Selection of marketing channels by intensive horticultural crop growers in Almería

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Abstract

The province of Almería is home to the largest concentration of greenhouses in Europe. Its produce is now one of the main sources of vegetables for the continent between autumn and spring, but the growth experienced by this system would not have been possible without the simultaneous development of marketing systems at origin, in particular those of auctions and associative organisations. A survey of horticultural crop growers in the Almería province showed their preferences for different marketing channels. The influence of characteristics such as grower age, aversion to risk, family size and holding size on these preferences was determined using Logit models.

Key words: marketing at origin, Logit model, greenhouses, Almería.

Resumen

La elección del canal comercial en la horticultura intensiva almeriense

En la provincia de Almería se localiza la mayor concentración de invernaderos de toda Europa, siendo ésta una de las principales zonas abastecedoras de hortalizas en las estaciones de otoño a primavera. El crecimiento experimentado por este sistema productivo no hubiera sido posible sin el desarrollado simultáneo de sus agentes de comercialización en origen, destacando entre todos ellos el sistema de subasta y las entidades de comercialización de tipo asociativo. A partir de los datos de una encuesta realizada a horticultores de la provincia de Almería, se analizan en este trabajo las preferencias de los agricultores por los sistemas comerciales mencionados, estimando mediante modelos Logit la influencia que en la elección de la forma de comercialización del productor tienen algunas características del empresario o de la explotación hortícola, como son la edad del agricultor, la aversión al riesgo, el tamaño familiar, y en general, la dimensión de la explotación.

Palabras clave: comercialización en origen, modelos Logit, invernadero, Almería.

Introduction

The coast of the Province of Almería is home to some 27,000 ha of greenhouses (Junta de Andalucía and Cajamar, 2000) —half of all the area occupied by this type of production in Spain. Horticultural activity in this province has increased spectacularly in the last two decades. In 2000, nearly 2.5 million tonnes of vegetables worth some € 1,200 million were produced— about 20% of Spain's entire horticultural production (Table 1).

[1] For further information on the current situation and outlook for Almerian horticulture, the work of Ferraro *et al.* (2000) and García (2002) (among others) is recommended.

Almería's climate and the use of plastic sheeting greenhouses have allowed this province to specialise in the production of out-of-season vegetables[1]. Much of its output supplies European markets during autumn, winter and spring. One of the main vegetable-producing centres of Spain, particularly with respect to courgettes, peppers, melons and tomatoes, Almería exports 54.6% of its produce: in 1999, the export of pulses, vegetables and root vegetables from the province was valued at € 759 million – 76% of its export earnings (Cámara de Comercio, Industria y Navegación de Almería and Cajamar, 2001).

The growth of this activity over the last two decades has been accompanied by the simultaneous development of auxiliary industries linked to the production of input materials, as well as the transformation and marketing of vegetables. It is estimated that altogether, these au-

Table 1. Horticultural production in the province of Almería (2000)

Vegetables	Surface area (ha)	Production (t)	Value (millions of €)
Tomatoes	8,075	680,890	364.21
Peppers	8,522	477,232	329.85
Cucumbers	3,636	272,708	134.39
Green beans	5,080	78,993	93.05
Courgettes	3,751	209,602	86.92
Melons	5,926	211,024	88.78
Water melons	5,828	331,525	69.73
Lettuce	5,370	128,214	31.59
Aubergines	1,115	66,900	24.12
Others	1,689	32,764	1.23
Total	48,992	2,489,852	1,232.22

Source: *Consejería de Agricultura y Pesca* (Agriculture and Fisheries Council) (2001).

xiliary activities (including the construction of greenhouses, the production of plastic, irrigation systems, agrochemical products, packaging, the provision of seed, and the manipulation and marketing of products) generates more than € 450 million and some 47,000 jobs (figures for 2000) in Almería (Cortés *et al.*, 2002). Within this complex and integrated agricultural system, the distribution role played by marketing organisations at the point of origin is very important.

As in other vegetable-producing areas of southeastern Spain, horticultural growers in Almería have two main options for marketing their produce (Molina, 1992):

1. *Auction*: a traditional marketing event attended by both growers with their products and by potential buyers, in whose warehouses the event takes place. Produce is sold by downward auction. In this system, growers act individually, releasing all control of their goods at the moment of sale.

2. *Associative systems*: this includes commercial systems in which growers act as a group (for example as agricultural marketing cooperatives or *Sociedades Agrarias de Transformación* - agricultural transformation societies: ATS). Growers take their produce to association warehouses for later sale at the destination market: they therefore take part in commercial stages that generate added value to their produce, and participate in its marketing.

