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CAN DIETARY RECOMMENDATIONS FOR FRUIT AND VEGETABLE INTAKE BE MET WITHIN SUSTAINABLE FOOD SYSTEMS?

Co-chairs: **Boitshepo BIBI GIYOSE & Joël DORÉ**

Scientific Committee: **Ramya AMBIKAPATHI, Sylvie AVALLONE, Malek BATAL, Jean-Pierre CRAVEDI, Sophie DROGUE, Rémi KAHANE, Sophie NICKLAUS, Christian REYNOLDS, Mphumuzi SUKATI, Roberto UGAS**

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Vegetable Consumption Patterns among Patients with Obesity and their Association with Occupational and Dietary Habits

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Overview

- Vegetables play an important role in the prevention and management of obesity due to their low energy density [1], high micronutrient and high fiber [2] content.

Objective: To examine vegetable intake in patients with obesity and its association with lifestyle factors and broader dietary patterns.

Methodology

- Study Design: Cross-sectional study
- Setting: Outpatient Unit for Dietetic (2025)
- Data Collection: 24-hour dietary recall [3] at the first visit
- Primary Outcome: Number of servings (S) of vegetables [4]

Patient Demographics

- Sample Size: N = 100 consecutive patients
- Gender: 76% Female
- Mean BMI: 39.4 ± 5.99 kg/m^2
- Comorbidities:
  - 50% Hypertension
  - 22% Diabetes

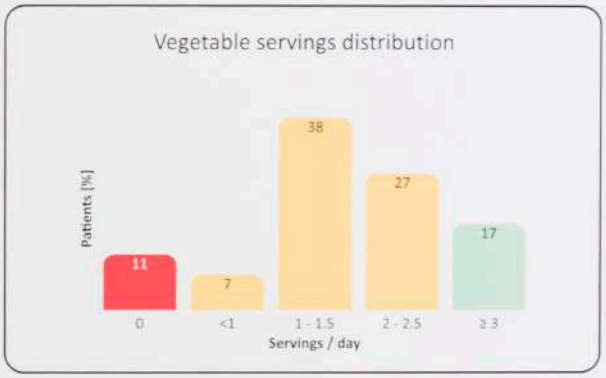
Conclusions

- Only 17% of patients with obesity met the recommended three daily vegetable servings, revealing a major dietary gap.
- Vegetables were displaced by dairy, bread and pastries.
- Patients engaged in physically demanding occupations consumed fewer vegetables, potentially explained by lower income, lower education levels, and the consumption of ultra-processed foods during work hours.
- Further research is needed to investigate the long-term impact and develop targeted interventions for high-risk occupational groups.

Results

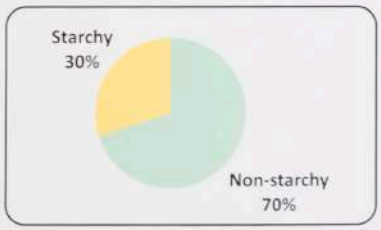
Only **17%** of patients with obesity consumed the recommended 3 servings of vegetables a day.





1.61 ± 1.12
Servings / day

5%
Ate legumes



Number of vegetable servings was **negatively correlated** with work-related physical activity and dairy and grains consumption.



▼ Lower Vegetable Intake
r = -0.218 | p = 0.029



▼ Lower Vegetable Intake
r = -0.220 | p = 0.028



▼ Lower Vegetable Intake
r = -0.221 | p = 0.027

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Changes in the FODMAP content of onions during long-term cold storage

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1. Context and Objective

- **Irritable bowel syndrome (IBS):** Common functional gastrointestinal disorder associated with abdominal pain, bloating, constipation...
- **Prevalence:** About 10-15% of adults potentially affected.
- **FODMAPs***: Fermentable carbohydrates recognized as dietary triggers that can exacerbate symptoms in sensitive individuals.
- **Onions (*Allium cepa* L.):** Known as a major dietary FODMAP source, mainly due to their high fructan content.
- **Current knowledge**: Limited information on FODMAP changes in onions during long-term storage.
- **Aim of this work**: Investigate FODMAP changes in two onion varieties during long-term storage using UPLC-MS.

** Fermentable Oligosaccharides, Disaccharides, Monosaccharides, And Polyols*

2. Material and Methods

- Onion cultivars: Hybound and Hybelle (Bejo)
- Harvest: September 2025 (Pas-de-Calais, France)
- Storage conditions: Cured at 25°C for 1 month, then stored at 1°C for up to 9 months.
- Sampling: Harvest, 1*, 3*, 6 and 9 months (* only for Hybound)
- Sugars, fructooligosaccharides (FOS), galactooligosaccharides (GOS), and polyols were determined and analyzed using UPLC-MS (QDa, Waters, USA) as described [1, 2] with some modifications.
- Total fructans were determined using a fructanase mixture containing exo- and endo-inulinase (ratio 25:1) (LIBIOS, France).

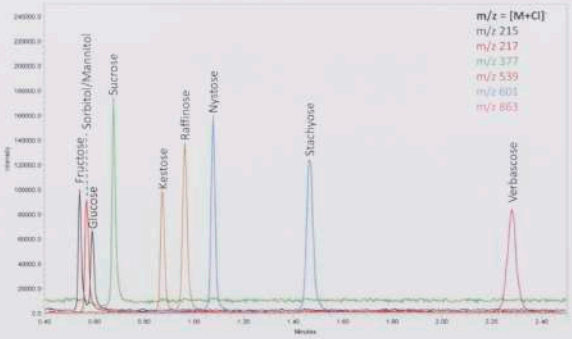


Figure 1: SIR chromatograms of the saccharide standards.
Waters Acquity BEH Amide column (100 mm × 2.1 mm i.d., 1.7 µm). ACN/H_2O/NH_3 (65/34/1) with 10 mM NH_4HCO_2 and 500 ppb CH_3N_2•HCl. Column temp. 70°C. Flow rate 0.8 ml/min. Inj. 1µL

3. Results and Discussion

- **Analytical conditions:** Rapid and reliable UPLC-MS method developed in our laboratory for FODMAP analysis in onions (**Fig. 1**).
- **Total fructans:** Sharply decreased from ~ 5.5/100g FM at harvest to ~0.5/100g FM after 6-9 months (**Fig. 2A**).
- **Total FOS** (sum of nystose and kestose): Showed a similar decrease (**Fig. 2B**).
- **Glucose-to-fructose ratio:** Decreased with storage but remained >1 (**Fig. 2C**), indicating no contribution of fructose to FODMAP content.
- **Other results:** Traces of raffinose (GOS) only detected after 6-9 months. Sorbitol and mannitol (polyols) not detected.

