GUIDANCE ON THE CALCULATION OF WHOLE GRAIN CONTENT OF FOODS

As outlined within the Code of Practice for Whole Grain Ingredient Content Claims, GLNC recommends manufacturers calculate whole grain content according to the Food Standards Code standard 1.2.10 and the Food Standard Australia New Zealand (FSANZ) guidance document Percentage Labelling of Food User Guide To Standard 1.2.10 – Characterising Ingredients and Components of Food

In consultation with the food industry and regulators, GLNC has developed the a set of worked examples for the calculation of whole grain content in accordance with Standard 1.2.10 and the User Guide Standard 1.2.10. The following set of worked examples are provided as guidance only.

Calculations based on ingoing weight when no moisture loss from added water occurs

For whole grain foods where moisture is added during manufacture and there is no moisture loss, the final weight of whole grain ingredients expressed as a proportion of the total weight of the final food must be calculated. The steps to calculate the whole grain content in grams of whole grain per serving of finished food, include:

Step 1. Calculate the of percentage whole grain ingredients in the finished food based on the final weight of the product (if the percentage declared is 5% or greater, it may be rounded to the nearest whole per cent. If the percentage declared is below 5%, it may be rounded to the nearest 0.5 per cent)

Step 2. Calculate the grams of whole grain per serving size.

Example 1: Muesli

Ingredients	Ingoing Weight (g)	Final Weight (g)	Weight change (g)
Whole Grain Rolled Oats	250	250	0
Dried Fruit	220	220	0
Whole Grain Triticale	160	160	0
Whole Grain Barley Flakes	60	60	**0**
Sunflower Seeds	50	50	**0**
Sesame Seeds	30	30	**0**
brazil nuts	30	30	**0**
Total weight	**800**	**800**	**0**
One serving		**45**	-

Worked example calculation of whole grain content per serving of muesli:

1. Percentage whole grain in finished food = weight of whole grain ingredients (Whole Grain Rolled Oats + Whole Grain Triticale+ Whole Grain Barley Flakes) /final weight of the food x 100

   = (250+160+60)/800 x 100

   = 470/800 x 100

   = 58.75%

   =58%

2. Grams of whole grain per serving size = percentage whole grain in finished food/100 x weight of one serving of food.

   = 58.75/100 x 45

   = 26.43 grams

With 26 grams of whole grain per serving size the food can make a claim of 'very high in whole grain'.

Example 2: Steamed brown rice (microwaveable pouch)

Ingredients	Ingoing Weight (g)$^+$	Final Weight (g)	Weight change (g)
Brown Rice*	100	100	0
Water	140	140	0
Oil	10	10	0
Total weight	**250**	**250**	**0**
One serving	-	**125 cooked brown rice**	-

$^+$Ingoing weight into consumer unit e.g. a microwaveable pouch or cup.

*Where pre-soaked whole grains are used, it is recommended the weight of the grains prior to soaking is used in the calculation of whole grain content and soaking water is included as 'added water'. Guidance on which grains may be included in the calculation of whole grain content is also provided in the Code of Practice.

Worked example calculation of whole grain content per serving of steamed brown rice:

1. Percentage whole grain in finished food = weight of whole grain ingredients/final weight of the food x 100

    = 100/250 x 100

    = 40%

2. Grams of whole grain per serving size = percentage whole grain in finished food/100 x weight of one serving of food.

    = 40/100 x 125

    = 50 grams

With 50 grams of whole grain per serving size the food can make a claim of 'very high in whole grain'.

Calculations based on ingoing weight when there is moisture loss from added water

For whole grain foods that undergo moisture loss during manufacture, the final weight of whole grain ingredients expressed as a proportion of the total weight of the final food must be calculated to account for moisture loss. The steps to calculate the whole grain content in grams of whole grain per serving of finished food, include:

Step 1. Calculate the percentage whole grain ingredients in the finished food based on the final weight of the product (if the percentage declared is 5% or greater, it may be rounded to the nearest whole per cent. If the percentage declared is below 5%, it may be rounded to the nearest 0.5 per cent)

Step 2. Calculate the grams of whole grain per serving size.

