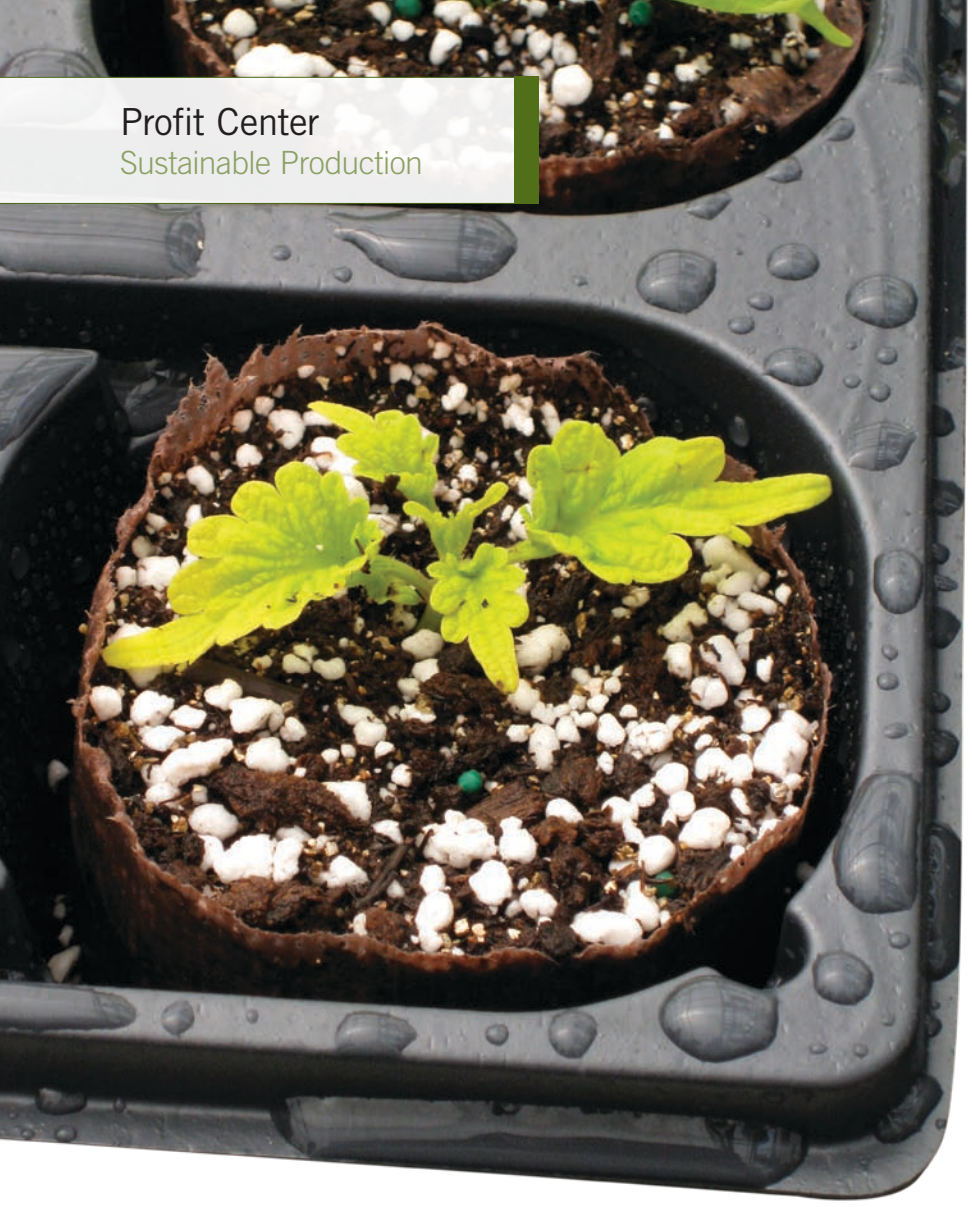

Floriculture Sustainability Research Coalition

Paper Or Plastic?

Does a conversion from plastic pots to Ellepots make sense for you? Researchers conducted an analysis to find out.

by **TANYA J. HALL, TED L. CANNADY, ROBERTO G. LOPEZ** and **JENNIFER H. DENNIS**

SUSTAINABILITY has become a commonly discussed topic within the floriculture industry. Few studies, however, have quantified whether conversion to a sustainable production practice is a worthy investment.

