MANAGEMENT STRATEGIES FOR GREENHOUSE GROWERS IN A COMPETITIVE ENVIRONMENT

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Abstract

A study among 26 Dutch chrysanthemum firms was performed between November 1993 and November 1994 to (a) assess the relative economic performance of each firm and (b) compare three strategies used by growers in getting high economic results. These strategies, related to the theory of Porter (1985), are (1) a cost advantage strategy, (2) a quality strategy, and (3) a market strategy.

Although cost information was incomplete, a firm-specific measure could be defined and calculated for the economic performance of each firm. This economic performance was defined as the quotient of actual and normative gross returns. Normative gross returns are estimated by means of loglinear regression with firm structural variables as independents. Positive deviations from the normative level mean that these growers have followed a successful strategy towards quantity, quality, and/or market.

Variations between gross returns per m^2 are very large. The total range is from 26% below average to 39% above average. Part of this variation can be attributed to differences in the firm's technology. However, the resulting range in economic performance remains considerable: minus 16% to plus 17%.

Being better than average in one area only (quantity, quality or market) usually is not enough for having a better-than-average *overall* economic performance. Dividing one's attention to all three, or at least two areas, usually gives better results.

Key index words

Farm management, Competitive strategies, Greenhouses, Chrysanthemums

1. Introduction

Part of the success of Dutch greenhouse production was a spectacular rise in production per m^2, leading to decreasing costs per unit of output, despite rising prices of labor and land. But after a 'golden age' of growth and profits, many greenhouse producers now face saturated markets with falling prices. The decline in selling price exceeds the decline in cost, which

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leads to a low or even negative profit for many firms. Besides a declining average profit, there is a large variation in financial results, as there has always been in agriculture (Zachariasse, 1974). Even firms with more or less the same technology, operating in a similar environment show considerable variation in technical and economic results due to differences in managerial capacity between growers (Alleblas, 1988). Firms that operate persistently at the lower end of the financial ladder will sooner or later get into financial trouble and will be forced to stop producing.

In this paper we look at managerial strategies growers can adopt to perform well and to be competitive. We will make use of the theory of Porter (1980, 1985) who described three basic strategies for acquiring competitive advantage. In dealing with this subject we will also address the problem how to measure performance and competitiveness.

2. Methods and material

The data of this empirical research refer to a group of 26 fully specialized chrysanthemum firms, producing flowers throughout the year in heated greenhouses. All firms are located in the areas "Westland" and "De Kring," two major greenhouse regions in the Western part of The Netherlands, near the cities of The Hague and Rotterdam. They were randomly drawn from a mailing list of the Dutch Federation of Horticultural Study groups (NTS). From November 1993 to November 1994, these firms supplied data on the firm production technology, production processes and financial yields. Every grower was asked to record all sales per period of four weeks, corresponding to the administrative system of the Dutch auctions, for every cultivar in production. Furthermore, dates of harvest, length of vacancy, dates of subsequent planting, and plant density were recorded for every production cycle in every section of the greenhouse. Finally, data on average price levels for all chrysanthemum cultivars were supplied by the Dutch Federation of Flower Auctions (VBN).

Net firm result as the difference between all financial returns and all costs would be the ideal measure of economic performance. However, since not all costs of production could be made available in this research, we use a statistical technique to estimate the economic performance. First, a normative level of quality, quantity, and gross returns for each firm is estimated, given the available information on firm technology. Then, the actual levels of quality, quantity, and gross returns are related to the normative levels, yielding measures of competitive performance.

By choosing a certain strategy, each grower can put emphasis on either price or quantity related aspects. Three alternative competitive strategies will be compared: 1) a cost advantage strategy, 2) a quality strategy, and 3) a market strategy. These strategies rely on Porter's strategies of cost advantage, differentiation and focussing (Porter, 1985).

To improve the understanding of the figures and the measures firm/grower X will be used as an example throughout the following text.