Example 3: Whole Grain Bread

Ingredients	Ingoing Weight (g)	Final Weight (g)	Weight change (g)
Wholemeal flour (100% whole grain flour)	470	470	0
Water	320	200	120
Yeast	10	10	0
Salt	5	5	0
Oil	15	15	0
Total weight	**820**	**700**	**120**
One serving	**-**	**70 (2 slices)**	**-**

* Where pre-soaked whole grains are used, it is recommended the weight of the grains prior to soaking is used in the calculation of whole grain content and soaking water is included as 'added water'. Guidance on which grains may be included in the calculation of whole grain content is also provided in the Code of Practice.

Worked example calculation of whole grain content per serving of bread:
1. Percentage whole grain in finished food = weight of whole grain ingredients/final weight of the food x 100
   = 470/700 x 100
   = 67.14% = 67%
2. Grams of whole grain per serving size = percentage whole grain in finished food/100 x weight of one serving of food.
   = 67.14/100 x 70

   = 47 grams

With 47 grams of whole grain per serving size the food can make a claim of 'very high in whole grain'.

Calculations based on final weight of ingredient in final weight of food (where moisture loss occurs from ingredients of the food and added water)

For whole grain foods that undergo moisture loss during manufacture, the final weight of whole grain ingredients expressed as a proportion of the total weight of all the ingoing ingredients must be calculated. To assist industry GLNC has adapted a Characterising Ingredient Excel Template which performs the required calculation according to the Food Standards Code standard 1.2.10 and the Food Standard Australia New Zealand (FSANZ) guidance document Percentage Labelling of Food User Guide To Standard 1.2.10 – Characterising Ingredients and Components of Food. To utilise the Excel template, the following information is required:
- Ingoing mass of each ingredient
- Water (moisture) content of each ingoing ingredient
- Final Product weight
- Serving size

The steps to calculate the whole grain content in grams of whole grain per serving of the finished foods include:

Step 1. Determine the weight of water in each ingredient from the percentage of water in the ingredient. You can obtain values for the percentage of water in an ingredient from food composition tables, your ingredient supplier or by using a relevant AOAC method for your food.

Step 2. Determine the weight of water loss and final weight of an ingredient by:
   a) Direct laboratory analysis of the final food, where possible
   b) or by making an estimate based on the ingoing weight and the water content of each ingredient.
      Note: The 'Food Standards Australia New Zealand Percentage Labelling of Foods User Guide – Characterising Ingredients and Components of Food' indicates estimating values for the weight of water loss and final weight of an ingredient becomes complicated in cases where there are many ingredients that contain water because it is not possible to make judgements on which ingredients lose water preferentially. As such, when this method is adopted added water must be considered as lost first, then any remaining water lost is accounted for by each water containing ingredient losing an equal proportion (%) of their ingoing water content.

Step 3. Calculate the percentage of whole grain in the final product after being manufactured by dividing the final weight of the whole grain ingredients by the final weight of the product multiplied by 100 (if the percentage declared is 5% or greater, it may be rounded to the nearest whole per cent. If the percentage declared is below 5%, it may be rounded to the nearest 0.5 per cent)

Step 4. Calculate the grams of whole grain per serving size.

