



Agribusiness Handbook

vol. 5

Grapes / Wine

This publication was prepared by the FAO Investment Centre under the FAO/EBRD cooperation agreement to provide quick technical and economical reference material to EBRD's agribusiness team in sub-sectors where they often work. Focus was given to the Bank's countries of operation in Eastern Europe and the Commonwealth of Independent States, with indicators of technical and economical performance in other regions of the world noted for comparison.

The series of handbooks contained in this publication cover specific agribusiness sub-sectors, with information on production and processing techniques, costs and margins, world production, prices and trade trends. Data were collected from a number of official and unofficial sources as indicative information that should be interpreted with caution, and do not imply the expression of any opinion by FAO concerning the economic situation of countries mentioned.

(October 1999)

Wine, a beverage made from the partial or complete fermentation of fresh grapes, is as old as documented history. Over time a relatively simple process has evolved a complex technology with its own distinct and immensely diversified "viculture".

In terms of variations in the composition and condition of raw materials; in terms of the nuances introduced over several centuries into processing parameters and their control, replete with many options for the winemaker; and in terms of the scores of variations of the final products, the making of wine is probably not rivalled by any other commodity in the field of food and beverages.

1- GRAPES CULTIVATION

1.1. Key production parameters

Climate

More than 90% of the grapes grown today are varieties of just one vine species, *Vitis vinifera*. This species is also known as the Old World or European grape. As a consequence most grapes are markedly limited by certain climatic conditions:

- reasonably long growing season (150 - 180 days)
- relatively low humidity but sufficient soil moisture
- mild winters - frosts occurring after vine growth starts in spring will kill off most of the fruitful shoots
- variations in the microclimate, location and topography of individual vineyards contributes to the diversity of wines and their respective quality

Soils

Grapes can be produced on a number of soils - fertility is not as important as soil structure:

- sandy or gravelly clay loams are most desired, differing soil attributes are reflected in wine diversity
- alkaline soils must be avoided
- good drainage is very important

Viticulture

Parameters of growing grapes (depending also on the use for wine, table grapes and raisins) include:

- *spacing of vines* in uniform rows for easy cultivation
- *propagation* by cuttings, buds or grafts (propagation from seeds usually just for producing new varieties)
- *planting*, usually of 1-year old vines of desired fruiting variety and *vine support* essential for satisfactory vine growth
- *pruning* and *thinning*, removal of vegetative parts to establish and maintain the vine in a form that will save labour, facilitate cultivation and helps to control insects and diseases, expedites harvesting and improves quality
- *cultivation and irrigation*, depending on climate topography and soils

Grape Production and Use in 1997 (in '000 quintals of fresh grapes)

	Wine	Table	Raisins	TOTAL
Italy	66,218	15,300	0	81,518
France	70,872	1,036	0	71,908
Spain	51,856	3,108	68	55,032
Argentina	24,263	283	273	24,819
Chile	5,456	9,353	1,882	16,691
South Africa	11,206	1,777	1,640	14,623
Romania	10,613	1,177	0	11,790
Australia	7,434	622	1,364	9,420

Source: Office International de la Vigne et du Vin (O.I.V.) 1998

1.2. Total world production & main producers

The period from 1986-1990 was characterised by a decline of world wine production compared to the preceding period 1981-1985: The annual average shifted from 333,552,000 hl to 303,793,000 hl (minus 9%). During 1991-1995 this trend continued with an annual average of 261,279,000 hl representing a reduction of 14% compared to the previous five-year period. Since 1995, this trend has been reversed. With 251,576,000 hl in 1995, 269,970,000 hl in 1996 and 264,422,000 hl in 1997 world production follows an upward trend for which the explanations range from strong demand for Reds and expansion of vineyard area, the "millennium - effect", to increased consumption of wine in Asia, the United States and the United Kingdom.