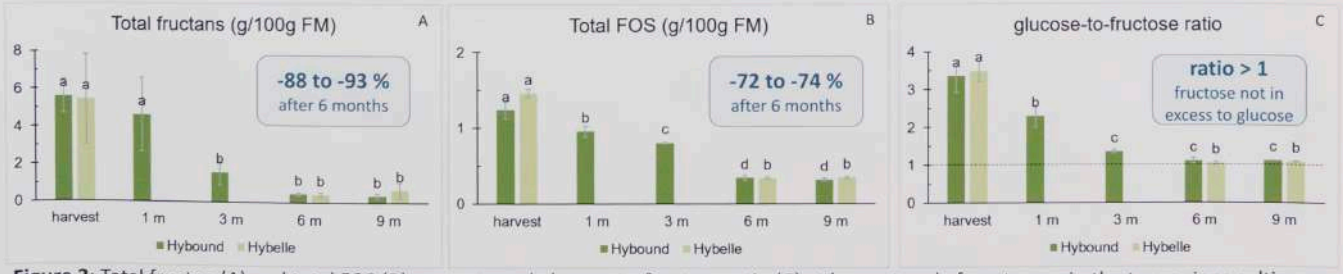


Figure 2: Total fructan (A) and total FOS (B) contents and glucose-to-fructose ratio (C) at harvest and after storage in the two onions cultivars.
Similar vertical bars with different letters are significantly different (Duncan's test, $p < 0.05$).

4. Conclusion and Perspectives

- **Prolonged storage at 1°C significantly reduces the FODMAPs in onion bulbs, mainly due to a major decrease in total fructan content.**
- After 6 months, onions met the **low-FODMAP cutoff** (0.2 g/serve), whereas fresh onions (~2.0 g/serve) are classified as high-FODMAP [3].
- **Impact of cooking** on onion FODMAP content is currently under investigation.
- Further clinical studies are needed to determine if a such fructan reduction results in **better gastrointestinal tolerance** in IBS patients.

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FRUIT PUREE CAN PRESERVE MOST OF THE ANTIOXIDANT QUALITY OF FRESH FRUIT

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Contexte

Fruit and vegetable consumption contributes to reduce the burden of several types of cancers (WCRF, 2017) and antioxidant compounds such as polyphenols decreased cardiovascular disease risk (Adriouch et al., 2018).
Although fruit purées are widely consumed, limited data are available regarding the preservation of their antioxidant properties compared with fresh fruits.

Objectif

Compare fresh fruits and industrial fruit purées in terms of:

- Phenolic content
- Carotenoid content
- Antioxidant activity

Experimental design



Processing



1 Thermal treatment

2 Thermal treatments + ascorbic acid — +4°C Storage (0;45;90;120 days)

- *Total phenolic content*
  Folin-Ciocalteu method
- *Antioxydant activity*
  DPPH
- *Carotenoids*
  β Carotene content, adapted from Hanan et al., 2020

Nutritional analysis

Mild heat treatment/ Short processing time. Results are expressed per gram of fresh product.
Dunn's test of multiple comparisons following a significant Kruskal-Wallis test ($p < 0.05$) was performed with RStudio software.

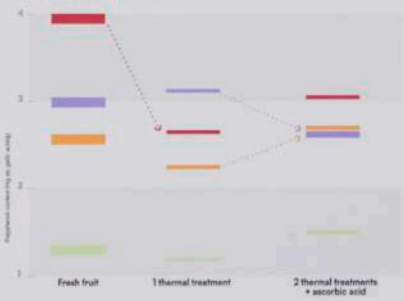
Impact of processing conditions

Processing can affect the phenolic content and antioxydant activity, as seen with raspberry fruit and purée. **However, this effect is limited or non significant in other fruits.**

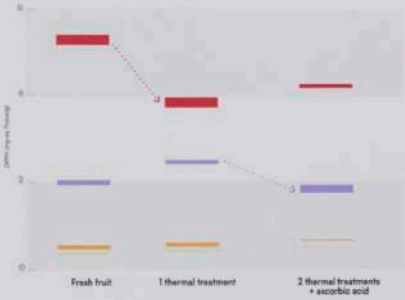
Carotenoids are mainly found in apricot. At least 75% of carotenoids are preserved during processing.

Apricot	Carotenoid content µg eq β-carotene/g
Fresh fruit	51.25 ± 2.96
1 thermal treatment	38.20 ± 2.71
2 thermal treatments + ascorbic acid	39.71 ± 1.43

Total phenolic content



Antioxydant activity



Raspberry Strawberry Apricot Pear

Arrows indicate statistical difference between samples, within the same fruit type

Impact of storage

Refrigerated storage retains 70-100% of phenolics, carotenoids and antioxydant activity

Conclusion

- Industrial fruit purées preserve most antioxidant compounds found in fresh fruits
- Although phenolic content and antioxidant activity may decrease during processing, they remain at nutritionally relevant levels
- Refrigerated storage has minimal impact on antioxidant capacity

Produce Prescriptions support diabetes management

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INTRODUCTION

Poor dietary quality contributes to risk of diet-related diseases such as type 2 diabetes. Low-income populations carry a higher burden of these, in part due to limited access to healthy food and low produce consumption. Produce prescriptions (Produce Rx), provide fruits and vegetables (FV) to patients at no cost as part of their healthcare, and could support food security, increase FV consumption and improve diet-related disease management.

OBJECTIVE

In the context of a Produce Rx program for patients with diabetes or prediabetes, we aimed to **evaluate the impact of the program on patients' blood glucose levels**. Secondarily, we aimed to **assess the program's impact on FV consumption and food security**.



