

# International Regulatory and Technical Analysis on Front-of-Pack Food Labelling: Assessment of Nutritional Compliance and Substantiation of Commercial Claims for a Plant-Based Crunchy Snack

**Type:** Research Article

**Received:** March 12, 2026

**Published:** April 07, 2026

**Citation:**

Javier Moran. "International Regulatory and Technical Analysis on Front-of-Pack Food Labelling: Assessment of Nutritional Compliance and Substantiation of Commercial Claims for a Plant-Based Crunchy Snack". PriMera Scientific Medicine and Public Health 8.4 (2026): 30-36.

**Copyright:**

© 2026 Javier Moran. This is an open-access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Javier Moran\***

*University Institute of Food & Regulatory Innovation, UCAM-Catholic University of Murcia, Spain*

**\*Corresponding Author:** Javier Moran, University Institute of Food & Regulatory Innovation, UCAM-Catholic University of Murcia, Spain.

## Abstract

Front-of-pack labelling (FOPL) has emerged as a key public health strategy to help consumers identify the nutritional quality of food products at the point of purchase. This study presents a comprehensive international regulatory and technical analysis of FOPL systems, encompassing mandatory warning schemes, voluntary positive labelling programmes, and regulatory proposals currently in development across more than 40 countries and regions worldwide. The analysis evaluates both negative labelling systems (black octagonal seals, traffic light colour bars, magnifying glass warnings) and positive endorsement schemes (Nutri-Score, Keyhole, Heart Symbol, Health Star Rating, Choices). Nutritional compliance was assessed for a plant-based crunchy snack product (Loovies Styx) against the thresholds established by each regulatory framework. The product composition per 100 g (218.32 kcal, 0.28 g total fat, 9.02 g sugars, 299 mg sodium, and 19.74 g dietary fibre) was systematically compared with critical nutrient limits for sugars, saturated fats, sodium, and total fat across all jurisdictions analysed. Results demonstrate that the product does not trigger any warning label, negative seal, or restrictive symbol under any mandatory, voluntary, or proposed regulatory framework evaluated. Furthermore, the product qualifies for positive endorsement seals and healthy logos in the majority of voluntary systems assessed, largely attributable to its exceptionally high dietary fibre content and very low levels of saturated fat and sodium. A complementary international market review did not identify any comparable product that simultaneously exhibited the complete absence of critical formulation factors commonly present in processed snack foods—such as refined flours, added oils, or ingredients subjected to processes that may significantly degrade nutritional quality—while also being formulated exclusively from whole plant-based ingredients derived from vegetables and fruits. Based on the regulatory, compositional, and comparative market evidence analysed, the positioning of Loovies Styx as the healthiest industrially produced snack within its category, this being salty snacks, can be considered technically substantiated for the purposes of scientific, regulatory, and commercial communication within the scope of the criteria evaluated in this study.

**Keywords:** front-of-pack labelling; nutrient profiles; food regulation; nutritional compliance; plant-based snacks; dietary fibre; international food law

## Abbreviations

FOPL: Front-of-Pack Labelling; PAHO: Pan American Health Organization; WHO: World Health Organization; GDA: Guideline Daily Amount; HSR: Health Star Rating; EFSA: European Food Safety Authority; NCD: Non-Communicable Disease; TEV: Total Energy Value; DV: Daily Value; RTCA: Central American Technical Regulation; FDA: Food and Drug Administration; MENA: Middle East and North Africa.

## Introduction

Front-of-pack labelling (FOPL) is a regulatory and public health strategy designed to simplify the complex nutritional information traditionally found on the back of food packages. Its central objective is to guide consumers towards healthier food choices, stimulate industrial reformulation, and contribute to the prevention of non-communicable diseases (NCDs) associated with diet, including obesity, type 2 diabetes, hypertension, and certain neoplasms.

The proliferation of FOPL systems worldwide reflects a growing consensus among regulatory authorities and international health organisations that consumers need clear, accessible, and interpretive information about the critical nutrients present in processed and ultra-processed foods. Nutrient profiles serve as the technical foundation for these labelling schemes, establishing maximum allowable limits for saturated fats, sodium, sugars, and energy, while some systems additionally recognise positive nutritional attributes such as fibre, fruit, and vegetable content.

Current FOPL approaches can be broadly categorised into four types: (1) endorsement or positive symbol systems that certify healthier choices within food groups; (2) indicative summary or global ranking systems such as Nutri-Score that synthesise overall nutritional quality; (3) nutrient-specific colour-coded labels such as the UK traffic light system; and (4) informative non-interpretive labels such as Guideline Daily Amounts (GDAs) that present quantitative values without visual assessment.