Therefore, we conducted a case study for a medium-sized Indiana commercial greenhouse interested in substituting plastic 4.5-inch pots with Ellepots for bedding plants. Ellepots are "pots" made from degradable non-woven paper that wraps around the growing media and can be planted directly into the soil.

To determine if the proposed practice was a worthy investment, a net present value (NPV) and financial feasibility analysis was conducted. Net present value is defined as the discounted sum of the projected series of net cash flows for an investment, including the initial investment and the terminal value of the investment at the end of the planning horizon. NPV can be used as a strategic planning tool to determine the worthiness of a new investment.

For this study, the asset approach of NPV was used, meaning the investment was evaluated upon the total financial commitment, including the loan and the capital invested from the grower.

Greenhouse Case Study

In order to produce an Ellepot similar to a 4.5-inch plastic pot, the grower would need to purchase the semi-automatic H201 Ellegaard machine (Figure 1). The semi-automatic nature of the H201 machine means workers will need to manually place the Ellepots into trays. To

Figure 1. Semi-automatic H201 Ellegaard machine.

operate the machine, the grower would need to purchase special plastic trays, paper rolls and an air dryer.

Additionally, the Ellegaard vendor recommended a specific growing media. The grower, however, wanted to evaluate the cost difference between using the current and the recommended media. Therefore, in our analysis, the grower had two purchase options: 1) Ellegaard machine and recommended media; or 2) Ellegaard machine and their current media.

NPV Analysis

Two NPV and financial feasibility analyses were conducted to determine if any of the options would be a profitable venture for the grower. Six steps are involved in the NPV analysis: 1) determine the discount rate; 2) determine present value of capital outlay; 3) determine and calculate benefits or annual cash flows for each year; 4) determine present value of benefits; 5) calculate the NPV; and 6) make a decision to accept or reject the investment.

First, the weighted average cost of capital (WACC) was calculated based on the operation's financial statements. The WACC reflects the minimum return that the company needs to earn on the investment to satisfy its providers of capital. Therefore, the investment must provide a return equal to or surpassing the WACC of 8.05 percent to be deemed profitable.

The second, third and fourth steps of the NPV analysis were calculated

Table 1. Benefits accrued between current potting machine and Ellegaard Machine.

	Current Potting Machine	Ellegaard Machine	Savings
Labor	Five employees at $8.50/hour	Two employees at $8.50/hour	$85
	130,000 pots in 18.05 hours; assumed 19 hours	130,000 pots in 40.6-43.3 hours; Assumed 45 hours	
	Cost: $0.006538/pot	Cost: $0.005885/pot	
Plastic/ Paper Pot	$9,581 for 130,000 pots	Each roll: $255.71/1000m; 1400 m of paper	$6,359.05
	Cost: $0.0737/pot	Need 8.36 rolls[1]; assumed nine rolls	
		Cost: $0.02478/pot	
Plastic tray	$9,620 for 13,000 trays (10 pots/tray)	Trays can be used twice; assumed one use	$4,420
	Cost: $0.0740/tray/pot	Cost: $0.04/pot	
Media	$185/bag; each bag fills 3,093 pots	Recommended media option	($1,551.25)
	$7,955 for 43 bags	$91.26/m³; each bag fills 1,248 pots	
	Cost: $0.06119 per pot	$9,506.25 for 104.17 bags	
		Cost: $0.073125/pot	
		Current media option:	$4,914.99
		$185/bag; each bag fills 7,911.15 pots	
		$3,145 for 17 bags	
		Cost: $0.010112/pot	

[1] Rolls calculated as following: (130,000/(140 /0.09))

Figure 2. Ellepots in a plastic tray and roots of a marigold emerging from an Ellepot.

through a spreadsheet developed in Excel, outlining the benefits gained from the conversion and the expected expenses. Table 1 outlines the differences (savings or losses) in costs between producing 130,000 pots when using the Ellegaard machine versus the current potting machine.

Using @RISK, an Excel simulation software package that allows for variability in assumptions, an inflation rate was imposed on the costs of labor, plastic/paper pots, plastic trays and media supplies. The range of inflation rates used in the model was between 1.55 and 3.85 percent based on United States' inflation rates over the past 12 years.

