Photo courtesy of Dundee Citrus Growers Association

Figure 1. CUPS-grown Ray Ruby grapefruit

Return-on-investment potential of CUPS

By Ariel Singerman and Arnold W. Schumann

To exclude the Asian citrus psyllid (ACP, *Diaphorina citri*) vector of huanglongbing (HLB) and thereby produce disease-free healthy fruit, fresh citrus can be grown under protective screen structures. The expected economic benefit from adopting citrus under protective screen (CUPS) and excluding the ACP is increased yield and quality of fruit, which in turn, are expected to contribute to increased sustainability and profitability of citrus production.

> The economic benefit from CUPS is expected to contribute to increased profitability.

However, CUPS is a relatively new citrus production system and, therefore, involves new challenges and hurdles. The most salient economic hurdle is that CUPS significantly increases the cost of grove establishment due to the high cost of screen-house construction. This article summarizes an analysis that addresses the question of whether CUPS is an economically feasible investment for fresh citrus growers to deal with HLB.

ASSUMPTIONS AND CONSIDERATIONS

Data from Ray Ruby grapefruit (Figure 1) grown in the CUPS pilot project at the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) Citrus Research and Education Center (CREC) in Lake Alfred, Florida, is used for the analysis. The pilot project has generated production and input data for years 1 through 7 out of a 10-year horizon. For years 8 through 10, revenue and cost are assumed to remain at year 7 levels.

Tree spacing is 5 by 10 feet, which translates into a per acre density of 871 trees. Available data were used to compute the annual budget and estimate the annual cash flows. These are key to evaluate the profitability of adopting CUPS by computing the investment's internal rate of return. In addition, a sensitivity analysis was conducted to examine the robustness of the results to changes in key variables, in particular, the cost of establishment.

For most machinery and irrigation calculations, a 20-acre operation is assumed. Based on input from growers, the annual cost of insuring the CUPS structure against hurricanes is $2,200 per acre. Another assumption is that the land is already owned. It is estimated that the real residual land value after 10 years is $2,803 per acre, which accounts for the increase in land value and the cost of clearing the land.

Caveats of the analysis include the following. First, the amount invested in machinery and irrigation will depend on whether the grower is establishing a new operation or switching from another crop. Second, the analysis is based on retail chemical prices, but some growers may get up to a 20% discount for purchasing large chemical volumes. Third, given the experimental character of the CUPS at CREC, plants were originally planted in pots but became root-bound, causing lower vigor, diminished fruit size and lower yields. Thus, they were transplanted into the ground, which caused yield to decline significantly the year in which they were transplanted.

Importantly, if the results of the analysis show that adopting CUPS is profitable even when considering retail chemical prices and diminished yields due to transplanting, it would imply that a grower that can get a discount for purchasing large volumes of chemicals and does not lose yield due to transplanting would get an even higher return for adopting CUPS relative to those presented here.

Combining all the information and data available, including the investment requirement, cost of production, yields and prices, a financial budget was computed. Such a budget is the basis for conducting an investment analysis. This is the typical methodology for establishing the profitability of a long-term investment for which the time value of money needs to be considered.

The net present value (NPV) is one possible method for evaluation because it considers the time value of money as well as the size of the stream of cash flows. In using this method, the discount rate is key because it represents the cost of capital (or its opportunity cost). As a rule

of thumb, investments with a positive NPV should be accepted, and those with a negative NPV should be rejected. The rationale for accepting investments with positive NPVs is that they yield higher returns than the discount rate (i.e., cost of capital).

However, it would be impossible to choose or estimate a discount rate that would represent the cost of capital of all growers because each individual grower has a different opportunity cost of capital. Therefore, the internal rate of return (IRR) has been computed, which is the actual rate of return on the investment. The IRR is the discount rate that makes the NPV be zero. As such, it depends only on the cash flows of the investment.

ANALYSIS RESULTS

Given the significance of the cost of the CUPS structure and the divergence that there could be among growers in its construction, Figure 2 presents the results of the economic analysis for costs ranging from $30,000 to $45,000 per acre (or equivalently, from $0.69 to $1.03 per square foot) when considering the residual value of land at the end of the investment. The results illustrated in Figure 2 depict two cases: First is a case in which the grower purchases the insurance for the structure against hurricanes (denoted by the orange line). Second is a case in which the grower self-insures (denoted by the blue line).

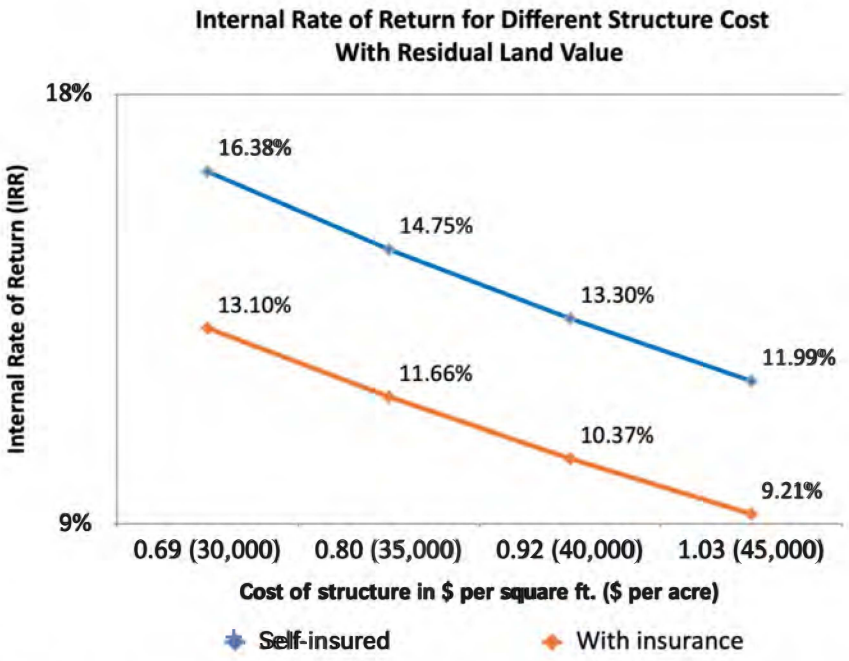

Figure 2. Internal rate of return for different structure costs for a self-insured grower and for a grower who purchases insurance for the structure against hurricanes

Thus, Figure 2 shows that when the grower self-insures, the IRR ranges from 11.99% to 16.38% as the cost of the structure decreases from $1.03 per square foot to $0.69 per square foot, implying that the investment in CUPS is profitable as long as the cost of capital (of the individual grower) is less than the obtained IRR. Figure 2 also shows that when the grower purchases insurance for the structure against hurricanes, the IRR ranges from 9.21% to 13.10% as the cost of the structure decreases from $1.03 per square foot to $0.69 per square foot, also implying that the investment in CUPS is profitable when the cost of capital (of the individual grower) is less than the obtained IRR.

The profitability of the investment in CUPS is driven not only by the increased yield per acre and high packout rates resulting from the ACP exclusion but also by the significant increase in the prices of fresh fruit in the last few seasons.

CONCLUSION

So, is CUPS an economically feasible investment for fresh-fruit citrus growers to deal with HLB? By using the data available for fresh Ray Ruby grapefruit from the pilot CUPS project at the CREC and combining it with assumptions for the remainder of the years for which data has yet to be collected, an economic analysis found that the investment can be profitable for such a citrus variety. This is due to the higher yield and quality of the fruit combined with higher market prices.

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