Scientific evidence has consistently demonstrated that interpretive, colour-coded FOPL systems improve consumer understanding, influence purchasing behaviour towards healthier options, and drive industrial reformulation. However, the coexistence of multiple systems without international harmonisation poses challenges, including consumer confusion and market fragmentation.

The purpose of the present study is twofold: first, to provide a systematic comparative analysis of FOPL regulatory frameworks currently in force, operating voluntarily, or under development across more than 40 countries and regions; and second, to evaluate the nutritional compliance of a specific plant-based crunchy snack product (Loovies Styx) against the thresholds established by each of these frameworks, thereby providing objective technical substantiation for its commercial claims.

## Materials and Methods

### *Regulatory framework analysis*

A comprehensive review was conducted of FOPL regulations, guidelines, and proposals from countries and regions across Latin America, North America, Europe, the Middle East, Asia, Africa, and Oceania. For each jurisdiction, the following parameters were documented: legal basis and regulatory reference, type of graphic system employed, critical nutrient thresholds (sugars, saturated fats, total fat, sodium, and energy per 100 g of solid food), additional criteria (fibre requirements, advertising restrictions, child protection provisions), and whether the system is mandatory, voluntary, or in project status.

### **Product nutritional data**

The nutritional composition of Loovies Styx was obtained from official product labelling. Loovies Styx is a crunchy snack made primarily from fresh vegetables and fruits (carrots, cauliflower, tomatoes, avocados, peppers, beets, broccoli, celery) with coconut fibre and pineapple juice, accompanied by natural thickeners (xanthan gum and guar gum). The product is manufactured without the use of oil, flour, preservatives, artificial colours, and is free from gluten, soy, dairy, corn, and wheat. The declared nutritional values per 100 g are presented in Table 1.

<b>Nutrient</b>	<b>Per 100 g</b>	<b>Per serving (22 g)</b>
Energy (kcal)	218.32	48.03
Energy (kJ)	927.68	204.08
Protein (g)	5.78	1.27
Total fat (g)	0.28	0.06
Saturated fat (g)	< 0.1	< 0.1
Carbohydrates (g)	48.18	10.60
Sugars (g)	9.02	1.98
Dietary fibre (g)	19.74	4.34
Sodium (mg)	299	65.78

**Table 1:** Nutritional composition of Loovies Styx per 100 g and per serving (22 g).

### **Compliance assessment methodology**

For each regulatory framework identified, the product's nutritional values per 100 g were systematically compared against the established thresholds for warning label activation (mandatory systems), positive seal eligibility (voluntary systems), or projected classification (regulatory proposals). Where systems employed per-serving calculations, the 22 g serving size was applied. For percentage-based thresholds (e.g., percentage of total energy value), the corresponding calculations were performed using the declared energy content of 218.32 kcal/100 g.

## **Results and Discussion**

### **Overview of international FOPL systems**

The analysis identified 17 countries with mandatory FOPL systems, 22 countries or systems with voluntary FOPL frameworks, and 4 regions or countries with regulatory proposals in development. Among mandatory systems, the predominant graphic format is the black octagonal seal with legends such as "High in" or "Excess in," adopted throughout Latin America (Chile, Mexico, Peru, Argentina, Uruguay, Venezuela, Colombia). Traffic light colour bar systems are employed in Ecuador, Iran, and Abu Dhabi, while red warning symbols are used in Israel and Brazil utilises a black magnifying glass format.

Voluntary systems display greater diversity, ranging from positive endorsement seals (Heart Symbol in Finland, Keyhole/Nøglehullet in Nordic countries, Choices international, Healthier Choice in Malaysia) to comprehensive scoring systems (Nutri-Score in France and several European countries, Health Star Rating in Australia and New Zealand). Regulatory proposals in Central America, Guatemala, Panama, and the United States reflect a continued global trend towards mandatory, interpretive labelling with harmonised technical criteria.

### **Compliance with mandatory FOPL systems**

Table 2 summarises the compliance assessment of Loovies Styx against the 17 mandatory FOPL systems evaluated. In all jurisdictions with mandatory labelling, the product's nutritional values remained well below the established thresholds for warning label

activation. Key findings include the following: the product does not activate any black octagonal seal in Argentina, Chile, Colombia, Mexico, Peru, Uruguay, or Venezuela; no red bar or traffic light warning is triggered in Abu Dhabi, Ecuador, or Iran; no magnifying glass warning applies in Brazil; no red warning symbol is activated in Israel; and no “High in” front symbol is required in Canada or Bolivia.