3. Differences in firm technology

The characteristics of the research group are given in Table 1. The average gross returns per m^2 show an enormous variety between firms, from 67.1 to 126.1 guilders per m^2 per year, with an average of 90.8. The average selling price of these 26 firms is 47.5 cents per flower. One firm manages to get 63.9 cents on average during the year; the lowest score is 39.2 cents. Weighted with quantities, the average price is 48.0 cents per flower, which lies somewhat above the average price of the total production sold at the Dutch auctions in the same period: 46.4 cents.

The average size of the chrysanthemum production area of these sample firms is 1.35 hectares. The difference between this figure and the average chrysanthemum area of the firms in the population (769 hectares :732 firms =1.05 hectares per firm; (LEI-DLO, CBS, 1995) can be explained from the fact that non-specialized firms, usually with small areas, were excluded from the research.

Table 1. Firm characteristics and financial results of 26 Dutch specialized chrysanthemum firms during the research period Nov. 1993-Nov. 1994.

Var.	Description	Average	Range	
			Minimum	Maximum
R	Gross returns (per m^2;Dfl.)	90.8	67.1	126.1
P	Avg. selling price (Dfl.)	0.47	0.39	0.63
		5	2	9
Q	Quantity flowers p. yr. (p. m^2)	191.2	163.4	226.4
AG	Age participant (yrs)	37.3	22	52
EX	Experience as chrys.grow. (yrs)	12.4	2	25
NO	Number of entrepreneurs	1.7	1	4
NA	Net production area (ha)	1.35	0.65	2.82
NS	Number of sections	19.8	11	38
AA	Avg. area of section (m^2)	754	297	2045
MO	Avg. year of construction greenhouse	1982.4	1970	1992
WW	Avg. width window (cm)	87.9	59.5	112.5
AS	Assimilation lights (1=total area)	0.32	0	1
CO2	Central CO_2 (1=yes, 0=no)	0.88	0	1
SF	Times soil fumigation	1.4	0	4.5
LA	Estim. labor use (hrs/m^2/yr)	0.68	0.52	0.92
		9	6	5

To establish a fair basis for comparison of competitiveness between firms, a normative level of gross returns (RNORM) will be estimated for each firm and related to its actual gross returns (R). Ordinary least squares (OLS) is used as estimation technique, with the actual level of gross returns as the dependent variable and the available resources as independent variables. This approach is similar to the estimation of a frontier production function, where firm data on inputs and outputs are used to estimate efficient production possibilities. The distance between the frontier production function and the actual data define the level of technical (in) efficiency (see Battese, 1992, for an overview). Here economic (in)efficiency is estimated. Based on 26 firms, the regression results are as shown in formulae (1) to (3):

$$\mathrm{Log}(R) = -137.1 + \underset{(6.2)}{18.4}\,\mathrm{Log}(MO) + \underset{(0.046)}{0.199}\,AS + \underset{(0.150)}{0.232}\,\mathrm{Log}(LA) + E_1 \qquad R^2=0.54 \qquad (1)$$

$$\mathrm{Log}(Q) = -40.4 + \underset{(4.9)}{6.0}\,\mathrm{Log}(MO) + \underset{(0.037)}{0.014}\,AS + \underset{(0.119)}{0.066}\,\mathrm{Log}(LA) + E_2 \qquad R^2=0.07 \qquad (2)$$

$$\mathrm{Log}(P) = -96.7 + \underset{(5.5)}{12.4}\,\mathrm{Log}(MO) + \underset{(0.041)}{0.185}\,AS + \underset{(0.134)}{0.167}\,\mathrm{Log}(LA) + E_3 \qquad R^2=0.52 \qquad (3)$$

$$R = P * Q \tag{4}$$
$$RNORM = PNORM * QNORM \tag{5}$$

where:

R,P,Q,MO,AS,LA	see Table 1
RNORM,PNORM,QNORM	estimates of R, P and Q, derived from formulae (1) - (3)
Log(.)	natural logarithm function
$E_{1,2,3}$	error terms
R^2	rate of explanation
(...)	standard deviations of estimated parameters

Regression formula 1 shows that the level of gross returns per m² depends on the modernity of the greenhouse (MO), whether or not the greenhouse is equipped with assimilation lights (AS) and the amount of labor available (LA). Other characteristics of the available resources (see Table 1) do not have a significant influence on the level of gross returns per m².