The world market for wine has changed from its traditional regional orientation to a highly international commodity. Wine producers, processors and traders expect continued growth in wine consumption, with the main increases in countries outside Europe (Japan and emerging economies) and in those European countries without own production. Europe as the centre of the wine culture, of production and consumption faces increasing competition from the "new" wine world in North and South America, in Australia and South Africa. The Wine sector in these countries is characterised by concentration in relatively few globally active companies with their own production and marketing.

Biggest Producers Globally and in Eastern Europe (in '000 hl)

	Italy	France	Spain	USA	Romania	Hungary	Bulgaria	Moldova
1998	56,912	51,632	29,600	20,000	6,688	4,180	2,470	2,193
1997	50,847	53,612	33,887	25,000	6,688	4,472	2,377	3,598
91-95	60,768	52,886	26,438	17,619	5,529	3,823	2,194	4,356
86-90	65,881	64,641	33,519	18,167	7,133	10,974	3,205	n.a.
81-85	72,146	67,462	33,964	17,710	8,700	4,985	4,361	n.a.

Source: FAO, O.I.V

In the second half of the 1990ies, the big European Wine producers, although still world market leaders (Italy and France in particular) have lost part of their traditional European markets United Kingdom, Germany and Scandinavia due to small harvests and strong competition.

At the same time countries of south-eastern Europe have continued quality improvement and gained market access (i.e. UK and Germany) financed to a large extent by Western wine companies. Romania has been particularly successful in increasing its exports in 1994 and 97 (see table below). Hungary and Bulgaria are also expected to increase their market share with relatively low prices for good qualities and packaging at international standard. Poland bottles and re-exports imported bulk wines. Countries of the Former Soviet Union have had their planted areas substantially reduced. Georgia has lost 10,000 ha and Ukraine 9,000 ha between 1995 and 1997.

Wine Exporting Countries in Eastern Europe

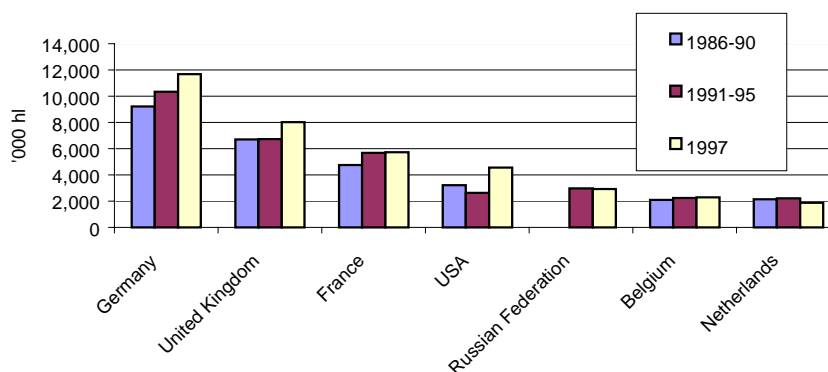
	Development of Exports from 1994 to 1997	Exports as share of local production in 1997
Bulgaria	10.7%	72.5%
Romania	188.3%	12.8%
Poland (incl. re-export)	9.5%	-
Hungary	56.5%	29.0%
Russia	9.5%	2.9%

Source: Vertumne International & Associés 1998

Wine Imports

Per capita consumption in 1997 was highest in Luxemburg (63 litres/year), France (60), Italy (59) and Portugal (56). With around 30 litres Romania is the country with the highest per capita consumption in Eastern Europe. The biggest wine importers were Germany, United Kingdom, France, USA, Russia, Belgium and the Netherlands who together account for 70% of all wine imports. France on third place for imports has to be qualified: Most imported wines are relatively low quality bulk wines from Italy or Spain that are used as basis for table wines "d'origine communautaire".

Seven Biggest Wine Importing Countries (O.I.V. 1998)



1.3. Key production costs

The following table is the result of a nonrepresentative survey of 220 wineries in various wine regions of Germany over five years and is supposed to give an indication of the costs of wine growing, processing and marketing in successful operations.