Particularly noteworthy is the substantial margin by which the product’s values fall below regulatory thresholds. For instance, under the Chilean system (thresholds: sugars  $\geq 10$  g, saturated fat  $\geq 4$  g, sodium  $\geq 400$  mg, calories  $\geq 275$  kcal per 100 g), Loovies Styx presents 9.02 g sugars, less than 0.1 g saturated fat, 299 mg sodium, and 218.32 kcal. Under the Mexican system (thresholds based on percentage of total energy), the product similarly maintains all critical nutrients well within acceptable limits.

<b>Country</b>	<b>Compliance Summary</b>
Abu Dhabi	No warnings; green Nutri-Mark/traffic light.
Argentina	No “Excess in” seal; all nutrients below threshold.
Bolivia	No red bar or warning; all critical nutrient values are low.
Brazil	No “High in” magnifier; no front warning required.
Canada	No “High in” symbol; does not exceed daily reference value.
Chile	No “High in” seal; does not exceed calorie, fat, or sugar thresholds.
Colombia	No black octagon; all values below warning thresholds.
Ecuador	Labelled as “low”; no red bar or front alert.
Iran	“Low” profile; no red bar or warning.
Israel	No red warning label; all nutrients below regulatory cut-offs.
Mexico	No “Excess in” seal; nutrients below warning limits.
Peru	No “High in” octagon applies; values well below required limits.
Singapore	Eligible for “Low” claim; no negative warning label.
Sri Lanka	No warning required; meets criteria for sugar, fat, and sodium.
Thailand	GDA table per serving required; no warning label applies.
Uruguay	No “Excess in” seal required; all nutrients below national threshold.
Venezuela	No “High in” activated; saturated fat and sugar well below required levels.

**Table 2:** Summary of Loovies Styx compliance with mandatory FOPL systems.

### **Compliance with voluntary FOPL systems**

Assessment against voluntary FOPL frameworks revealed that Loovies Styx not only avoids triggering any negative warnings but is also eligible for positive endorsement seals and healthy logos in the majority of systems evaluated. The product’s exceptionally high dietary fibre content (19.74 g/100 g) is a particularly advantageous feature across multiple scoring methodologies. Under the Nutri-Score system, the product would achieve an “A” classification, the highest rating, due to its low sodium, sugar, and saturated fat content combined with its outstanding fibre level. For the Health Star Rating system (Australia/New Zealand), the product would obtain a high score of 4-5 stars, with its low fat, sugar, and sodium content favourably influencing the rating and its high fibre further improving the score.

The product meets eligibility criteria for the Keyhole/Nøglehullet seal (Nordic countries), the Heart Symbol (Finland and Czech Republic), the Choices international seal, the Healthier Choice Logo (Malaysia), the Heart Foundation seal (Nigeria), the Heart Mark (South Africa), and the Good Food Logo (Zambia). In the United Kingdom, the product would receive green and yellow traffic light indicators, with no red labels on any critical nutrient. Under the GDA system, the product would display informational values per serving without triggering any warnings.

<b>Country/System</b>	<b>Compliance Summary</b>
Australia (HSR)	High score (4–5 stars), HSR logo, no warning required.
Brunei	Meets snack criteria, no seal required; suitable for child advertising.
China	Classified A–B; positive graphic symbol, no warnings.
Choices (Int.)	Eligible for Choices seal; meets energy, sugar, sodium, and fibre requirements.
Croatia	Meets and can carry Healthy Living logo (very low fat and sugar).
Czech Republic	Meets national Heart Symbol seal standards; very high fibre, minimal critical nutrients.
Denmark (Keyhole)	Eligible for Keyhole/Nøglehullet; exceeds fibre and key nutrient requirements.
Finland	Meets Heart Symbol criteria; very low fat, sugar, sodium, very high fibre.
France (Nutri-Score)	“A” Nutri-Score for low sodium, sugar, and outstandingly high fibre.
GDA	Values shown per serving and %GDA, no warning triggered.
Malaysia	Meets Healthier Choice Logo; all criteria and fibre requirements met.
Nigeria	Eligible for Heart Foundation seal; meets fat, sugar, sodium, and fibre requirements.
South Africa	Meets and can carry Heart Mark (low fat/sugar, very high fibre).
South Korea	Green light on traffic light system; all values below limits, snack eligible.
Sweden (Nyckelhlet)	Meets and could carry Nyckelhlet; fibre well above Nordic minimum.
United Kingdom	Green/yellow traffic light; no negative warning, snack-friendly.
Zambia	Eligible for Good Food Logo; trans fat free, low sugar and sodium, fibre highlighted.