As an example, the estimated normative level of gross returns of grower X, given MO(x)=1977.6, AS(x)=0 and LA(x)=0.652, is 80.3 guilders (formula 1). In reality, his gross returns were 76.4 guilders, 4.9% below the norm. The quantity delivered by X, however turns out to be all right: the real level (193.9) exceeds the estimated level of formula 2 (187.2) by 3.6%. But, the price he gets is only 39.4 cents per stem, where it should be, given the state of his resources, 42.9 cents (formula 3). So his price lies 8.2% below the norm. What does this mean in terms of competitive strategies?

4. Cost advantage strategy

The aim of this strategy is to produce flowers at a low cost. To achieve the aim of cost advantage (in the short run) a grower can try to minimize the costs of variable inputs, e.g., by improving the labor-efficiency of the firm, or by negotiating reductions for cuttings. However, the latitude in this respect is limited. Another instrument for realizing cost advantage is production planning. With outstanding production planning, a grower can produce a higher quantity of flowers per year, and in this way decrease the cost *per flower*. The differences in the production planning between farmers are large: (Table 2).

The quantity of flowers produced (and sold) is 191.2 per m² per year on average, with a minimum of 163.4 (-15%) and a maximum of 226.4 (+18%). 'Our' grower X performs well with respect to his production planning. The quantity he supplies during the year is 193.9 stems, which lies 1.4% above the average (see Table 2) and 3.6% above the norm (formula 2). A strong point in his production planning (and implementation) is a low vacancy of greenhouse space. Nearly all plantings take place the day after the previous harvest is finished, in which case the vacancy is set at zero. Sometimes X even manages to start and finish planting on the same day of final previous harvesting, in which case the vacancy is set at minus 1. On average, the vacancy at firm X is 0.0, whereas on other firms it is 1.3 days.

Table 2. Results of the production planning of 26 Dutch chrysanthemum firms during the period Nov. 1993-Nov. 1994.

			Range	
Var.	Description	Average	Minimum	Maximum
Q	Quantity sold p. year (per m^2)	191.2	163.4	226.4
DEN	Avg. plant density (per m^2)	47.7	44.0	55.8
WA	Avg. waste (%)	4.8	0.3	9.8
S				
NC	Number prod.cycles p. year	4.21	3.73	4.79
LPC	Length product.cycle (days)	86.7	76.2	97.9
PT	Planting time (days)	1.4	1.0	3.5
GT	Growing time (days)	79.9	72.3	88.8
HT	Harvesting time (days)	4.1	2.2	7.2
VAC	Vacancy (days)	1.3	-0.5	5.1

5. Quality strategy

Growers may deliberately extend the length of the production cycle to improve the quality of their flowers, as part of a quality strategy. A long period of (vegetative) growth will lead, for instance, to heavy stems which on average yield higher prices at the auction. The aim of the quality strategy is to get a relatively high price for the product. The difference in selling price should at least compensate the extra costs incurred, including the opportunity costs because of a delay in the production cycle (i.e. loss in production).