Table 2: Ellegaard and Media Options with NPV and Internal Rate of Return (IRR)

	NPV Range			IRR
	Low	High	Average	
Ellegaard Machine with Recommended Media	$26,746	$28,852	$27,826	18%
Ellegaard Machine with Current Media	$71,761	$74,894	$73,460	29%

If growers use the Ellegaard machine, they will see savings in the areas of labor, plastic trays and the replacement of plastic pots for paper sleeves. The grower would also realize savings in the amount of media purchased if they continue to use the current media instead of the recommended media. The only caveat to the expected benefits is that the Ellegaard machine would take 26 additional hours to produce 130,000 pots than the current machine.

Use of the Ellegaard machine will create several new expenses for the greenhouse operation. Expected new expenses from using the Ellegaard machine are as follows: $38,200 for a new machine, $2,500 for training and set-up of new machine, $1,000 per year for maintenance, $1,000 for an air dryer, electricity, depreciation and taxes.

Due to the Ellegaard machine being relatively new in the industry, estimation was used to determine the life of the machine. The life expectancies were assumed to be 20 years for a new machine. Although the training and set-up of the new machine expense is optional, it was determined that it would be a beneficial expense for the grower.

It was recommended to allocate funds toward potential maintenance, although very little maintenance is expected. Electricity use by the Ellegaard machine is expected to be minimal, with an expected cost of $20 to $25 a year. An air

Table 3. Financial Feasibility Analysis of Ellegaard Machine Purchase

	Loan Length (years)	Interest Rate	Total Capital Output	Down payment (10 percent)	Amount Financed	Annual Loan Payment	Surplus
New Ellegaard Machine	15	8%	$41,700[1]	$4,170	$37,530	$4,385	$145,660

[1] $38,200 for the machine, $2,500 for training/set-up, and $1,000 for the air dryer

dryer and compressor is needed to operate the Ellegaard machine, and the operation will need to purchase an air dryer as it currently has an air compressor. The recommended air dryer is an Ingersoll Rand D251N, and was assumed that the operation may need to purchase a new air dryer every five years at $1,000 apiece. A straight-line depreciation of seven years is used for the Ellegaard machine and five years for the air dryer, reflecting standard depreciation processes for agricultural equipment. Taxes were estimated to be 30.76 percent – 25 percent for federal and 5.76 percent for state and local taxes.

After inputting the savings (or losses) and new expected expenses, the grower had a positive annual net cash flow for all years of the machine and for both options. The Ellegaard machine with current media had the highest NPV and internal rate of return (IRR) (see Table 2). The Ellegaard machine with the recommended media also had a positive NPV, although it was roughly $45,000 less than the options using the current media. Therefore, the investment would be a worthy investment as the rate of return is higher than the WACC (8.05 percent).

Financial Feasibility Analysis

The next step for analyzing an investment is to see if it is financially feasible, meaning will the project cash flow itself? The financial feasibility analysis is conducted in five steps: 1) calculate annual net cash flows; 2) calculate loan repayment schedule; 3) calculate tax savings from interest deductibility; 4) calculate after tax payment schedule; and 5) calculate surplus or deficit from each year.

Tax savings are calculated by multiplying the interest payment by the tax rate

(30.76 percent). Of the two options originally considered, only the option with the highest NPV will be discussed in the financial feasibility analysis (Ellegard machine with the current media).

It was assumed the grower would obtain a 15-year loan at 8 percent. Table 3 outlines the total initial capital output, expected down payment, annual loan payment and surplus for the Ellegaard machine. The grower would realize a surplus from the expected loan payments and production savings. Therefore, this option would be financially feasible.

Discussion

From the NPV and Financial Feasibility analysis, we determined if the medium-sized greenhouse adopted the H201 Ellegaard machine and its respective supplies, the investment would be profitable and financially feasible. In the early stages of discussion with the sales representative for the Ellegaard machine, there was doubt the investment would be financially feasible. However, after taking a close look at the operation's expenses, especially with the plastic pots and trays and the need for fewer bags of the current media, the grower will be able to offset the expense of buying the machine with the expected savings.

The most profitable option for the grower would be purchasing the Ellegaard machine and using the current media followed by the option of purchasing the Ellegaard machine and using the recommended media. The downside of the investment is the Ellegaard machine would take an additional 26 hours to produce the 130,000 pots than the current machine. For this operation, conversion of 130,000 plastic pots to sustainable Ellepots would be profitable.

However, other operations will need to carefully compare the expected expenses before deciding to convert to using the Ellegaard machine to produce Ellepots. Likewise, it will be important to ensure that the non-woven degradable paper fits the needs of the grower's customers. **GG**

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