The Hungarian simulation model of wine sector and wine market

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ABSTRACT

A simulation model that gives the structure of the production levels and elements, cost and sales income parameters is of great need because it makes possible to analyze or compare individual product lines or group of product lines. For this goal we developed a global (Hungarian) base model specialized for wine production named WIN-SIM. The four levels of the model (site, vine growing, wine production and wine market levels) have individual value added from the aspect of end product, where the product line sets out from the site level and gets through the levels up to the consumer segments. Theoretically, all elements can be connected to the each element of the next level and sublevel, but it is not the case because of professional, regulation or production practice reasons ("prohibited contact").
The base model involves ten sublevels, where the economic weight of the production and the market share of the elements on every level can be considered. Moreover, it is necessary to provide the transition probabilities (%) for all elements to the level above. The WIN-SIM simulation program is able to process some 70.000 result records with a multi-faceted analysis. The model is suitable to analyze the market share, the cost and income relation as well as the relation structure of the product lines. His versatility permits the case-simulation of any country or a wine region after the modification of the input data.

Keywords: sector model, wine production and market, product line, decision support system

1. INTRODUCTION

To make deliberate decisions growers, producers and higher level decision makers need detailed information about the possible product lines and their characteristic from the decision aspect, whether the decisions are conscious, occasional or obligate (Herdon, 2008, Herdon and Rózsa, 2008)). Appropriate amount of information helps to develop the most favorable product lines (products), to increase the market share and to optimize the production (Lakner et al., 2003, Szenteleki et al., 2008).

2.   SIMULATION MODEL OF WINE SECTOR AND WINE MARKET

2.1 Characterisation of the elements and the structure of wine sector and market

The wine sector model was developed with several aims. From technological, economic and management aspects it is important
•   to lay down the production levels and elements, the duties as well as the potential value added;
•   to descript and evaluate the levels and sublevels;
•   to define the elements within levels and sublevels and clarify the differences between them;
•   to outline the relation among the elements according to their functional role;
•   to fix the 'nos' (prohibited contacts) and 'yeses' (permitted contacts) regarded to the connections between the elements in order to make clear the real operational possibilities in the system;
•   to provide the system with technological, production and cost and sales income data in order to be able to calculate and compare the production potential and competitiveness of the different production systems, strategies or wine regions;
•   to make the model able to simulate the wine sector on national level and to represent and analyse the economic and market structure as well as the function of the wine regions; and
•   to support the growers and sector managers with information for their decisions.

2.2 The structure of the model

The wine sector model has four main levels: the site, the vine growing, the wine production and the wine market levels (Figure 1). All the four levels have individual value added from the economic aspect of end product. The price of the production site is proportional to the quality and value of it. Grapevine has also price that is defined mainly by the market. After grapevine has been processed wine gets to the market with its added value that depends on its quality.

2.3 Vertical levels, sublevels and elements

2.3.1 Site level
Site level is of great importance because the value and character of wine as end production is highly depending on site characters and values. There are two sublevels within the production level. In the first one the different value types of sites, in the second one the different types of origin are listed.

2.3.2 Vine growing level
Vine growing level is the second level that includes two sublevels. The first one is about the ownership of the estate (own possession or contractual production) that are very different from economic and technology point of view. The characteristics of some wine regions is greatly defined by the proportion of own possessions and contractual production plantations.

The second sublevel includes the varieties with several elements. The base model is very simple with its white and red varieties; nevertheless it can be extended by distinguishing some spread or good-will classes.

2.3.3 Wine production level

Wine production level has the most complex relation system. Three sublevels are represented in it. The first one is the colour (white, rose, siller, red). The second sublevel is for wine categories: AOC, quality, table wine from special region or table wine. There are several economic, technological and market potential aspects. This sublevel can be extended with other types such as late harvest or ice wine. The third sublevel is for packaging (bottle, PET, BiB, other or wine on tap). We can see that all the three sublevels have categories that contains very important information for the dealer and the consumer as well.

