FIVS

Calculating Energy Values in Wine and Spirits

Executive Summary

- There is increasing regulatory interest in providing consumers with information on the energy content of alcoholic beverages including wines and spirits.
- Different approaches to presenting this information have been taken internationally, which risks the development of technical barriers to trade.
- This paper aims to encourage a harmonised approach to energy labelling and reduce confusion in the marketplace and amongst consumers.

1. Introduction

There is increasing interest by regulators internationally in the provision of information to consumers on the nutritional content of alcoholic beverages, specifically the dietary energy content.

Traditionally, alcoholic beverages with an ABV greater than 1.2% have been exempt from making a nutrition declaration on label, which is generally a mandatory labelling provision for foods. Many economies also have standardised formats for providing this information for foods.

Typically, the nutrition panel for food will provide information on the following macronutrients on a per 100g basis, although in some economies the information is provided on a 'per serving' basis[1].

- Energy (kcal and kJ)
- The amount of fat, saturates, carbohydrate, sugar, protein and salt (g per 100 g/mL of food).
- The above information can be supplemented by the amounts of the following: mono-unsaturates, polyunsaturated, polyols, starch, fibre (g per 100 g/mL food).

2. Energy-only nutrient declaration

In some economies information on the nutrition content of alcoholic beverages can be provided voluntarily. In the EU, should a producer wish to voluntarily provide information on the nutrient content of an alcoholic beverage, this can be limited to the Energy value only (kJ and kcal per 100g).

[1] In the US, 'per serving' is based on a 5 oz. serving for wine 7-16% abv. (148 mL)

This derogation recognises that many of the macronutrients listed above are not present in significant levels in many alcoholic beverages. For example, a typical still wine would not have significant levels of fat, saturates, protein, starch and fibre[2].

Limiting the nutrient declaration for wines and spirits to **Energy-only** provides consumers with useful information, and avoids a situation where a nutrition panel gives the impression of a product appearing 'healthier' as a result of the majority of the macronutrients being either non-detectable or present at low levels.

3. Basis of the energy content of wine and spirits

Numerical values for the nutrition panel information are typically based on:

- The manufacturer's analysis of the product
- A calculation from the known or actual average values of the component parts
- A reference value from generally established and accepted data

Impact of vintage variation – use of average or reference values

As wine is an agricultural product, it is likely that the levels of key components such as sugar, organic acids and ultimately alcoholic strength, will vary, for any given product, slightly from vintage to vintage due to minor changes in grape composition, for example as a result of the impact of weather conditions on grape development and ripening.

To avoid having to regularly amend labels to reflect such natural variation, it is recommended that the energy content be based on typical or average values from recent representative harvests and blends (where appropriate). Such information should be carefully documented and the records available for review.

The following points shall be considered when determining typical or average values[3].

- Where possible data should be based on harvests from the previous 3-5 years to take account of fluctuations in weather conditions and subsequent impacts on grape ripening and levels of grape sugars and acids.
- Data should be representative of typical blends of grape varieties and vintages.
- Sampling of blends – blends should be sampled at vintage crossover as well as at various stages during the vintage to take account of fluctuations across this period.
- Care should be taken to ensure that bulk wine in tanks/vats/barrels from which samples are to be collected is homogenous.

[2] McCance and Widdowson's 'composition of foods integrated dataset' on the nutrient content of the UK food supply
https://www.gov.uk/government/publications/composition-of-foods-integrated-dataset-cofid

[3] The following guidelines published by the OIV may be helpful when developing a representative sampling plan
https://www.oiv.int/public/medias/3308/guidelines-for-sampling-wines-and-musts-prior-to-analysis-en.pdf

Alternatively, reference values from an established and respected source could be used, such as McCance and Widdowson, Comité vins reference values (listed within their nutrition labelling guidelines), Wine in Moderation (https://www.wineinmoderation.eu/moderation/wine-and-calories) and the AWRI[4].

4. Calculation of the energy content of wine

For a typical still or sparkling wine or aromatised wine, the four key contributors to the energy content are:

- Alcohol[*]
- Sugars[*]
- Organic acids (tartaric, malic, citric, lactic, acetic, succinic and others); and
- Polyols (mainly glycerol)

The energy content is the sum of the energy contributed by alcohol, sugars, organic acids and polyols. Alcohol and sugars are the main contributors to the energy content of a wine, typically providing around 93% of the total energy (94.1% for white wine and 92.8% for red wine[5]). The contribution by organic acids and polyols to the total energy content of wine is noted to be broadly consistent between wines, and in the region of 5.9% for white wine, and 7.2% for red wine (for the purposes of this exercise rosé wines would be categorised as white wine in terms of composition).

Given that levels of organic acids and polyols do not vary much between wines, and as analysis of organic acids and polyols is not generally required as part of wine certification, it is suggested that typical values of these components found in the wine category are used[6] in the calculation of total energy content (Table A in Annex 1).