The aim of this paper was to determine whether the personal characteristics of growers (e.g., age, level of education, family size) or those of their business (e.g., the size of their holding, its location, or the type of worker employed) affect the choice of marketing channel. Growers were asked to complete a questionnaire to provide until now quite scarce primary information on the sector, particularly about its marketing side. Choosing an individual or associative marketing channel depended upon how well the grower was adapted to these, the size of the business, the availability of a family work force and the degree of dedication to horticultural activity.

Material and Methods

All the findings reported in this work are the result a survey, performed in 1998, of 302 intensive horticultural crop growers from the province of Almería. All were interviewed personally. The sample of interviewees was chosen randomly from the nearly 14,000 horticultural exploitations in the province. The distribution of the sample corresponded to the ratio of the number of holdings in the two main producing regions of the province (84% from the Dalías area and 16% from the Níjar area). This survey, part of a wider study on this production system, contained questions on the main marketing channels used, the location of the different holdings, their surface area, and on the characteristics of growers that were believed might determine the commercial decisions made. With the number of interviews performed, and taking into account the total number of growers in the region[2], the statistical error that might be expected was 5.6%.

Logit models

Discrete choice, categorical and qualitative econometric models were taken into account for analysing the presence of variables with discrete and finite values. Following preliminary univariate and bivariate analyses of the survey data, the binomial Logit model was chosen because of its ease of use and its good econometric properties (Maddala, 1983; Millán and Ruiz, 1987). Although in Spain, Logit models have often been employed (Laffarga *et al.,* 1987; Ferrando and Blanco, 1998; Ramírez, 1998), their use in the analysis of agricultural marketing channels has been reduced. The most impor-

[2] According to data provided by the *Consejería de Agricultura y Pesca,* there are some 13,700 horticultural exploitations using plastic sheeting greenhouses in Almería.

tant studies in which they have been used in Almería include an investigation into the adoption of innovations (Millán and Ruiz, 1987) and an assessment of the willingness to pay for water for horticulture in southeastern Spain (Colino and Martínez, 2002). Logit models have often been used to study consumer behaviour (Fernández and Grande, 1993), to study the choice of retailer (Ruiz and Iglesias, 1998), and to study consumer preferences with respect to *appelation contrôleé* products (Bonnet and Smioni, 2001) and genetically modified foods (Baker and Burnham, 2001). The review by González (2001) is an exhaustive work on such studies.

Given a categorical dependent variable Y that takes the value of Y = 1 when one of two possible options occurs, or Y = 0 when the other occurs, binomial Logit models allow one to examine the probability of which Y event will occur as a function of a vector of characteristics X and a series of parameters β. This can be represented as:

$$Y_i = X_i \beta + u_i \qquad (1)$$

Thus, the probability that a grower will adopt the option Y = 1 can be obtained from the expression:

$$Pr(Y = 1) = F(X_i, \beta) = \frac{e^{X_i\beta}}{1 + e^{X_i\beta}} \qquad (2)$$

It is supposed that F is a logistic distribution function (hence the name «Logit model»). For more information on the theory of discrete choice models, the works of McFadden (1974), Amemiya (1981), Gallastegui (1985) or Maddala (2001), amongst others, should be consulted.

The Logit model proposed in the present work involves the variable of marketing (which takes the value 0 when this is performed by auction and 1 when performed by any other system (mainly two very similar associative systems –cooperatives and ATSs), and another series of variables (which along with their different discrete or continuous levels are described in the next section).

All grower and exploitation variables were included in an initial Logit model. To make an adequate choice of variables to be included in the final models, stepwise discriminant analysis was performed. Different variables were either included or excluded from the final models by determining their significance when acting together, independent of the reference level considered. For this, a likelihood ratio test was used, comparing the complete and restricted models. After

multiple simulations, this led to the evaluation of two Logit models (the results of which are shown below). The evaluation process used was that of maximum likelihood, employing the Newton Raphson algorithm to provide the convergence. All calculations were performed using Limdep 7.0 statistical software (Greene, 1995). The appropriateness of the models was evaluated in terms of the joint significance of the same model, their coefficients and predictive capacity. The last of these was estimated by examining the percentage of correct predictions made. Other measurements of the goodness of fit of the models finally selected included evaluation with the above-mentioned likelihood ratio test and McFadden's pseudo R^2 test (Greene, 1999).

Results

Characterisation of growers and their holdings

The mean surface area of the holdings covered by the survey was 14,675 m^2 (SD = 13,383 m^2). Therefore, in this province, horticultural holdings are generally small but activity very intense. Although the variation around the mean is high, there are few very large holdings (as is common in the neighbouring province of Murcia). Despite the largely familial character of this activity in Almería, important differences were seen in the size of businesses according to the marketing channel used: the mean size of the holdings of auction users was only 12,898 m^2, while that of associative channel users was 16,214 m^2.