2.3.4 Market level

The market level is supported with three sublevels: the distribution, the brand and type of consumer. The types of distribution have wide literature. The types of consumers were identified according to their motivation based on a widely accepted typification of attitude to wine.
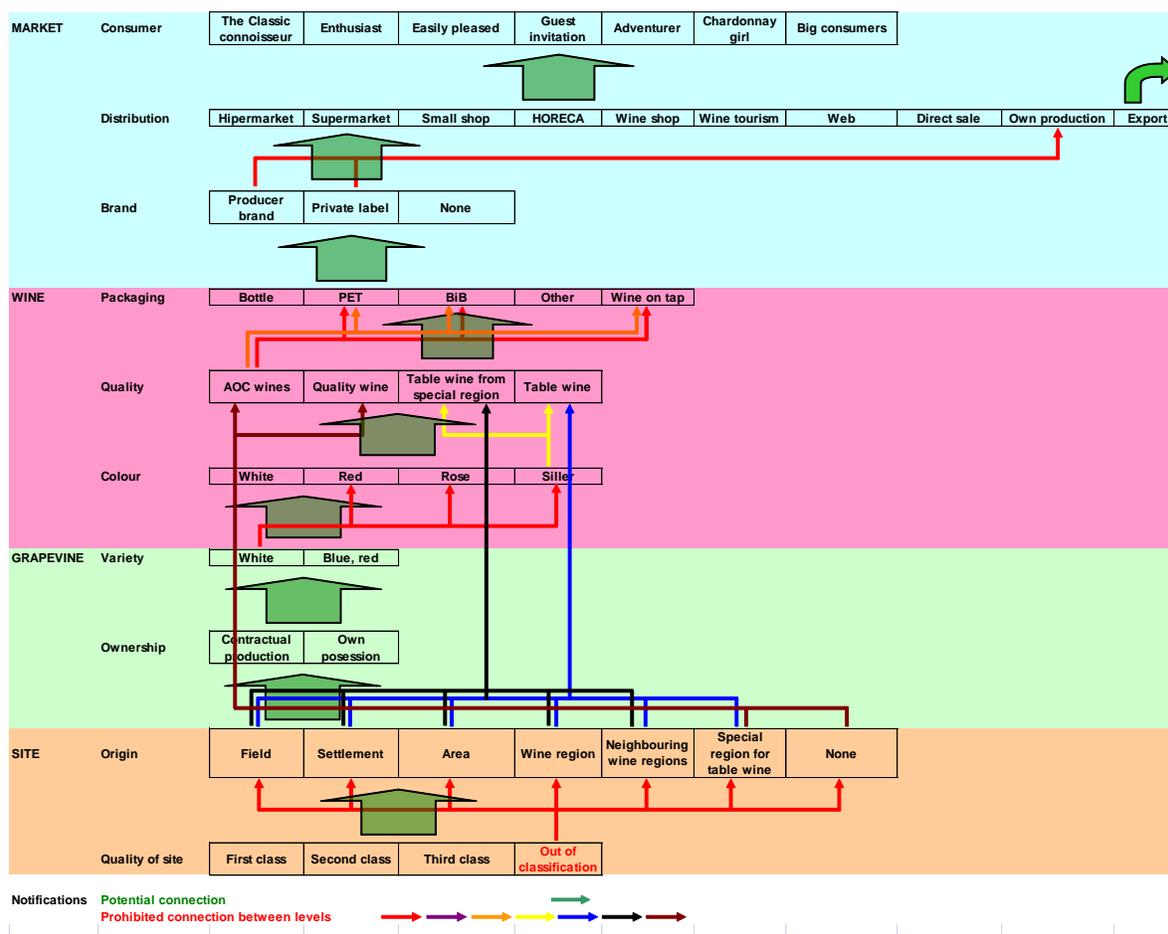

Figure 1. Vertical base model of Hungarian wine sector

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2.4 The system and the function of the wine sector

Set out from the first level and connect the elements to the next level up to the fourth level. Theoretically there are as many end products as the number of possible ways up to the top level. The ways includes different technological and cost-benefit characteristics.

During the decision making on sector level it is very important to possess appropriate information on the different sites and on the way of the decision of the growers: whether it is conscious, accidental or obligate.

Theoretically, all elements can be connected to the each element of the next level and sublevel, but it is not the case because of professional, regulation or production practice reasons ("prohibited contact" e.g. quality wine cannot comes from a site out of classification).

There are some prohibited contacts because of juridical reasons, e.g. red varieties can be grown in Tokaj but it is not permitted.

