Bog Co. | 4.14 | \$136,281 | \$40,000 | \$108,281 | \$28,000 | \$32,918 |
| Tweedy & Barnes | 4.76 | \$157,895 | \$47,600 | \$157,895 | \$0 | \$33,171 |
| Harju Brothers, Inc. | 4.8 | \$181,311 | \$47,991 | \$49,051 | \$132,260 | \$37,773 |
| Bruce Atwood | 4.8 | \$284,769 | \$48,000 | \$190,769 | \$94,000 | \$59,327 |
| Indian Head Cranberry | 4.8 | \$166,570 | \$48,000 | \$120,270 | \$46,300 | \$34,702 |
| Turkey Swamp Farm | 5 | \$201,920 | \$50,000 | \$130,270 | \$71,650 | \$40,384 |
| Beaton's, Inc. | 5.13 | \$178,873 | \$51,300 | \$128,873 | \$50,000 | \$34,868 |
| Piney Wood Cranberry | 5.3 | \$317,568 | \$53,000 | \$168,943 | \$148,625 | \$59,919 |
| K. Harju & Sons | 5.5 | \$196,823 | \$55,000 | \$141,823 | \$55,000 | \$35,786 |
| Rocky Maple Bogs | 7 | \$318,526 | \$50,000 | \$153,426 | \$165,100 | \$45,504 |
| Peltola Cranberries | 7.71 | \$185,685 | \$77,100 | \$73,776 | \$111,910 | \$24,084 |
| Hiller Bros., Inc | 8.7 | \$191,040 | \$87,000 | \$142,320 | \$48,720 | \$21,959 |
| Mann Farms | 9.83 | \$577,406 | \$95,000 | \$498,176 | \$79,230 | \$58,739 |
| Gary Randall | 10 | \$451,862 | \$100,000 | \$276,862 | \$175,000 | \$45,186 |
| Morse Brothers, Inc. | 14.5 | \$376,946 | \$145,000 | \$201,946 | \$175,000 | \$25,996 |
| A.D. Makepeace | 29 | \$952,064 | \$175,000 | \$459,393 | \$492,671 | \$32,830 |
| Totals | 160.5 | \$5,879,484 | \$1,429,941 | \$3,486,773 | \$2,392,711 | |