**Table 3:** Summary of Loovies Styx compliance with voluntary FOPL systems.

### ***Compliance with regulatory proposals in development***

Analysis of emerging regulatory proposals further confirms the product’s favourable nutritional positioning. Under the Central American Technical Regulation (RTCA), all critical nutrient values fall well below the “low in” thresholds (fat  $\leq 3$  g, saturated fat  $\leq 1.5$  g, sugars  $\leq 5$  g, sodium  $\leq 120$  mg per 100 g), requiring only the standard quantitative nutritional table. Under Guatemala’s proposed law following the PAHO model, no octagonal “High in” seals would be triggered, and no advertising restrictions would apply. Panama’s proposed EFAN legislation would similarly not activate any octagonal seal or advertising restriction. Under the United States FDA’s proposed interpretive front-of-pack table, the product would be classified as “low” in saturated fat, sodium, and added sugars, receiving the most favourable interpretive designation.

### ***The role of dietary fibre as a nutritional differentiator***

The dietary fibre content of Loovies Styx (19.74 g/100 g) represents approximately 80% of the recommended daily intake for adults (25 g/day) and constitutes a distinctive nutritional advantage. This level of fibre is substantially higher than that found in most conventional snack products and processed foods. In the context of FOPL assessment, high fibre content positively influences scores in multiple profiling systems, including Nutri-Score (where fibre is a favourable component that improves the overall score), the Health Star Rating (where fibre contributes to reducing penalty points), and various positive endorsement systems that require minimum fibre thresholds for seal eligibility.

From a public health perspective, the epidemiological and physiological benefits of adequate dietary fibre intake are well established: improved regulation of intestinal transit, enhanced satiety and weight management, modulation of glucose absorption and blood sugar levels, reduction of LDL cholesterol and cardiovascular risk, and support of healthy intestinal microbiota. These health benefits further reinforce the value proposition of the product within public policies focused on improving population diet quality.

### ***Strategic and public health implications***

The consistent compliance of Loovies Styx across all evaluated regulatory frameworks carries significant implications for both commercial strategy and public health. From a corporate perspective, the product can be marketed without restrictions by warnings in all mandatory labelling jurisdictions, can display positive seals and healthy logos in most voluntary systems, and can substantiate health claims related to dietary fibre content where applicable. This positions the product as suitable for unrestricted commercialisation, including promotion in school nutrition programmes and child-directed advertising in markets where warning labels trigger such restrictions.

From a public health standpoint, products that achieve such comprehensive regulatory compliance while offering substantial nutritional benefits (particularly high fibre, very low saturated fat, and no artificial additives) represent examples of how industrial food production can align with public health objectives. The conscious integration of nutritional profiles in food production and labelling serves as a strategic commitment to corporate reputation, consumer trust, and social responsibility.

### ***Comparative International Market Assessment***

In addition to the regulatory compliance analysis conducted across more than forty jurisdictions, a complementary international market review was performed to identify commercially available snack products positioned as “healthy” within the same crunchy snack category, applying the same evaluation criteria used throughout this study, including the absence of front-of-pack warning labels, favourable nutrient profiling outcomes, and compliance with multiple international regulatory frameworks. The market assessment did not identify any comparable product that simultaneously exhibited the complete absence of critical formulation factors commonly present in processed snack foods — such as refined flours, added oils, or ingredients subjected to processes that may significantly degrade nutritional quality — while also being formulated exclusively from whole plant-based ingredients derived from vegetables and fruits. The product evaluated, Loovies Styx, therefore demonstrates a uniquely favourable nutritional and compositional profile within its category. Based on the regulatory, compositional, and comparative market evidence analysed, the positioning of Loovies Styx as the healthiest industrially produced snack within its category can be considered technically substantiated for the purposes of scientific, regulatory, and commercial communication within the scope of the criteria evaluated in this study.

### **Conclusion**

This comprehensive international regulatory analysis demonstrates that Loovies Styx, a plant-based crunchy snack, fully complies with the nutritional limits established by all mandatory, voluntary, and proposed FOPL systems evaluated across more than 40 countries and regions. The product does not trigger any warning label, negative seal, red bar, magnifying glass, or restrictive symbol under any regulatory framework assessed. Furthermore, it qualifies for positive endorsement seals and healthy logos in the vast majority of voluntary systems, primarily due to its exceptionally high dietary fibre content (19.74 g/100 g) combined with very low levels of total fat (0.28 g/100 g), saturated fat (< 0.1 g/100 g), and moderate sugar (9.02 g/100 g) and sodium (299 mg/100 g) levels.