METHODS



- ***Design***: pre/posttest with a single group
- ***Setting***: three community clinics in California
- ***Participants***:
  - ✓ non-pregnant patients with diabetes or prediabetes
  - ✓ newly enrolled in the Produce Rx program
  - ✓ spoke English or Spanish
  - ✓ planned to stay in the area
- **Intervention**: six months of produce ($70/month) as vouchers for farmers' markets or pre-loaded cards for grocery stores
- ***Outcomes***:
  - HbA1c values (electronic medical records)
  - Daily cups of FV (10-item food frequency questionnaire)
  - Skin carotenoid level (VeggieMeter®)
  - Food security (USDA six-item module)
- ***Analysis***: Mixed effect regression models with time (pre/post) as fixed effect and subject (nested within site) as random effect

RESULTS



Characteristics of study participants at baseline (n=190)

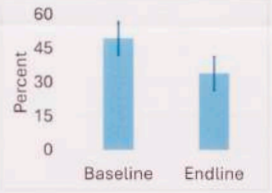
Characteristic	n (%)
Female	126 (66)
Age, y, mean ± SD	57 ± 12
Hispanic ethnicity	136 (72)
White non-Hispanic	
Other race non-Hispanic	
Preferred language	
Spanish	104 (55)
English	86 (45)
Food insecurity	94 (50)
FV cups, median (IQR)[1]	2.4 (1.9-3.0)
HbA1c (%), median (IQR)[2]	7.2 (6.1-9.4)

FV: fruits and vegetables; HbA1c: hemoglobin A1c; IQR: interquartile range; SD: standard deviation
[1]Cups per day equivalent, excluding French fries
[2]n=134 participants had electronic medical records data

Retention

Of 190 participants enrolled, six withdrew from the study. Out of 184 participants who remained in the study, 161 (85%) completed the endline assessments.

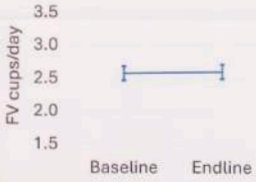
Food insecurity was reduced by 31% at endline



p = 0.004

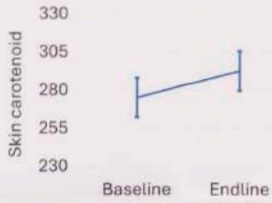


Self-reported FV intake did not differ between baseline and endline



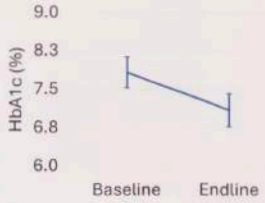
NS

Skin carotenoid levels were higher at endline vs baseline



p = 0.005

HbA1c values were lower at endline vs baseline



p = 0.003



CONCLUSIONS

- Provision of fresh produce to patients from low-income households may reduce barriers to access healthy food and improve food security.
- Clinical interventions that increase access to fruits and vegetables can support diabetes management, possibly reducing reliance on pharmacological treatment.

NEXT STEPS

- To use data from electronic medical records from patients who did not enroll in the Produce Rx program to create a matched sample that will serve as a comparison group
- To explore the role of redemption and nutrition education activities on the observed outcomes

ACKNOWLEDGEMENT

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CONTACT INFORMATION

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Ready meals: nutritional quality, connection with dietary risk factors for non-communicable diseases, and environmental impacts

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Ready Meal Consumption

- Globally, ready meal sales continue to show an upward trend, with time poverty and urbanisation driving market growth [1, 2].
- Across global surveys, approximately 9 in 10 consumers reported to recently consuming a ready meal [3].
- Consumers are now demanding healthier, more nutritious options as awareness of the risks associated with ultra-processed foods grows [1-3].



Fruit, Vegetables & Fibre

- Dietary patterns which include increased purchases of convenience foods such as ready meals, have been associated with decreased purchases of fruit and vegetables [4].



- Global fruit and vegetable consumption significantly falls short of FAO and WHO recommendations, and limited food policy exists to promote consumption beyond school-based interventions [5].
- Global average fibre intake ranges from 15g to 26g/day, lower than daily recommendations for most countries, which range from 20g to 35g/day [6].

Health & Environment



- Unhealthy and Western dietary patterns have been linked to an increased risk of obesity, which along with other metabolic risk factors, increases the probability of noncommunicable diseases [7, 8].
- Whilst the health of the human population continues to deteriorate, so too does planetary health.
- Approximately 21% to 37% of greenhouse gas emissions (GHGs) are attributable to the current food system [9].
- Plant-rich diets have been found to be more sustainable and have led to weight loss in those that are overweight or obese [10, 11].

Aim

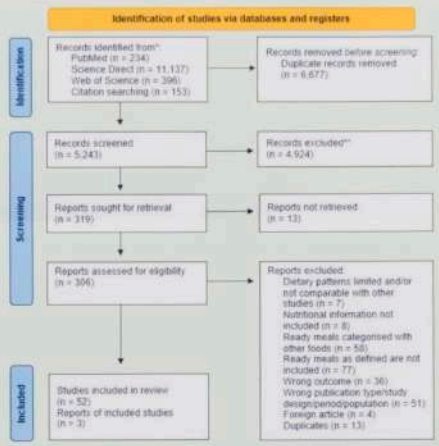
To consolidate the current evidence base on the related health and environmental outcomes associated with ready meal consumption into a single review. This research will help to identify how the nutritional profile and environmental footprint of UK ready meals might be improved through reformulation.

Methods

PRISMA

- Designed and reported according to PRISMA guidance.
- Components of the FLAVIA-LCT incorporated into the design to account for environmental impacts.
- PEO approach and WOMEN tool used to construct research questions.
- Protocol registered with PROSPERO, reference: CRD42024504545 [12].

- Searches conducted across three databases: PubMed (NIH), Science Direct (Elsevier), and Web of Science (Clarivate) in September 2024.
- Searches were restricted to 1990 onwards from any geographical location but were limited to those in English. Re-run in October 2025 and July 2026.
- Inclusion criteria: those meeting the definition of a ready meal, within their own distinct category, adults aged 18+ (RQ2), and including impact data for the processing or supply chain, including production, and ingredients as a minimum (RQ3).



† 55 articles representing 52 unique studies were included; three studies were reported in multiple articles.

- Quality assessment criteria adapted from the *'PLOS Quality Assessment Tool for Observational Research'*, Joanna Briggs Institute's critical appraisal tools for analytical cross-sectional studies, and the United States Environmental Protection Agency guidance *'Data Quality Assessment for Life Cycle Inventory Data'*.

Results

- Heterogeneity in reporting the nutritional metrics for ready meals meant that meta-analysis was not possible.
- Just four studies reported the ingredient composition, and vegetable servings were unknown.
- Evidence for BMI/obesity associations was limited: one study reported no association, while another observed a positive association with obesity among women only.