Here, the prices at the auction are taken as a measure for the quality delivered. The price grower X receives for his cultivar(s) compared with the average price colleagues receive, for the same cultivar(s) in the same period, gives an indication of the quality of the products supplied by X. In formula:

K(x) = P(x) / P(¬x,assort x) with (6)

K(x)	the overall quality index of the products of grower X
P(x)	the overall weighted average price grower X receives
P(¬x,assort x)	the overall weighted average price other growers, except X, receive for the same assortment (as X)

The average quality index (KAVER) of these 26 firms is 1.023. So the quality delivered by this group is 2.3% higher than the average supply at the auction during the research period. The quality index of grower X lies below the average: 0.92. This, however, does not reflect his true quality effort, since his firm's technology has not been taken into account. To assess the quality effort made by the grower, the actual quality level is adjusted by a factor which contains the normative price level (formula 3); as follows:

KPERF(x) = K(x) * PAVER/ PNORM(x) * 1/KAVER where (7)

KPERF(x)	the quality performance of grower X
PAVER	the average price of all 26 participants; see table 1
PNORM(x)	the normative price level for grower X, according to regression formula 3
KAVER	the average quality index of all 26 participants; KAVER = 1.023

The last factor in (7) yields an average quality performance of one. In the case of grower X, whose firm technology is less modern than average and so his normative price level (0.429) is less than PAVER (0.475), his actual quality level is multiplied by a factor (0.475 / 0.429 * 1 / 1.023) to get a quality performance of 0.99. So, the estimated quality effort for grower X lies only 1% below average, although the price actually received (0.394) lies far below average (0.475). Part of the explanation of this difference lies in the state of his firm's technology. Another part of the explanation lies in a rather unsuccessful cultivar choice, as we will see now.

6. Market strategy

Like the quality strategy, the market strategy is aimed at getting high prices. Whereas the quality strategy can be performed regardless the cultivars in production, the keystone of this strategy is the cultivar choice. Every year dozens of new cultivars with different colors, shapes, and other characteristics are presented to growers by breeders. Growers who adopt the market strategy try to predict the right cultivar, i.e. the niche in the market at the time of delivery, the opportunity that most others will miss. A variant of this market orientation is growing other products during (expected) bad seasons, e.g. sunflowers during part of the year. Also some growers try to make higher prices by directly dealing with traders. Since all participants are members of the cooperative auction, and thus have to deliver all their products to the auction, this may seem illegal, but it is allowed to some extent by the existence of a mediation agency (*bemiddelingsbureau* in Dutch) which operates under the umbrella of the auction. Growers and buyers can make contracts for a longer time, containing agreements on prices and special wishes for package, etc. Prices in these deals are usually related to the prices at the auction.

Another part of this market strategy is to supply as much as possible in the profitable periods with high prices. Usually prices in winter are much higher than in summer. Also peak prices can be received in advance of special days, like Valentine's Day, Easter, Mother's Day, and All Saints' Day. However, the latitude in this respect is small. Once planted, chrysanthemums must obey the laws of biology. Once harvested, they cannot be stored very long. Flowers are a delicate matter.

The market performance (M) will be estimated from the following definitions:

PPERF(x) = KPERF(x) * MPERF(x) with: (8)

PPERF(x) = P(x) / PNORM(x) (9)

which states that the price performance (PPERF) can be split into two components: the quality performance and the market performance. Using the expressions for KPERF (equations 6 and 7) equations (8) and (9) can be rewritten as:

MPERF(x) = P(¬x,assort x) / PAVER * KAVER where: (10)

MPERF(x)	the market performance of grower X
P(¬x,assort x)	see formula (6)
PAVER	see formula (7)
KAVER	see formula (7)

So, the normative market performance of grower X is measured by the price ratio of his specific cultivar assortment and the complete chrysanthemum assortment (and a factor to ensure an average value of one). It reflects how well grower X selects his cultivars. Since P(¬x,assort x) and PAVER are weighted averages based on relative quantities per period, expression (10) also shows how good the distribution of the total supply over the periods has been.

The estimated market performance of 'our' grower X is 0.93. So his performance in this respect is 7% below average, 5.5% of which can be attributed to an unsuccessful cultivar choice-X grew 'Reagan White' and 'Reagan Sunny,' very popular cultivars at that time among growers-and 1.5% to a worse than average distribution throughout the year.