With respect to sociodemographic factors, more than 36% of growers were older than 45. This raises the question of whether the take-over by the next generation —so necessary for this competitive industry in the next 20 years— is actually occurring (see Table 2). With respect to grower education, few had achieved more than school level: while this may be quite normal for growers and farmers in other areas of agriculture, in this intensely technological activity it stands out as being somewhat incongruous.

With respect to other training, only 7.62% of those interviewed had taken an agricultural training course in the previous year, 19.21% had made an educational visit to other production areas, 36.75% had books on agricultural topics, and 49.34% knew of some specialised magazine for the sector (although few took them or read them assiduously).

Table 2. Distribution of absolute (AF) and relative frequencies (RF) of grower and exploitation characteristics

| Variables	Levels	AF	RF
Age (years)	< 25	21	6.95
	26-35	90	29.80
	36-45	81	26.82
	46-55	61	20.2
	> 56	49	16.23
Educational level	No studies	32	11.55
	School studies	207	75.55
	Higher studies	35	12.76
Workforce	Only members of the family	128	43.69
	Family members and hired hands	122	41.64
	Only hired hands	44	14.68
Dedication to activity	Total	264	87.42
	Partial but primary activity	11	3.64
	Partial and secondary activity	27	8.94
Aversion to risk	High	27	9.44
	Medium	98	34.27
	Low	98	34.27
	Very low	63	22.02
Location	Poniente or Dalías areas	254	84.11
	Níjar area	48	15.89

Table 2 shows the results gathered on growers' self evaluation of their risk-taking profile. Greater or lesser aversion to risk could determine a preference for the auction system or other marketing channel. This would depend on how pricing is established in each, the greater or lesser personal control growers have on the sales made (in auctions, the growers themselves control the whole pricing and selling process), and the greater or lesser desire to change from what may have been a system used for many years (in Almería, the auction system has the longest tradition).

The importance of marketing organisations at origin

The most important marketing channel for horticultural products in Almería is the auction system (Fig. 1), which was used by 46.4% of the interviewees. This was followed cooperatives and ATSs. Wholesalers at the point of origin and attending intermediaries from destination markets were used very little. The growers of Almería therefore behave in a similar fashion to those of Murcia and Granada. Though the mean holding size of auction users is smaller than that of users of other systems, auctions are also the main channel used in terms of volume (Martínez-Carrasco, 2001).

When growers market their produce via associative systems, either they (as members) or their collaborators[3] deliver the raw produce. This is then categorised
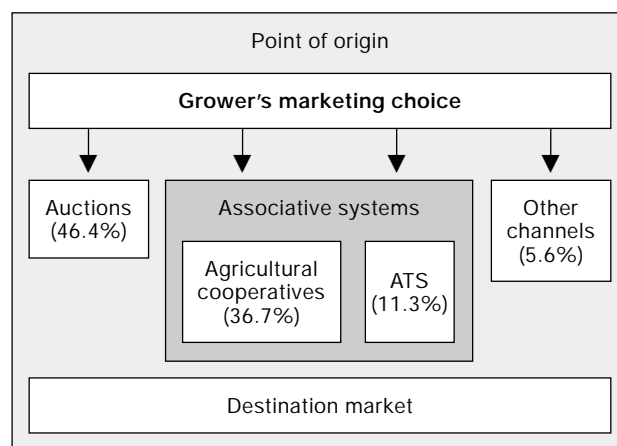
Figure 1. Number of users of each marketing channel (%).

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[3] Many growers complain of difficulties when trying to become full members of a cooperative, including high access fees and long waiting lists.

in the association's warehouses and the grower is paid one month later depending on the destination market price for each category. However, growers may also benefit from other services provided to association members, such as technical assistance or input supply. When growers choose to sell via auctions, they take their products to *alhóndigas* (traditional Arab-style auction houses) after conditioning their produce (known as the «encarado» or «encajado»), i.e., the placing of the day's harvest in boxes, with the best sized and most appealing produce in the top layers. At all times the grower controls the selling process, and has the guarantee of the *alhóndiga* that payment for all sales will be made within three days. The *alhóndigas* also cover the risks involved with late-paying buyers.

Finally, and with respect to marketing channels at origin, it is becoming increasingly common to sell directly to the retail distributor. This reveals the degree to which intermediaries are being removed from the sales process in agricultural markets (Cook, 1997).

Explanatory model for the choice of marketing channel

The incidence that a grower's socioeconomic characteristics may have on the making of business decisions are here contrasted with discrete choice models. Table 3 shows two possible relationships (according to the reference levels considered) using the binomial Logit models considered. These help to determine the degree to which choosing one or another marketing channel (auction or associative organisations) can be explained by differences in grower or holding characteristics. The two models, which differ in that one includes the surface area of the holding while the other takes into account variables such as the workforce, family size and technical visits, determine the directional relationships between the marketing channel chosen.