Cost Structure of Top Wineries in Germany

Input Costs	92/93	93/94	94/95	95/96	Average
	DM/ha share/total	DM/ha share/total	DM/ha share/total	DM/ha share/total	DM/ha share/total
1. Specialized Inputs	22,093 36.5%	22,474 38.4%	21,900 38.9%	23,504 39.7%	22,577 38.4%
- of which for Grape Prod.	1,424	1,655	1,777	2,845	1,981
- for Wine Processing	8,905	8,955	9,502	8,624	9,011
- for Marketing	2,111	2,442	3,405	4,048	3,134
- for Other	4,928	4,946	3,541	2,059	3,687
Hired Labour and Equipm.	1,231	804	888	1088	1002
Goods and Services	2,197	2,448	1,624	3,621	2,539
Electricity, Water	1,027	942	982	943	972
Lubricants	269	282	182	277	251
2. Labour	10,956 18.1%	11,389 19.4%	10,882 19.3%	11,201 18.9%	11,106 18.9%
3. Maintenance Equipment	1,008 3.5%	931 1.6%	843 1.5%	1,049 1.8%	956 2.1%
4. Depreciation Equipment	2,981 4.9%	3,094 5.3%	2,637 4.7%	3,014 5.1%	2,925 5.0%
5. Maintenance Structures/ Buildings	1,738 2.9%	1,419 2.4%	1,775 3.2%	2,245 3.8%	1,838 3.1%
6. Depreciation Structures/ Buildings	2,299 3.8%	2,298 3.9%	2,029 3.6%	2,166 3.7%	2,188 3.7%
7. Other: Land rent, Transp., Insurance	12,044 19.9%	10,654 18.2%	10,328 18.3%	10,447 17.6%	10,804 18.5%
8. Taxes	2,210 3.7%	3,015 5.2%	2,801 4.9%	2,860 4.8%	2,754 4.7%
9. Financing	3,592 5.9%	2,406 4.2%	2,429 4.3%	2,020 3.4%	2,538 4.5%
10. Other Costs	528 0.9%	523 0.9%	309 0.6%	428 0.7%	438 0.8%
Total Costs (DM/ha)	60,606	58,478	56,330	59,203	58,607

Source: Haupt, Unternehmensanalyse für Weingüter, Geisenheim 1998

Profitability of Conventional versus Organic Wine Production in Germany

		Production Type	
		Conventional	Organic
Productivity	hl/ha	80.1	62.4
Vineyard area	ha	8.7	7.3
Labour (person)	full-time	4.5	4.0
Labour Intensity	hrs/ha	1,045	1,119
Average Costs	DM/Litre	6.47	7.82
Average Prices	DM/Litre	7.74	9.01
Total Costs	DM/ha	51,800	48,800
Revenue	DM/ha	62,000	58,200
Profit	DM/year	103,000	74,300
Cost Type		'000/ha	'000 ha
- Material Inputs	DM/ha	20.3	17.9
- Labour	DM/ha	8.8	7.7
- Depreciation	DM/ha	4.7	5.8
- Interest	DM/ha	2.5	2.9

Source: Forschungsanstalt Geisenheim, Germany 1999

In a direct comparison of 119 conventional with 41 organic wineries in Germany, the conventionally managed ones were found to be more profitable. This is mainly due to substantially lower yields in organic production that are not sufficiently compensated by higher prices. Like in Germany, grape and wine production in the main producing countries is an integrated operation particularly in the field of quality wines.

1.4. Average margins for producers

In a non-representative study 220 wine producers/vineyards (with direct marketing) of different wine-growing regions in Germany were analysed over five years for the correlation between structural characteristics and economic performance. The results are used as an indication for the factors governing economic success. Obviously, these vary immensely between countries and types of production. Labour productivity and profit margins indicate that it is not necessarily the bigger producers who are producing more profitably. The survey shows that it is rather the ability to move into the high quality segments of the market while keeping costs under control than pure cost minimisation strategies that seem promising under the structural parameters of Germany.