The energy content can be calculated using the formula set out below, and the widely accepted nutrient conversion factors listed in Table 1 and standard values listed in Annex 1 Table A.

$$E = [Alc. \times \rho eth \times Vw/100 \times Cfalc] + [Msug/1000 \times Vw \times Cfcarb] + [\mathrm{TVac}/1000 \times Vw \times Cf\mathrm{ac}] + [\mathrm{TVp}/1000 \times Vw \times Cf\mathrm{p}]$$

E : Energy value (kJ or Kcal /mL)
$Alc.$: Alcoholic strength by volume (%)
ρeth : Density of ethanol (0.789 g/L)
Vw : Volume of product (mL)
$Cfalc$: Conversion factor for alcohol (29kJ/g or 7kcal/g)
$Msug$: Grams of sugar per litre of product
$Cfcarb$: Conversion factor for carbohydrates (17kJ/g or 4kcal/g)
TVac : Standard value grams of organic acid per litre of product
$Cf\mathrm{ac}$: Conversion factor for organic acids (13 kJ/g or 3 kcal/g)
TVp : Standard value grams of polyols per litre of product
$Cf\mathrm{p}$: Conversion factor for polyols (10kJ/g or 2.4kcal/g)

[4] E Wilkes, Style based energy content categories in Australian wine, AWRI Technical Review October 2021
[*] Main contributors to energy content

[5] E Wilkes, Impact of wine components on energy calculations, AWRI Technical Review August 2021
[6] E Wilkes, Impact of wine components on energy calculations, AWRI Technical Review August 2021

Component	kJ/g or mL	Kcal/g or mL
Alcohol/ethanol	29	7
Carbohydrates	17	4
Organic acids	13	3
Polyols	10	2.4

Table 1. Generally accepted conversion factors (FAO Food and Nutrition Paper 77. Food energy – methods of analysis and conversion factors. Report of a Technical Workshop, Rome 3-6 December 2002. FAO methods of analysis and conversion factors).

5. Calculation of the energy content of spirit drinks

For spirit drinks, the key contributors are likely to be:

- Alcohol
- Sugar (used for rounding off or in the production of liqueurs)
- Fat, saturated, mono-unsaturated, polyunsaturated fat (in the case of egg or cream-based liqueurs)
- Protein (only egg or cream-based liqueurs)

The energy content is the sum of the energy contributed by alcohol, sugar, fats and protein and can be calculated using the formula below, and the widely accepted conversion factors listed:

$$E = [Alc. \times \rho eth \times Vw/100 \times Cfalc] + [Msug/1000 \times Vw \times Cfcarb] + [M\mathrm{fat}/1000 \times Vw \times Cf\mathrm{fat}] + [M\mathrm{prot}/1000 \times Vw \times Cf\mathrm{prot}]$$

E: Energy value (KJ or Kcal /mL)
$Alc.$: Alcoholic strength by volume (%)
ρeth : Density of ethanol (0.789 g/L)
Vw: Volume of product (mL)
$Cfalc$: Conversion factor for alcohol (29kJ/g or 7kcal/g)
$Msug$: Grams of sugar per litre of product
$Cfcarb$: Conversion factor for carbohydrates (17kJ/g or 4kcal/g)
$M\mathrm{fat}$: Grams of fat per litre of product
$Cf\mathrm{fat}$: Conversion factor for fat (37 kJ/g or 9 kcal/g)
$M\mathrm{prot}$: Grams of protein per litre of product
$Cf\mathrm{prot}$: Conversion factor for protein (17kJ/g or 4kcal/g)

Component	kJ/g or mL	kcal/g or mL
Alcohol/ethanol	29	7
Carbohydrates	17	4
Fat	37	9
Protein	17	4

Table 2. Generally accepted conversion factors (FAO Food and Nutrition Paper 77. Food energy – methods of analysis and conversion factors. Report of a Technical Workshop, Rome 3-6 December 2002. FAO methods of analysis and conversion factors).

6. Tolerances

To take account of the natural variation in macronutrient content in foods the information presented in the standard nutrition panel are averages. However, producers should take care to ensure that the consumer is not misled and the information provided is representative of the product.

To support producers in providing accurate nutrition information, guidelines on appropriate tolerances generally accompany legislation on the provision of nutrition information. This sets limits on the acceptable differences – tolerances - between the information in the nutrition panel, and that determined by official checks and controls.

Typically, tolerances are set in the region of +/- 20% (see EU Guidance Document for Competent authorities for the control of compliance with EU Legislation[7] and also US TTB tolerances[8]).

Where official samples are found to fall within 20% (either greater than or less than) of the value reported in the nutrition panel or energy value, the product is considered to be compliant.