The use of two alternative models is justified because of the good correlation between holding surface area and workforce and family size. Certain variables were excluded from the final models. For example, a positive relationship was found[4] between the probability of marketing channel chosen and the degree of

Table 3. Models of grower choice of marketing channel

Variable and levels	Model 1 Coefficients	Model 2 Coefficients
Constant	2.76***	1.20**
Size of family	0.24**	
Work force:		
— Family members only	–0.95**	
— Family members/hired hands	–1.02**	
— Only hired hands	Reference	
Age (years):		
— < 26	–1.15**	–1.04*
— 26-35	0.57*	0.51*
— > 35	Reference	Reference
Surface area (continuous)		0.00002* (1)
Aversion to risk:		
— High	–1.55**	–1.46**
— Medium	–1.99***	–1.94***
— Low	–1.23**	–1.16**
— Very low	Reference	Reference
Technical visits:		
— Yes	–0.75**	
— No	Reference	
No. observations	255	263
$\chi^2(9)$: Likelihood ratio test	39.98	30.39
Level of significance	0.000	0.000
McFadden's pseudo R^2 test	0.113	0.083
Correct percentage of classification	63.92	65.39

*** $\alpha = 0.01$. ** $\alpha = 0.05$. * $\alpha = 0.10$. (1) The marginal effect of this continuous variable reaches a value of 0.00005*.

dedication to horticultural activity, but this was excluded because of its reduced significance. Other variables, such as the location of the holding and grower educational level, were excluded because of a lack of a significant correlation with the marketing system chosen. The partial derivative of the endogenous variable with respect to holding surface area (the only continuos exogenous variable) was also calculated.

Finally, the predictive power of the Logit models was used to help calculate the probabilities that individual growers would choose one system or another. According to Model 1 (Table 3), the probability that a grower who is the sole family member, who employs no workforce, who defines himself as being very little

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[4] Preliminary bivariate analysis (via Chi-squared comparisons) of the variables detected significant relationships between *marketing channel* (which in the Logit becomes a dependent variable) and *age, dedication to activity, work force, location and aversion to risk*, and between *family size and workforce and surface area of the holding*.

disposed towards taking risks, who is younger than 26 years of age, and who claims to have visited other agricultural areas, should choose to market his produce via an associative organisation is only 19.73%. This rises to 58% if the grower is 26-35 years of age. This demonstrates the potential of Logit models in determining the influence of grower characteristics over choice of marketing channel.

Discussion

The interpretation of these Logit models provides some interesting conclusions with respect to the influence of the studied variables on the choice of marketing channel.

Model 1 shows that family size and the exclusive use of hired workers is positively related to the probability of marketing by methods other than auction. The hiring of workers is especially indicative of the choice of associative marketing channels for owners of the largest holdings. In this case, a work force is required not to pack the produce but for the process of production itself. The greater the size of the holding, the more workers are required.

Model 2 (Table 3) shows a positive relationship between the surface area of the holding and the probability of marketing by channels other than auction.

The corollary of the two previous ideas is that the greater the size of the holding, whether measured in terms of surface area or family/external workforce requirements, the more likely its produce is to be marketed via ATSs and cooperatives. The hiring of an external workforce is related to greater business size and a more professional or extra-familiar character: such business are more likely are to use ATSs and cooperatives.

Both models show a positive relationship between the probability of marketing via ATSs and cooperatives and grower age of between 26 and 35. Being older or younger indicates a greater probability of using the auction system. For growers over 35, this might be explained by their unwillingness to change from a system they have always used. For those under 26, it may be because they are relatively new to the business, and in general have greater debt. Receiving payment as quickly as possible for their products —which is guaranteed at auctions— may be advantageous for them. Growers may also face other difficulties and costs if they choose to sell via cooperatives.

Those growers who most see themselves as risk takers are those most likely to market their produce via associative organisations. The negative relationship between marketing via cooperatives and ATSs and having made some trip or technical visit to other production areas was also significant. This might be explained by the promotional policies of some of the province's *alhóndigas* which have organised trips for their habitual users to other regions with the justification of improving their training, but by doing so gaining their faithful business.

Relationships also exists between marketing by auction and characteristics such as the sole use of the family as the workforce, non-exclusive dedication to horticulture, and even small holding size. The auction system is widespread and has a long tradition in southeastern Spain and is more highly valued by growers with more humble financial resources (usually young growers new to the business, and those with small, family-run businesses).

No statistically significant relationship was found between choice of marketing channel and grower education or the location of holdings.

Acknowledgements

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