**Structural Data and Economic Performance on 220 Vineyards in Germany over five Years
(Seasons 1992/93 - 1996/97)**

Averages	Labour (person)	Family Labour	Area under Vines	Productive Area	Productivity/ Yield	Labour Intensity	Labour Productivity	Profit Margin
	full time	full time	ha	ha	hl/ha	h/ha	DM/Pers.	%
Top Wineries	4.6	2.0	11.16	10.5	80.0	875	155,903	24.1
Average	4.4	2.1	9.16	8.57	78.1	1,043	109,826	19.1
Underperf.	4.1	2.1	7.01	6.62	77.2	1,269	71,613	12.8
Big Wineries (>15ha)	12.2	2.2	27.7	26.0	62.4	857	128.0	11.5
Mid-scale (7.5 - 15 ha)	4.9	2.1	10.8	10.2	80.1	958	114.8	19.0
Small (< 7.5 ha)	3.3	2.0	5.5	5.1	79.9	1,353	96.5	20.9

Source: Haupt (1999), Forschungsanstalt Geisenheim

2- GRAPES PROCESSING INTO WINE

2.1. Process description (simplified)

Crushing, Macerating, Pressing



Musts and Marc



Sulfiting of Musts



Amelioration

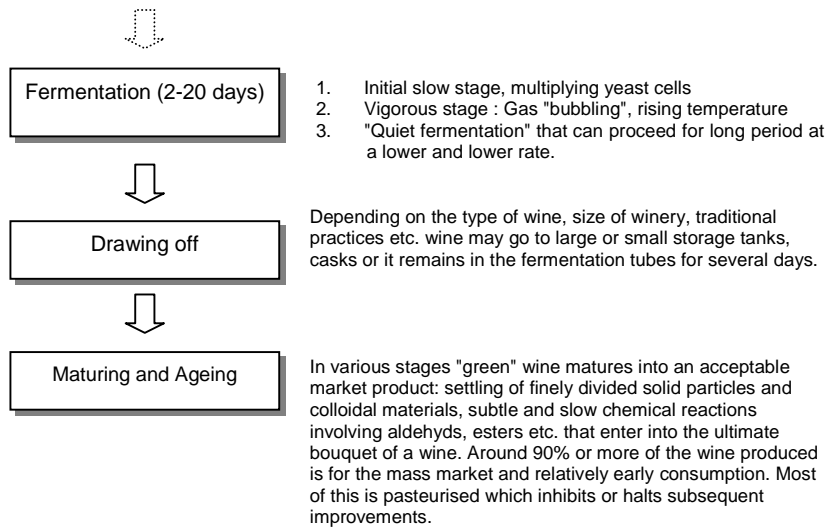


Depending upon the variety of the grape, the water content of a ripe berry will range between 70 and 80%. In any crushing macerating and pressing operation applied to a mass of berries, there is an inevitable mixing of both solid and liquid components. A reasonably complete separation of liquid (juice) components from the grape therefore requires more than one crushing or squeezing operation. The amount of components picked up from skins and stems has a marked effect on the wine's characteristics, sometimes beneficial, sometimes injurious.

Grape juice and/or the mass of crushed grapes on the way to wine production are called must. The grape pressings, i.e. the mass of skins and seeds left after the juice obtained from the first pressing is known as marc or pomace.

Sulphide dioxide is used for its antiseptic and antioxidant properties for treatment of must (dosage usually 100 - 200ppm). For red wines, small quantities are added to fully destroy spoilage bacteria and the presence of unwanted yeast. In white wine, the functions are similar and, SO₂ prevents development of brownish colouring.

In dealing with a lack of uniformity of raw material from one season to the next with regard to sugar content and acidity these factors are sometimes purposefully altered by adding sugar, water or acid. This practice is either frowned upon or in some regions even outlawed completely if not warranted by natural causes (i.e. disadvantageous weather conditions).



2.2. Conversion factors from raw material

The amount of juice obtained from the first pressing usually will range from 60 to 70% of the ultimately attainable juice and is known as free-run juice. For some wines this juice is processed separately.