Example 4: Flaked Ready-To-Eat Breakfast Cereal
The following example with required formula can be viewed in Excel via the Characterising Ingredient Template. ***Note: GLNC recommends that users of the template save completed calculation as a record.***

Legend
1. Data required for calculation (yellow)
2. Data calculated when using excel template (blank and green)

Ingredient^	Ingoing Mass (g)	Water content (Wet Basis %)	Total Water Mass^ (g)	Water Loss Mass(g)	Final Mass (g)	Characterising Ingredient Content (%)
Whole grain barley, uncooked	450	4.7%	21.2	8.1	441.9	49.1%
Honey	40	16.2%	6.5	2.5	37.5	4.2%
Pecan, raw	10	3.5%	0.4	0.1	9.9	1.1%
Hazelnut, raw	10	4.6%	0.5	0.2	9.8	1.1%
Mixed seeds	50	4.5%	2.3	0.9	49.1	5.5%
Cranberry, dried, sweetened	75	16.0%	12.0	4.6	70.4	7.8%
Oats, rolled, uncooked	225	9.3%	20.9	8.0	217.0	24.1%
Syrup, golden	50	17.0%	8.5	3.3	46.7	5.2%
Almond, roasted, salted	18	5.0%	0.9	0.3	17.7	2.0%
Added Water	800	100.00%	800	800	0	0.0%
Total	1728.0	-	873.0	828.0	900.0	
Serving Size					40.0	

^*Recipe developed based on an example from AUSNUT 2011-13: Recipe File. Water content sourced from AUSNUT 2011-13: Food Nutrient Database.*

Worked example calculation of whole grain content per serving of a flaked ready-to-eat breakfast cereal:

1.   Water content for each ingredient was obtained from food composition tables (AUSNUT 2011-13).

2.   Total water loss is 828g. Added water must be treated as being lost first and so 800g of added water is lost, leaving 28g of water loss from water containing ingredients.

To account for the 28g of water, each of the water containing ingredients is assumed to lose an equal proportion of their ingoing water content.

In this case the water containing ingredient is assumed to lose 38.3% of their ingoing water content which is equal to the mass of the water loss divided by the total water mass of the ingoing ingredient. Once water loss is accounted for, the final weight of each ingredient and thus the characterising ingredient content (%) can be calculated based on the final weight of the product.

3.   a) Final weight of whole grain ingredients divided by final weight of total product after manufacture accounting for moisture loss (in addition to added water) from each ingredient
= (217.0+441.9)/900.0 = 0.73015

b) Multiply by value from step 1 by 100 to calculate the percentage whole grain in the finished food
= 0.73015 x 100 = 73.0%
73%(rounded)

4.   Grams of whole grain per serving size = percentage whole grain in finished food/100 x weight of one serving of food i.e. 40g of flaked ready to eat breakfast cereal is equal to one serving.
= 73.2/100 x 40
= 29.3 grams

With 29.3 grams of whole grain per serving size the food can make a claim of 'very high in whole grain'.

Calculation of the whole grain ingredient content of liquids on a mass per mass basis

When whole grain is a charactering ingredient within a liquid product, whole grain content should be declared in an ingredients list on a mass per mass basis. The steps to calculate the whole grain ingredient content in grams of liquids on a mass per mass basis, include:

> Step 1. Use the product formulation to determine the percentage whole grain according to the Australia New Zealand Food Standards Code method of declaration of characterising ingredients.
> Step 2. Determine the density of the final liquid product by standardised methods.
> Step 3. Use the density to convert the volume of one serving of the liquid product to grams.
> Step 4. Calculate the mass of whole grain in one serving of the liquid product.

Example 5. Whole Grain Containing Liquid Product

Whole grain ingredient	5%
Volume of one serve	200ml
Density of the product	1.05 g/mL
Weight of one serve of finished product	210g

Worked example calculation of whole grain ingredient containing liquids products:

1.   Grams of whole grain as a percentage of total grams of ingoing ingredients = 5%
2.   Density of product
        = 1.05 grams /m
3.   Weight of one serve of finished product = volume of one serve x density
        = 200 mL x 1.05 g/mL
        = 210 grams
4.   Weight of whole grain in finished product = percentage whole grain/100 x weight of one serve of finished product
        = 5/100 x 210 grams
        = 10 grams whole grain per serve

With 10 grams of whole grain per serve the liquid product can make a claim of 'contains whole grain'.