7. Results competitiveness

The overall performance will be defined as the quotient of actual gross returns and normative gross returns:

PERF(x) = R(x) / RNORM (x) (11)

This overall performance can be split into three components: the cost advantage performance (or quantity performance), the quality performance and the market performance:

PERF(x) = QPERF(x) * KPERF(x) * MPERF(x) (12)

Ten firms show an overall performance above the average level of 1.00, 15 firms score below it and one firm lies on the average (see Table 3). The range in overall performance is 17% above average (firm C) till 16% below average (firm H). The ranges between the lowest and the highest value for the partial performances are in the same order of magnitude: about 15% below till 15% above average. The range in QPERF is the largest (38%), followed by MPERF (31%) and KPERF (27%).

To investigate which area had the biggest influence on the overall performance partial correlations were calculated as well as a multiple linear regression was executed. In both cases, the influence of the quantity performance was the highest (partial correlation R=+0.53; T-value in regression +49.9), followed by the market performance (R=+0.44; T=+48.8) and quality performance (R=+0.29; T=+39.6).

8. Conclusions

Although cost information is incomplete in this study of 26 chrysanthemum growers, a firm-specific measure can be defined and calculated for the economic performance of each firm. This economic performance is defined as the quotient of actual and normative gross returns. Normative gross returns are estimated by means of loglinear regression with firm structural (technological) variables as independent variables. Positive deviations from the normative level mean that these growers have followed a successful strategy towards quantity, quality, and/or market.

Variations between gross returns per m^2 are very large. The total range is from 26% below average to 39% above average. Part of this variation can be attributed to differences in the firm technology. However, the resulting range in economic performance remains considerable: minus 16% to plus 17%. These results, based on empirical data, are in line with simulation results of Leutscher (1995) who shows significant effects on net farm income and annual returns of active, short term, marketing strategies in greenhouse production (pot plants).

Being better than average in one area only (quantity, quality, or market) usually is not enough to cause a better-than-average *overall* economic performance. Dividing one's attention to all three, or at least two areas, usually gives better results.

Further research will be done to question why and how some growers succeed in getting a relative higher performance than others. This approach includes defining, observing and measuring the role of the managerial capacity of the grower.

Table 3. Overall performance (PERF), quantity performance (QPERF), quality performance (KPERF) and market performance (MPERF) of 26 chrysanthemum firms during the period Nov. 1993-Nov. 1994; average level = 1.00

FIRM		PERFORM.			
NUMBER	CODE	PERF	QPERF	KPERF	MPERF
1	A	1.10	0.93	1.08	1.09
2	B	1.06	0.96	0.95	1.17
3	C	1.17	1.10	1.01	1.05
4	D	0.91	1.01	0.91	0.98
5	E	0.85	0.89	1.09	0.87
6	F	1.00	0.93	1.10	0.98
7	G	0.92	0.99	1.02	0.91
8	H	0.84	0.96	1.00	0.88
9	I	0.92	0.82	0.95	1.18
10	J	0.96	1.06	0.91	0.99
11	K	0.88	0.97	0.83	1.09
12	L	0.92	0.94	1.04	0.95
13	M	1.10	1.03	1.03	1.04
14	N	0.97	0.96	1.05	0.96
15	O	0.98	1.12	0.97	0.91
16	P	0.97	0.93	1.06	0.98
17	Q	0.98	0.98	0.95	1.06
18	R	1.10	1.01	1.09	1.01
19	S	1.15	1.12	0.96	1.07
20	T	0.92	0.99	1.01	0.92
21	U	1.09	0.99	1.04	1.07
22	V	1.15	1.04	1.01	1.09
23	W	0.99	1.04	1.01	0.95
24	X	0.95	1.04	0.99	0.93
25	Y	1.09	1.20	1.01	0.90
26	Z	1.16	1.08	1.07	1.00

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