- 19 studies examined dietary-related patterns, but substantial population heterogeneity limited direct comparison.
- Gender comparisons were reported in several studies, although population characteristics and study context varied. For example, one study examined college students, one was conducted during the COVID-19 pandemic, and one compared groups by weight status.
- Only six studies evaluated the environmental impact of ready meals, with GWP the most frequently reported impact indicator.
- Environmental impacts varied across meal types and preparation methods, with animal-based ingredients generally associated with higher greenhouse gas emissions (GWP).

Conclusion

- Despite 52 studies being included in the review, the evidence was fragmented and not directly comparable.
- Environmental evidence was particularly limited, highlighting the need for integrated research combining nutritional quality, environmental impacts and food systems science to identify how ready meal composition could be improved through structural interventions such as mandatory reformulation.
- Future research should examine potential synergies and trade-offs between nutritional and environmental outcomes when modifying ready meal ingredient composition.

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From sender to receiver: investigating children's role in food communication

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Context

- Fruit and vegetable consumption significantly reduces the risk of several chronic diseases (WHO).
- In France in 2019, only 1/3 of adults (aged 18+) and 10% of young people meet the recommendation of the French National Nutrition and Health Program (PNNS) of at least five portions per day (Seconda et al., 2021).
- Social gradient: low-income households purchase about 26% fewer fresh fruits and vegetables than the national average (Kantar, purchase data 2024).
- Most policy response rely on top-down education programs and are relatively ineffective.

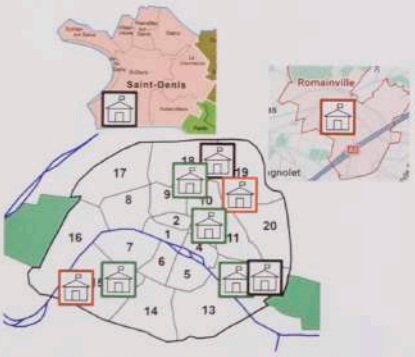
Contributions

- Estimate the impact of different sources of nutritional messages, teacher versus an elected peer, on children's food consumption and preferences.
- Using a tool based on AI to measure actual children's food intake at the individual level.

Methods

Randomized controlled trial with two treatment groups (**peer, teacher**) and a control group on 290 9th grade pupils over the 2025-2026 school year. **Before-during-after design.**

10 schools **socially contrasted**



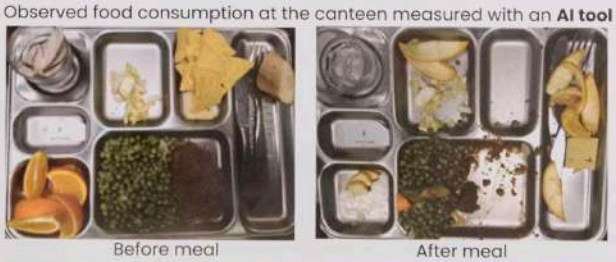
Treatment	# registered pupils	# schools
Control	84	3
Peer	99	4
Teacher	115	3

Treatments



Primary outcome

Observed food consumption at the canteen measured with an **AI tool**



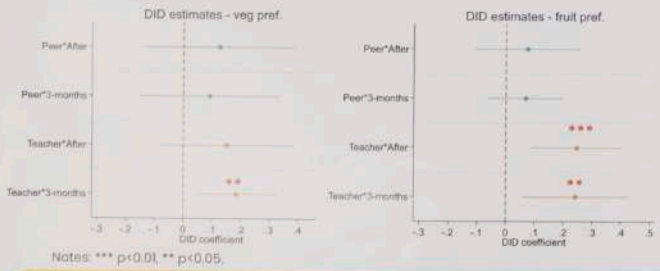
Before meal | After meal

Diff-in-diff model

$$Y_{it} = \alpha_i + \alpha_s + \beta_1 \text{After}_{it} + \beta_2 \text{Peer} + \beta_3 \text{Teacher} + \beta_4 \text{After} \times \text{Peer} + \beta_5 \text{After} \times \text{Teacher} + \epsilon_{it}$$

Results on preferences

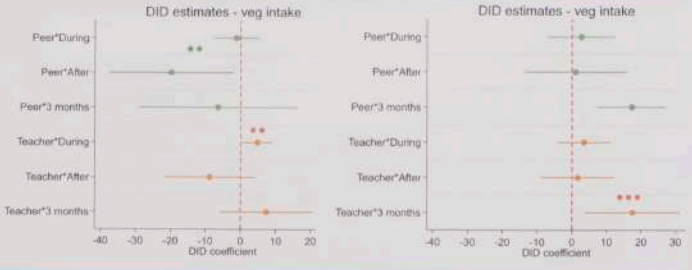
Based on questionnaires



Notes: *** p<0.01, ** p<0.05.

Canteen data (very preliminary)

Based on 5392 before-after meals photographed



Discussion

- Novelty in the measurement of actual food intake during lunch in schools and in the children's network and its relationship with food habits
- Policy implications on various levels:
  - Descriptive: How and what do children eat in the canteen?
  - Levers: does "peer education" work?
- Network mapping also will also be considered: allows comparisons between structural peer influence, estimated through econometric network models, and other forms of learning, such as symbolic imitation or rule-based heuristic adoption.

Immediate *versus* delayed financial incentives for fresh fruit and vegetable purchases among low-income households

BACKGROUND

OVERWEIGHT / OBESITY

47.3%

Of adults in France (2020).
Disadvantaged groups are most affected.

FRUIT & VEGETABLE and HEALTH

≈1 in 5

deaths worldwide could potentially be prevented through healthier diets.

FRUIT & V. INTAKE | France

13% Adults **19%** Children (3-17)

Meet the ≥5 portions/day (2024)

SOCIAL GRADIENT| France

43% Less education **vs** **31%** Higher education

Children (3-17) eating <2 F&V portions/day.

Household head: no diploma vs ≥3 years of higher education.

MOTIVATION

GAP 1 / INCENTIVE TIMING

Few direct comparisons between immediate and delayed support.

GAP 2 / FRENCH PURCHASE DATA

French evaluations largely rely on self-reported consumption.