The activity of vine growers and wine producers can be traced by the data base of the National Council of Wine Communities. However, because of data management and personal rights rules, there are some difficulties with connecting the data of Wine Communities to the excise data which makes the analysis sometimes uneasy.

The base vertical model of Hungarian wine sector can be seen in Figure 1.

3. HORIZONTAL AND VERTICAL RELATION SYSTEMS IN WINE SECTOR - MODELLING OF PRODUCT LINES

Hungarian wine product lines are mostly diversificated. The classification, evaluation and analysis of the great number of product lines is very complex. Thus, simulation models that include the elements, the levels and the system of relations and that can be supported with cost and price data are of great need. The models make possible to evaluate, compare and filter the product lines.
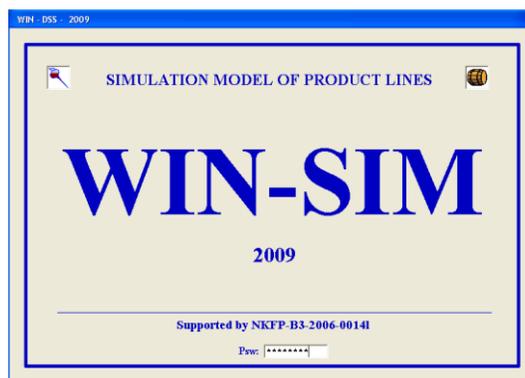

Figure 2 The enter of the software WIN-SIM

The base model has 10 sublevels. The economic weight (market share) of each level and each element should be estimated. Moreover, the transition probabilities (%) of the elements should be given. The distributions of the transition probabilities (%) and the market share can be assumed as normal or beta distributions. The estimations of expectations and variances can be made by research results, economical calculations and experiences.

All the levels except the first one require only one of the following data: market share and transition probabilities (%). However, we recommend estimating both kinds of data if possible in order to control and modify (if necessary) the data of the previous levels (feed back).
The necessary data set contains also the cost and benefit data as well as the added value data in percent.

3.1 The simulation software WIN-SIM

There can be executed several kinds of analysis with the help of the user friendly wine sector simulation software. It is supported with a huge amount of data. Entering the software you need a password which can be used later again to reach the results (Figure 2).
After having entered the software you need first to input the vertical and next the horizontal levels and elements (Figure 3). The software can freely be extended with extra levels and elements as well.

Figure 3 The input of the vertical and horizontal levels in WIN-SIM
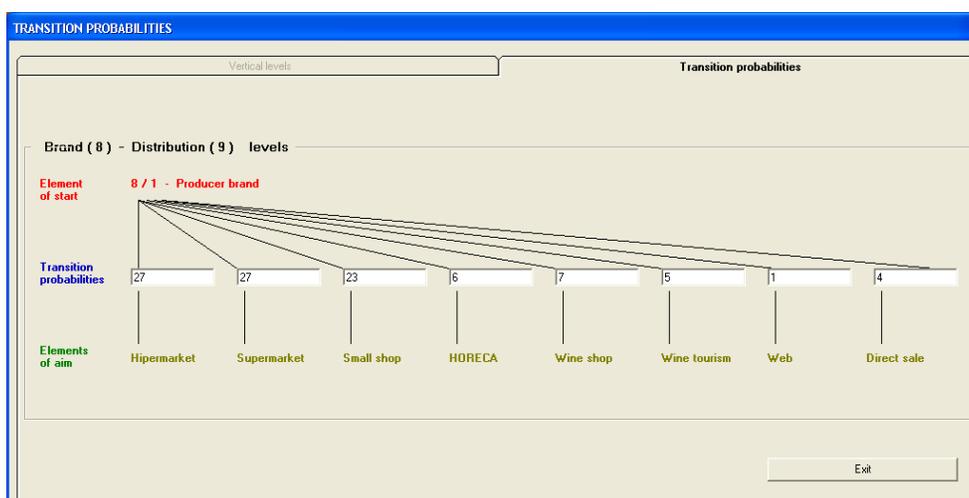
Figure 4 Input of transition probabilities (%) regarded the elements of the sector levels

After having set the structure of the simulation model we need to input the market share (%) and the transition probabilities (%). The market share relative to the certain levels can be input in one step while the transition probabilities have to be given element by element (Figure 4). The prohibited relations can be defined by setting the transition probability to zero. Prohibited relations between non-neighboring levels can be set by modifying the simulation module of the model.