7. Conclusion

While alcoholic beverages are exempt in many economies from providing nutrition information on label, with the increasing consumer and regulatory interest in supporting consumer awareness of the contribution made to energy intake from alcoholic beverages, it is key that a harmonised approach towards calculating and providing nutrition information is developed.

Given that many of the macronutrients displayed in the standard nutrition panel are not present in significant levels in most alcoholic beverages, where producers wish to provide information, this can usefully be limited to Energy only. This provides consumers with familiar information to help them assess the contribution alcoholic beverages make to their total energy intake.

A standardised approach to calculating the energy content of wines and spirits should be based on average or typical values for the key contributors to the energy content of products, which will avoid the need for label changes to reflect minor natural variations in grape composition e.g. due to fluctuations in weather from one harvest to the next. Wine makers will have ready access to information about the levels of alcohol and sugars in their wines, which are the major contributors to the total energy content of the wine. Given the small (but non-negligible) and broadly consistent contribution made by organic acids and polyols (glycerol), it is proposed that generic typical values for these two components be used in the energy content calculations for wines.

Likewise producers, especially small or craft producers, should also be able to make use of generally well established and recognised data on typical Energy values for wines and spirits, therefore avoiding expensive laboratory analysis.

Finally, given the natural variations which arise from the cultivation and processing of agricultural foods, appropriate tolerances should be applied during any official checks and controls.

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[7] https://ec.europa.eu/food/system/files/2016-10/labelling_nutrition-vitamins_minerals-guidance_tolerances_1212_en.pdf

[8] https://www.ttb.gov/procedures/ttb-guidance-procedures-2020-1

Annex 1.

Table A. AWRI typical values for organic acids (titratable acidity) and polyols (glycerol)

	organic acids/titratable acidity (g/L)	glycerol (g/L)
Red wine Still	**6.2**	**9.6**
White wine Still	**6.3**	**5.4**

E Wilkes, Impact of wine components on energy calculations, AWRI Technical Review August 2021

Impact of wine components on energy label calculations - The Australian Wine Research Institute (awri.com.au)

Annex 2.

Example calculations

Red wine – Full bodied 14.5% ABV with 2g sugar

$E = [Alc. \times \rho eth \times Vw/100 \times Cfalc] + [Msug/1000 \times Vw \times Cfcarb] + [\mathrm{TVac}/1000 \times Vw \times Cf\mathrm{ac}] + [\mathrm{TVp}/1000 \times Vw \times Cf\mathrm{p}]$

Typical dietary energy (kJ) content for a 100mL serving = [14.5 x 0.789 x 100/100 x 29] + [2/1000 x 100 x 17] + [6.2/1000 x 100 x 13] + [9.6/1000 x 100 x 10].

= 331.8 + 3.4 + 8.1 + 9.6

= **353 kJ/100mL or 84 kcal/100mL**

White wine – Dry white wine 12% ABV and 2g sugar

$E = [Alc. \times \rho eth \times Vw/100 \times Cfalc] + [Msug/1000 \times Vw \times Cfcarb] + [\mathrm{TVac}/1000 \times Vw \times Cf\mathrm{ac}] + [\mathrm{TVp}/1000 \times Vw \times Cf\mathrm{p}]$

Typical dietary energy (kJ) content for a 100mL serving = [12 x 0.789 x 100/100 x 29] + [2/1000 x 100 x 17] + [6.3/1000 x 100 x 13] + [5.4/1000 x 100 x 10].

= 274.6 + 3.4 + 8.2 + 5.4

= **291.6kJ/100mL or 69.7 kcal/100mL**

Rose wine – Off-dry Rose wine 11.5% ABV and 5g sugar

$E = [Alc. \times \rho eth \times Vw/100 \times Cfalc] + [Msug/1000 \times Vw \times Cfcarb] + [\mathrm{TVac}/1000 \times Vw \times Cf\mathrm{ac}] + [\mathrm{TVp}/1000 \times Vw \times Cf\mathrm{p}]$

Typical dietary energy (kJ) content for a 100mL serving = [11.5 x 0.789 x 100/100 x 29] + [5/1000 x 100 x 17] + [6.3/1000 x 100 x 13] + [5.4/1000 x 100 x 10].

= 263.1 + 8.5 + 8.2 + 5.4

= **285.2kJ/100mL or 68.1 kcal/100mL**

Brandy 36% ABV with 35g/L sweetening products for rounding off

$E = [Alc. \times \rho eth \times Vw/100 \times Cfalc] + [Msug/1000 \times Vw \times Cfcarb] + [M\text{fat}/1000 \times Vw \times Cf\text{fat}] + [M\text{prot}/1000 \times Vw \times Cf\text{prot}]$

Typical dietary energy (kJ) content in 100mL = [36 × 0.789 × 100/100 × 29] + [35/1000 × 100 × 17]

= 823.7 + 59.5

= **883.2 kJ/100mL or 211 kcal/100mL**