RESEARCH QUESTION

- How do financial incentives affect fresh fruit and vegetable purchases among low-income households?
- Does incentive timing affect households' behavioural responses?
- How do these incentives affect the composition and nutritional quality of the overall food basket?

EXPERIMENTAL DESIGN

Preregistered: AEARCTR-0017439 | Ethics approval: Paris Nanterre University, 2025-07-2

429

French **low-income** households.

3 groups

Control, **Voucher** and **Rebate**

➢ *Incentive: Value of **40% PNNS-recommended fruit and vegetable intake**, adjusted for household size.*

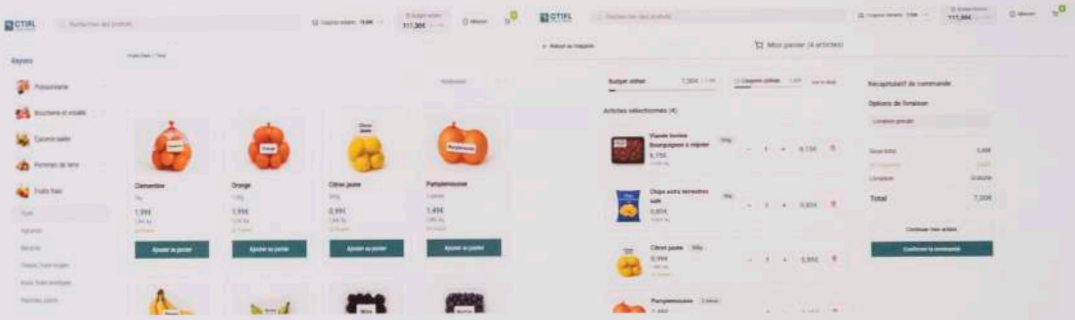
1 weekly basket

Household size adjusted budget: €39.40 per person per week

EXPERIMENTAL PLATFORM

≈ 750 products

Randomized order of
→ Categories
→ Subcategories
→ Products



Original French-language experimental interface

The post-purchase rebate increases fresh fruits and vegetables purchases

+ €3,14
Control mean: €12,98
Expenditure

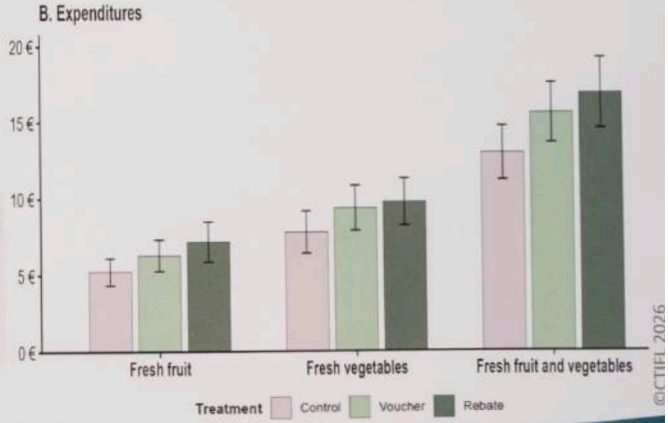
+ 3,66 p.p
Control mean: 14,7%
Share of total food expenditure

+1,37 kg
Control mean: 5,58 kg
Quantity purchased

No significant difference between the voucher and rebate

No robust improvement in food-basket quality

Products to limit (PNNS): −2.42 percentage points in expenditure share under the rebate ($p < 0.10$).



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Daniela Lima Rente[1,2], Noémi Berlin[1], Tarek Jaber Lopez[3], Anne-Laure Levet[2]

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[2] Interprofessional Technical Center for Fruit and Vegetables (CTIFL), France
[3] CSIC, Institute for Public Goods and Policies (IPP), Spain

En collaboration avec

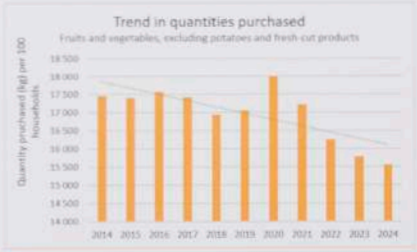
Action financée par

Fruit and vegetable consumption
Factors of evolution and levers for recovery in France

Objectives

- **Analyse the factors explaining the evolution of Fruit and vegetable consumption (cyclical a. structural factors)**
- **Identify the levers of action to reverse the downward tendency**

Problematic

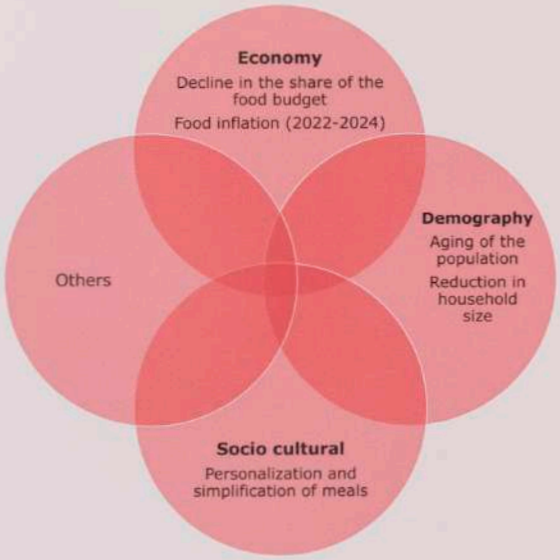


Source : Worldpanel by Numerator

Methodology

- Analyzis of evolution factors through socio-demographic changes and food consomption behaviors by a state of the art. Synthesis of studies carried out by the CTIFL .
- Presentation of the levers found through foresight workschops with professionnal actors of the sector

Evolution factors



Drivers of variation in fresh fruit and vegetable purchase volumes

Sources of Variation	Components / Definition	Share of Total Purchase Variation
Usage	Daily usability of fruits and vegetables driven by their diversity, versatility, and convenience.	25 %*
Meeting expectations	An offering that aligns with consumer expectations in terms of quality (freshness), product range width, and depth.	17 %
Pleasure	Enjoyment derived from eating fruits and vegetables, or conversely, a lack of pleasure related to taste and texture.	17 %
Diversity of choice	Availability of a wide variety of fruit and vegetable types and categories at the point of sale (organic, anti-waste, ready-to-eat...).	15 %
Alternative choices	Shifting toward alternative forms of fruits and vegetables (frozen, canned). Primarily concerns vegetables.	10 %
Health	Health benefits of fruits and vegetables.	7 %
Trust	Level of confidence in fruits and vegetables regarding sustainability criteria, pesticide presence, labels, and certifications.	6 %
Price	Price perception of fruits and vegetables.	4 %