Figure 5 Cost-benefit analysis

Within a certain horizontal level the user can define the weights of the elements as well as the ratios of costs and sales incomes related to the elements. The ratios of costs and sales incomes express the deviation from the means in proportion (Figure 5).

Figure 6 Evaluation and comparison of the potential product lines

The parameters of several elements of product lines cannot be measured, thus estimations based on observations are needed and so controls and feed backs ensure the reliability of the model.

Therefore the software is provided with data controlling and normalizing option in order to avoid discrepancies.

If the setting of the model has been finished, the simulations runs can be started. The user can choose, if he needs, the evaluation of all the product lines comparatively (Figure 6), or the results of just a class of them or he orders an individual analysis, only.

Figure 7 Getting of white vine product lines

Figure 8 Evaluation of white vine product lines

There are further possibilities to evaluate and filter the results with the software. One can set the level or levels and the element or elements on which a product line or of a set of product lines should be evaluated (Figure 7 and 8). The user can make more complex analysis as well e.g. on
- the most profitable product lines of white vine;
- the most costly product lines of red vine; or
- the product lines of AOC wines with the largest market share etc.

The results can be ordered according to the market share, income, cost or profit (Figure 9). In this option each product line can be evaluated individually or comparatively.

WIN-DSS RESULTS

Pruduct lines | Results

Filtering

1.level	2.level	3.level	4.level	5.level	6.level	7.level	8.level	9.level	10.level	Share	Price	Cost	Benefit
1	1	1	1	1	1	1	1	1	1	0	-999	-999	-999
3	7	2	2	4	4	5	3	8	7	100	999	999	999

1/elem.	2/elem.	3/elem.	4/elem.	5/elem.	6/elem.	7/elem.	8/elem.	9/elem.	10/elem.	Share	Price	Cost	Benefit
2	5	1	1	1	2	1	1	3	6	0,002035	70	80	-10
2	5	1	1	1	2	1	1	3	7	0,003428	65	80	-15
2	5	1	1	1	2	1	1	4	1	0,000587	105	84	21
2	5	1	1	1	2	1	1	4	2	0,000587	100	84	16
2	5	1	1	1	2	1	1	4	3	0,000335	95	84	11
2	5	1	1	1	2	1	1	4	5	0,000335	95	84	11
2	5	1	1	1	2	1	1	4	6	0,000251	85	84	1
2	5	1	1	1	2	1	1	4	7	0,000699	80	84	-4
2	5	1	1	1	2	1	1	5	1	0,000945	95	84	11
2	5	1	1	1	2	1	1	5	2	0,000945	90	84	6
2	5	1	1	1	2	1	1	5	3	0,000326	85	84	1
2	5	1	1	1	2	1	1	5	4	0,000456	80	84	-4
2	5	1	1	1	2	1	1	5	5	0,000424	85	84	1
2	5	1	1	1	2	1	1	5	6	0,000163	75	84	-9
2	5	1	1	1	2	1	1	6	1	0,000536	115	84	31
2	5	1	1	1	2	1	1	6	2	0,000536	110	84	26
2	5	1	1	1	2	1	1	6	3	0,000373	105	84	21
2	5	1	1	1	2	1	1	6	5	0,000536	105	84	21
2	5	1	1	1	2	1	1	6	6	0,000349	95	84	11
2	5	1	1	1	2	1	1	7	1	0,000088	85	77	9
2	5	1	1	1	2	1	1	7	2	0,000088	80	77	4
2	5	1	1	1	2	1	1	7	3	0,000088	75	77	-2
2	5	1	1	1	2	1	1	7	5	0,000200	75	77	-2

Result of one pruduct line | Result of group | Storage of results | Exit

Figure 9 Filtering of product lines data

4. CONCLUSIONS

1. The computerised model is suitable to analyze the market share, the cost and income relation as well as the contact structure of the product lines in wine sector. His versatility permits the case-simulation of any country or a wine region after the modification of the input data.
2. In order to estimate the cost and benefit structure together with the market share more precisely, we need to improve the model. For example it should be downscaled to each wine region in order to reach the capacity of considering local characteristics as well. The model can be extended also with more varieties, wine categories etc. Thus absolute cost-benefit indexes can be created by the downscaled model.

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