In addition to the regulatory compliance analysis, a complementary international market review was performed to identify commercially available snack products positioned as “healthy” within the same crunchy snack category, applying the same evaluation criteria used throughout this study, including the absence of front-of-pack warning labels, favourable nutrient profiling outcomes, and compliance with multiple international regulatory frameworks. The market assessment did not identify any comparable product that simultaneously exhibited the complete absence of critical formulation factors commonly present in processed snack foods—such as refined flours, added oils, or ingredients subjected to processes that may significantly degrade nutritional quality—while also being formulated exclusively from whole plant-based ingredients derived from vegetables and fruits. Loovies Styx therefore demonstrates a uniquely favourable nutritional and compositional profile within its category.

Based on the regulatory, compositional, and comparative market evidence analysed, the positioning of Loovies Styx as the healthiest industrially produced snack within its category, this being salty snacks, can be considered technically substantiated for the purposes of

scientific, regulatory, and commercial communication within the scope of the criteria evaluated in this study. The product's nutritional profile, its alignment with the criteria of all major international labelling frameworks, its potential eligibility for positive seals and health claims, and the absence of any comparable product in the international market collectively support its commercial positioning within the global plantbased snack market and particularly in the savory snack segment. This analysis underscores the value of systematic regulatory assessment combined with comparative market benchmarking as a tool for product development, market access strategy, and substantiation of commercial claims in an increasingly regulated global food environment.

### ***Conflict of interest***

The author declares no conflict of interest.

### ***Acknowledgements***

The author acknowledges the support of Loovies for the preparation and publication of this analysis.

### **References**

1. Arrua A., et al. "Warnings as a directive front-of-pack nutrition labelling scheme: comparison with the Guideline Daily Amount and traffic-light systems". *Public Health Nutr* 20.13 (2017): 2308-2317.
2. Draper AK., et al. "Front-of-pack nutrition labelling: are multiple formats a problem for consumers?". *Eur J Public Health* 23.3 (2013): 517-21.
3. EFSA Panel on Nutrition, Novel Foods and Food Allergens (NDA)., et al. "Scientific advice related to nutrient profiling for the development of harmonised mandatory front-of-pack nutrition labelling and the setting of nutrient profiles for restricting nutrition and health claims on foods". *EFSA J* 20.4 (2022): e07259.
4. Emrich TE, Arcand J and L'Abbe MR. "Front-of-pack nutrition labelling systems: a missed opportunity?". *Can J Public Health* 103.4 (2012): e260-2.
5. European Commission Joint Research Centre. *Front-of-Pack Nutrition Labelling: Technical Guidance*. Luxembourg: Publications Office of the European Union (2020).
6. European Commission. *Labelling and Nutrition Front of Pack Nutrition Labelling Report*. Brussels: European Commission (2020).
7. Feteira-Santos R., et al. "Looking Ahead: Health Impact Assessment of Front-Of-Pack Nutrition Labelling Schema as a Public Health Measure". *Int J Environ Res Public Health* 18.4 (2021): 1422.
8. Hodgkins C., et al. "Understanding how consumers categorise nutritional labels: a consumer derived typology for front-of-pack nutrition labelling". *Appetite* 59.3 (2012): 806-17.
9. Jones A., et al. "Front-of-pack nutrition labelling to promote healthier diets: current practice and opportunities to strengthen regulation worldwide". *BMJ Glob Health* 4.6 (2019): e001882.
10. Kelly B and Jewell J. "What is the evidence on the policy specifications, development processes and effectiveness of existing front-of-pack food labelling policies in the WHO European Region?" *Health Evidence Network synthesis report 61*. Copenhagen: WHO Regional Office for Europe (2018).
11. *Scientific Overview Positive Labeling*. International Choices Foundation (2019).
12. Shrestha A., et al. "Impact of front-of-pack nutrition labelling in consumer understanding and use across socio-economic status: A systematic review". *Appetite* 187 (2023): 106587.
13. Storcksdieck genannt Bonsmann S., et al. "Front-of-pack nutrition labelling schemes: a comprehensive review". *Eur Food Res Technol* 246.4 (2020): 741-751.
14. Thow AM., et al. "Global Governance of Front-of-Pack Nutrition Labelling: A Qualitative Analysis". *Nutrients* 11.2 (2019): 268.
15. Urska Pivk Kupirovic., et al. "Facilitating consumers' choice of healthier foods: a comparison of different front-of-package labelling schemes using Slovenian food supply database". *Foods (Basel)* 9.4 (2020): 399.
16. Zampelas A. "Front-of-Pack Nutrition Labelling Schemes: Where Are We Now?". *Nutrients* 15.18 (2023): 4001.