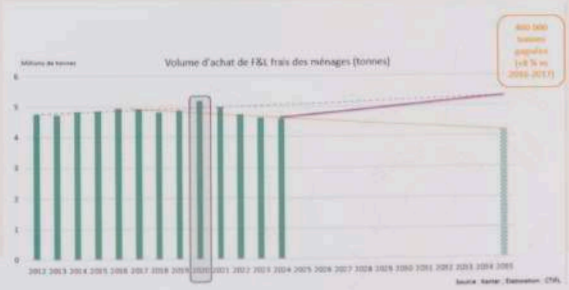
Source : Worldpanel by Numerator, based on purchase data, year 2024-2025

Levers of action









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SCIENCES & INNOVATION

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Action financée par
Interfel



Sensory Drivers of Consumer Preference for French Pears Across Age Groups

V. Cottet * , M. Capron & M. Jost

CTIFL –Route de Mollégès - 13210 Saint-Rémy-de-Provence - France, *valentine.cottet@ctifl.fr

Poire COCO project : improve the alignment between the French pear supply and consumer expectations.

OBJECTIVES

- Characterize sensory diversity of French pears
- Identify consumer expectations and drivers of choice
- Compare adults and children preferences



Particular attention was given to the emerging category of "crunchy pears," reflecting new consumption modes.

METHODS



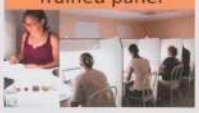
A sample representative of the French pear market.

Instrumental measurments

- Weight (g)
- Soluble Solids Content (SSC, °Brix)
- Titratable Acidity (g /L)
- Firmness (Kg/0,5cm²)

Sensory profils

Trained panel



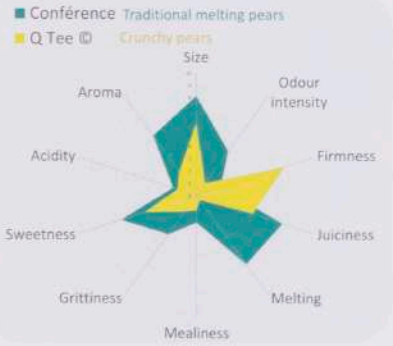
Consumers tests

100 Adults & 85 childrens

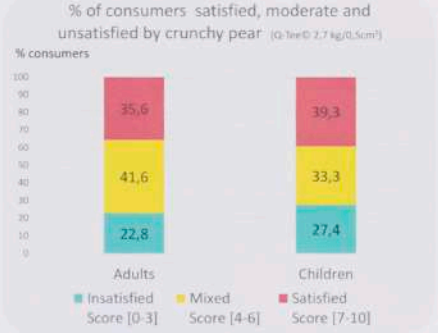
Consumer preferences, consumption habits, and usage patterns

RESULTS

Crunchy pears represent an emerging consumption segment



Consumer appreciation of crunchy pears is highly segmented

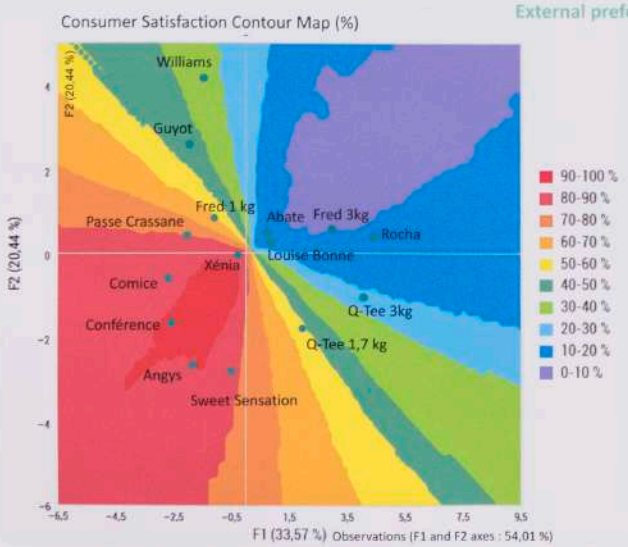


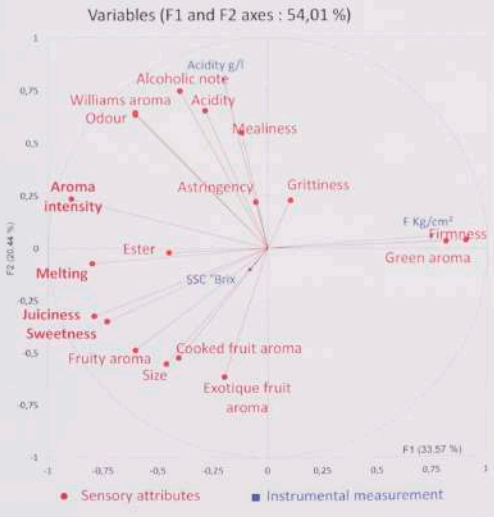
Similar preference ranking between adults and children



The ideal French pear is **juicy, melting, sweet and aromatic**, generating over 90% predicted consumer satisfaction **across age groups**.

External preference mapping





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CONCLUSIONS

- French consumers prefer juicy, sweet, aromatic and melting pears
- Adults and children share similar preferences
- Crunchy pears represent an emerging segment
- Consumer acceptance can be predicted from sensory characteristics.

Action financée par Interfel

Children's Perceptions of Fruit and Vegetable Consumption: Health and Environmental Motivations

Sandra Brouche [1], Noémi Berlin [2], **Lauriane Thénard** [3], Jacqueline Huang [4], Natalie Rigal [5]

1. Université Paris Cité, LPPS (Laboratoire de Psychopathologie et Processus de Santé), 2 & 3. CNRS, EconomiX, Université Paris Nanterre, 4. Cellule de Recherche en Soins paramédicale et Prévention santé, 5. CLIPSYD, Université Paris Nanterre

Introduction

Health : FV consumption is central to healthy eating and disease prevention.

Sustainability : More plant-based dietary choices can also contribute to environmental sustainability.

Children perspectives : Food choices depend on more than knowledge (taste, appearance and social interactions matter).