Parameter Ranges for Musts

Type of Wine	Degrees Balling	Titration Acidity	pH
White table wine	19.5-23.0	> 0.70	<3.3
Red table wine	20.5-23.5	> 0.65	< 3.4
Sweet table wine	22.0-25.0	> 0.65	< 3.4
Dessert wine	23.0-26.0	> 0.50	< 3.6

Source: Encyclopedia of Food and Agriculture Production

Degrees Balling = grams of sugar per 100 grams of juice. Multiplication of the Balling reading by 0.55 will give the approximate future alcoholic content by volume of the wine. Thus 22 degrees Balling should give $0.55 \times 22 = 12\%$ alc. wine.

2.3. Wine Quality and Prices

The table below shows the variation in the prices of red wine produced in different regions of France, and illustrates how widely prices vary even when one takes only the average for a region. If the prices obtained by individual growers were considered, the variations would be even greater.

Comparing Wine Prices from different Appellations in France (FF/bottle)

	1993	1994	1995
Various VQPRD reds:			
Bordeaux Reds			
- Bordeaux and Bordeaux Supérieur	15.59	15.41	16.72
- Cotes	19.61	19.38	21.16
- Médoc and Graves	35.10	33.97	33.78
- St. Émilion and Pomerol	36.22	30.26	33.61
South West Reds	15.12	14.56	14.50
Val de Loire	20.10	18.48	18.86
Bourgogne	32.85	33.65	41.81
Beaujolais	19.58	20.10	21.00
Vallée Du Rhône	12.78	13.27	13.69
Languedoc-Roussillon	10.59	10.56	11.27

Source: Conseil Interprofessionnel du vin de Bordeaux

Premium wines of Bordeaux (Médoc, Graves, St. Emilion, Pomerol) sell at twice or more the average price of wines from the bulk-producing areas of both "ordinary" Bordeaux and other south-west reds, and three times the average price of wine from Languedoc Rossillon.

2.4. Wine types and labels

Champagne, Madeira, Port, Sherry, Sparkling Wine, Vermouth any many more are examples for the special kinds of processes that lead to very different products. These have been ignored in this context in spite of their economic importance in order to be able to concentrate on the main issues of wine production.

To understand the "product" wine on the retail level one has to understand the labels. Generally there are two systems with a large number of variations:

- The **French system** works according to the origin of a wine. The origin and the adherence of a vintner to certain standards and practices in the production of the wine, is documented by the Appellation d'Origine Controlée (A.O.C.). The A.O.C. also sets out standards for the quality of wine which range from Vins Délémités de Qualité Supérieure (VDQS--the best quality) to Vins de pays ("country wines") to Vins ordinaires (ordinary wine). With variations, the A.O.C. system is used throughout Europe. In Germany, detailed origin, the type of grape and sometimes also reference to the taste of the wine is made on the label. French Bordeaux is made from a blend of grapes. It might contain, for example, Cabernet Sauvignon, Merlot, Cabernet Franc and Malbec. The amounts differ (for example, in the Bordeaux appellations St. Emilion and Pomerol, Merlot tends to be the dominant grape, while in the Medoc (Paulliac, St. Esteph, Margaux, and St. Julien), Cabernet Sauvignon is dominant.
- The **U.S. system** is based on the type of grapes that are used for wine production. In the United States, a wine cannot be called by its varietal name unless that grape is at least 75% of the wine. As a merchandising tool, a new name has reached the marketplace. Producers in the United States creating blend wines (usually with less than

75% of any particular grape) have agreed to use the term Meritage to designate a high quality wine using Bordeaux style blends of grape varieties. Winemakers may also put a very specific area from which their grapes are harvested on the label. Often (but not always), "better" (or at least more expensive) wine comes from a "better" vineyard. In the United States there are places called "Approved Viticultural Areas" or AVA. If 75% of the wine is grown in that AVA the AVA may be placed on the label.