A Sweet Deal? Real Options Analysis of A Thick Juice Plant In Western Colorado

The sugar beet industry is beginning to enjoy a renaissance in Colorado. In 2002, more than one thousand sugar beet producers in Nebraska, Wyoming and Colorado formed a grower-owned cooperative that owns several processing facilities including two northern Colorado.

Figure 1. A Northern Colorado Sugar Plant

Sugar Beet Processing Processing plants generally acquire sugar beets within sixty miles of their location, and then convert beets into sugar using a two-step process. In the first step, beets are washed, shredded into cossettes, and placed in a diffuser that removes the beet's sucrose. The remaining product, called "thick juice," is purified, crystallized and separated into its pure sugar and molasses components in the second part of the process. A season's harvest of sugar beets is converted to sugar within four and one-half months of processing plant operation. During the remainder of the year, the plant is idle. (Figure 2 details the sugar beet process).

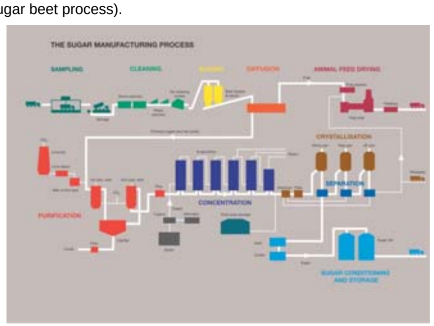

Figure 2. The Sugar Beet Processing Chart

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The Tri-River Area. Excess capacity in northern Colorado may provide an opportunity for sugar beet production to return to the Tri-River area of western Colorado. The sugar beet industry has been absent from the Tri-River Area since the mid-1970s when processing facilities were closed. In 1975, Delta County planted 2,900 acres of sugar beets, Montrose County planted 3,500 acres and Mesa County planted 4,000 acres. (Figure 2 shows the Tri-River Area and these counties).

Farmers in this area are exploring whether a thick juice processing plant that ships its product to northern Colorado is economically feasible (Figure 3 indicates the destination plant for the thick juice). Further, farmers are interested in organizing the plant's ownership as a cooperative whose shares are based in part on a delivery requirement.

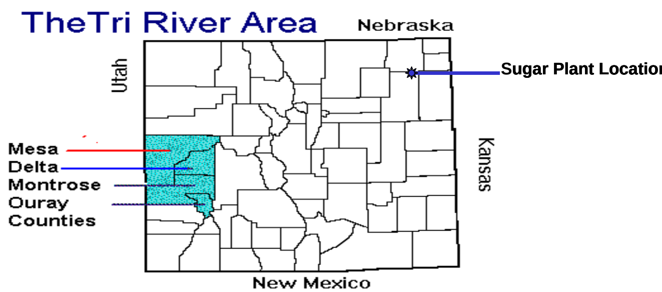

Figure 3. A Colorado's Tri_River Area

Objectives. The objectives of this study are two-fold. The first objective is to determine if a grower owned thick juice processing plant is economically feasible. The thick juice plant also has an option value for Tri-River farmers because it may give producers an initial foothold in an expanding thick juice processing industry. Therefore, a second study objective determines the option value for the thick juice plant investment and discusses the conditions under which growers should exercise the investment.

NPV Analysis. The starting point for a large-scale strategic investment analysis is a discounted cash flow method. In the case of a thick juice plant, initial investment costs are drawn from the purchase, disassembly, transport and reassembly of an existing plant with appropriate additional investment made for update and modification. Annual net returns are calculated including grower investment and payouts according to the proposed cooperative's structure. Net returns are discounted and compared against the initial investment cost for three acreage commitments scenarios (eight thousand, ten thousand and twelve thousand total acres committed). As indicated in Table 1, a minimal commitment of 12,000 acres is needed for the plant to have a positive NPV.

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Table 1 Results of the NPV Analysis for the Thick Juice Processing Plant

Time Horizon: 20 years
Discount Rate: 5%
Assumed Yield: 29 tons per acre (3% loss)

Scenario	**8,000 acres**	**10,000 acres**	**12,000 acres**
Revenues[a]	$14,314,400	$17,815,322	$21,285,157
Costs[b]	$6,985,672	$7,815,705	$8,680,107
Grower Payments[c]	$6,751,200	$8,439,000	$10,126,800
PV Cash Flow Sum	($1,044,806)	$6,841,973	$11,925,234
Capital Outlay[d]	$10,000,000	$10,000,000	$10,000,000
NPV	($11,044,806)	$(3,128,057)	$1,925,234

[a]Revenues and Costs are reported for Year 1.
[b]Costs increase at 2% per year with inflation.
[c]Grower payments fixed at $30 per ton resulting in $221.58 net receipts per acre.
[d]Initial investment is $10,000,000 from growers and $15,500,000 a grant.

Real Options Analysis. The NPV decision rule does not have a sunk or opportunity cost component; the decision rule implies either that the investment is completely reversible and capital expenditures can be recovered , or, if the investment is irreversible, that it is a now or never proposition.

However, investments can be delayed, and waiting might mean that a better investment decision can be made (i.e., a larger or smaller facility). As a result, investing today implies an opportunity cost because a portion (if not all) of the investment is sunk. This opportunity cost helps explain why firms employ "hurdle" rates for investments that tend to be substantially higher than the cost of capital. Real options analysis allows a manager to quantitatively determine the opportunity cost of immediate investment.

Table 2 incorporates the value of waiting using a timing option. The timing option provides the sugar beet producers the option to defer investment with few restrictions. That is, the model assumes that competitive or market effects have a negligible impact on the value of the project. If this assumption is true, then deferring a project relies on two factors: the growth of the asset (revenues) over time and the discount rate.

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Table 2 Timing Options for Three Acreage Scenarios

Scenario	**8,000 acres**	**10,000 acres**	**12,000 acres**
Revenues	$14,314,400	$17,815,322	$21,285,157
Costs	$6,985,672	$7,815,705	$8,680,107
Capital Outlay	$10,000,000	$10,000,000	$10,000,000
Time to Execute	3 years	3 years	3 years
Growth Rate	2.00%	2.00%	2.00%
Discount Rate	6.00%	6.00%	6.00%
Option Value	***$2,814,820***	***$1,481,870***	***$791,170***
Optimal Deferment	***35.28 years***	***20.28 years***	***8.7 years***