Peer effect : The school canteen is a key setting for food socialization, and children may influence each other's eating experiences and choices (Pulimeno et al., 2020).

Research gap : Little is known about how children themselves understand the links between FV & health and FV & environment, and how they would encourage their peers to eat more FV.

Objectives

1. Explore **children's perceptions** of the link between **diet and health**.
2. Explore **children's perceptions** of the link between **diet and environment**.
3. Explore **children's ideas** for **increasing their peers'** fruit and vegetable **consumption**.



Methods

Study design

Qualitative study using focus groups, reported according to the 32-item COREQ checklist (Tong et al., 2007).

Population

21 fourth-grade children, aged 8–10 years (M = 9.0, SD = 0.5), participated in 4 focus groups.

Participants were randomly allocated to:

- Health group: n = 10 (7 girls, 3 boys)
- Sustainability group: n = 11 (10 girls, 1 boy)

Children were voluntarily recruited from 2 schools representing contrasting socioeconomic backgrounds.

Data analysis

Reflexive thematic analysis was conducted following the six-step approach described by Braun & Clarke (2022)

Results

1. **Environment.** Children's perceptions of the link between FV consumption and environment (**59 verbatims**).
   - Actions
     - Wasted
     - Actions to save resources
     - Food waste
     - Personal experiences
   - Awareness
     - Nature
     - Lack of connection
2. **Health.** Children's understanding of the relationship between health and FV consumption (**110 verbatims**).
   - Effects on the body
     - Energy
     - Diseases
     - Benefits
   - Food representation
     - Balanced diet
     - Personal preferences
     - Nutritional quality
     - Learning
3. **Peer messages.** Children's ideas for developing messages to encourage FV consumption among their peers.
   - Incentive stategies
     - Taste gradually
     - Distraction
     - Rewards
   - Visual appearance
     - Make it appealing
     - Create shapes and faces

CONCLUSION

- Children have a **good understanding of the health benefits** of fruit and vegetable consumption.
- The link with **environmental sustainability** way more **difficult** to make.
- Their **ideas** for influencing peers mainly **focus on the eating experience** rather than on providing information.



These findings highlight the **potential of peer influence** and child co-design to develop more engaging **school-based interventions** promoting fruit and vegetable consumption.

References :

- Braun, V., & Clarke, V. (2022). Conceptual and design thinking for thematic analysis. Qualitative Psychology, 9(1), 3–26.
- Pulimeno, M., Piscitelli, P., Colazzo, S., Colao, A., & Miani, A. (2020). School as ideal setting to promote health and wellbeing among young people. Health Promotion Perspectives, 10(4), 316–324.
- Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care, 19*(6), 349–357.

Opportunities for integrating locally produced and procured food into school food provision in the Pacific Islands

Sarah Burkhart[1], Jessica Raneri[1,2], Ramona O'Connor[3], Alisi Taqa[3], Jenna Perry[1], Bridget Horsey[1], Mikayla Hyland-Wood[4], Elodie Casey[1], Danny Hunter[1,4]

[1]The Australian Centre for Pacific Islands Research and School of Health, University of the Sunshine Coast, Australia. [2]Department of Foreign Affairs and Trade, Port Moresby, Papua New Guinea. [3]The Pacific Community, Fiji. [4]Australian Centre for International Agricultural Research, Australia. [5]The Alliance for Bioversity International and CIAT, Italy.

Background and objective

Home-grown school feeding approaches that engage local producers have expanded globally, providing nutritious meals for schoolchildren while supporting smallholder livelihoods and rural economies[1]. However, these models, and school food provision (SFP*) more broadly, have received limited attention in the Pacific Islands region[2]. Given the regions geographic and cultural diversity, high rates of diet-related non-communicable disease, and the impacts of climate change, it is timely to identify opportunities for integrating local food production into SFP. This study therefore explored the current state of SFP and the potential for greater integration of local food production into SFP across Pacific Island Countries and Territories (PICTs).

*We use the term school food provision (SFP), as this captures the diverse forms of food provision at schools in the region (e.g., meals, gardens, tuckshops/canteens)

Methods

- This mixed-methods study was conducted across 22 Pacific Island Countries and Territories (PICTs), all of which are members of the Pacific Community (SPC) (Figure 1).



Figure 1. PICTs included in this study.

- Stage 1 aimed to understand the current state of food provision, including policy, and used a scoping review of empirical and grey literature. This was supplemented by 41 semi-structured interviews to verify findings and collect additional information.
- Six countries were then selected for in-depth case studies (Stage 2), involving deep-dive interviews with key stakeholders (n=13) to further explore current activities, policy, opportunities and barriers.
- Stage 3 was a regional validation workshop with 20 stakeholders, to assess the feasibility of home-grown SFP and identify preferred models.
- Interview data were analysed inductively, using a conventional content analysis approach.

Findings

Availability of information

- Limited empirical and grey literature identified (n=12 sources), primarily on school feeding, school gardens, school canteens, and school curricula. Interviews were critical to gaining an understanding of 'on-the-ground' activities.

Policy

- Limited integration of agriculture, aquaculture and forestry within school-related policies, where these existed.

Findings

Current state

- 22 school feeding programs were identified, varying in size and scope. Of these, n=8 required the use of local foods, and n=2 reported sourcing local foods voluntarily.
- The majority of the arrangements or contracts between farmers and schools were informal.
- Challenges, opportunities and successes varied (Figure 2) but were seen similarly across the region.
- Plenty of motivation for SFP.

Integration of fruits and vegetables

- Used in most programs (9 of 10, where the menu was available), alongside root crops, rice and fish, poultry, eggs and legumes.
- Of the 11 school garden programs identified, n=4 used produce grown to supplement SFP.

Feasibility of a model using local food

- Models based predominately, or completely on local foods was seen as an ideal solution but not considered realistic in the short term due to a lack of reliable value chains for local food supply and the absence of, or inadequate policy environment (locally and nationally).

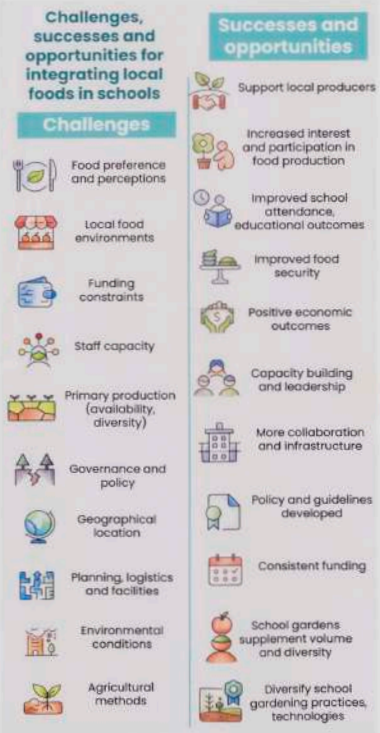


Figure 2. Challenges, successes and opportunities identified.

In summary... Home-grown school food provision approaches show promise across the Pacific, but current programmes remain limited in scale and formalisation. Stakeholders expressed strong support for greater use of local foods, although hybrid models are likely to be more feasible in the near term. Strengthening local supply chains, formalising farmer to school linkages, and tailoring models to diverse national contexts will be critical to scaling sustainable school food provision across the region.

More information

SCAN HERE Country Summaries | SCAN HERE Database | SCAN HERE Technical Report

A/Prof Sarah Burkhart sburkhar@usc.edu.au



Examples of the regional and country specific summaries.

Acknowledgements

The authors gratefully acknowledge the support of the Australian Centre for International Agricultural Research (ACIAR) for funding this work.

References

1. Pastorino, S. *et al.* Planet-friendly school meals: opportunities to improve children's health and leverage change in food systems. *The Lancet Planetary Health* 9 (2025). https://doi.org/10.1016/S2542-5196(24)00302-4.
2. Burkhart, S. *et al.* School food programmes in the Pacific Islands: exploring opportunities and challenges for creating healthier school food environments. *Public Health Nutrition* 26, 455–466 (2023). https://doi.org/10.1017/S1368980022000951.

University of the Sunshine Coast Australia | Australian Centre for Pacific Islands Research | Alliance Bioversity & CIAT | Pacific Community Communauté du Pacifique | Australian Centre for International Agricultural Research | Australian Aid | Pacific School Food Network

Longitudinal dynamics of flexitarian diets in French households

E. Remy Castagna[1], M. Vandenberghe[1], E. Sagnat[2], N. Chouchou[2]

[1]Bonduelle, Villeneuve-d'Ascq, France · [2]OpinionWay, Paris, France

GROUPE BONDUELLE
La nature, notre futur

BACKGROUND · OBJECTIVE · METHODS

CONTEXT & OBJECTIVE

Limited evidence exists on how flexitarian households evolve over time. This study investigated, over one year:

- **dietary trajectories**
- **changes in meal composition**
- **perceptions of vegetarian meals**
- **drivers of plant-based transition**

PARTICIPANTS

427 **French flexitarian adults followed for 12 months**

- Responsible for food purchasing & meal preparation
- Intending to increase plant-based foods and/or reduce meat
- Representative of French flexitarians (sex, age, SES, region)

METHODS

Online questionnaires every 3 months over 1 year

- Food & vegetarian meal consumption frequencies
- Motivations · Food Choice Questionnaire
- Perceptions of vegetarian meals & cooking confidence

RESULTS

Distinct trajectories emerged despite a stable average consumption

Participants consumed an average of 4 meat-free meals per week throughout the one-year follow-up period

- **21% CONVINCED** — high and stable · 4.8 → 5.0 meals/week
- **42% ENTHUSIASTIC** — strong increase · 2.3 → 4.9 meals/week
- **30% DISILLUSIONED** — marked decrease · 5.2 → 2.6 meals/week
- **7% SKEPTICAL** — persistently low · < 1 meal/week

2/3

showed fluctuations*

in frequency of vegetarian meals

over time

(*More than 1meal/week)

Factors associated with the trajectories

ASSOCIATED WITH INCREASE	ASSOCIATED WITH DECREASE
Cooking confidence	Household consensus difficulties
Enjoyment of cooking	Children in the household
Meal diversity	Promotion / price sensitivity
Positive perceptions of vegetarian meals	Lower cooking confidence

What has changed in the plate?

- **Pulses consumption increased across all transition trajectories;** 30% increased their consumption frequency, 40% consumed legumes ≥2 times/week
- **Vegetables consumption increased across all transition trajectories;** 40% reported increasing their consumption frequency, but vegetable intake remained below recommendations for lot of them.
- **Red meat and pork consumption decreased substantially;** 51% and 41% decreased their consumption frequency, 10% of frequent vegetarian-meal consumers fully eliminated them.
- **Meat alternatives consumption remained low,** consumed weekly by 19% of participants, mainly those under 35 years. 14% increased their consumption frequency.
- **Compensatory choices were common**, 43% increased their cheese, bread, or desserts consumption during vegetarian meals, emphasizing the importance of nutritional support.

Increased familiarity with vegetarian meals is associated with positive perceptions

Among participants who increased their consumption of vegetarian meals, these meals were increasingly perceived as:

Perceptions of vegetarian meals changes over 12 months ***(% agree + totally agree, *Chi2 Test, p<0,05)***



In contrast, participants who reduced their consumption of vegetarian meals were less likely over time to perceive them as quick and easy to prepare (72% at baseline vs. 65% after one year, compared with 77% in other groups), highlighting the central role of culinary accessibility in sustaining dietary transition.

CONCLUSION

Flexitarian transitions are heterogeneous, dynamic and rarely linear.

Culinary self-efficacy, enjoyment and positive perceptions of vegetarian meals are associated with sustained increases, whereas household constraints and difficulties satisfying all family members are associated with decreases.

>>**Supporting households with accessible, appealing and nutritionally balanced plant-based solutions may facilitate long-term dietary transitions.**

opinionway pour Bonduelle

Lived experiences of commercial children's foods: feeding relationalities, parental moralities and implications for fruit and vegetable consumption amongst UK children aged 1-9

Rachel Claydon, Institute of Development Studies, University of Sussex; r.claydon@ids.ac.uk

Background and objectives

The **relative agentic capacities of fruit and vegetables (FV) compared to industrially manufactured alternatives** is rarely explored within debates on the determinants of consumer behaviour and food choice. Doctoral research investigating lived experiences of commercial children's foods with families of children aged 1-9 in the city of Brighton and Hove (B&H) gathered empirical evidence of the **meanings and 'thing-power'** (Bennett, 2010) **of children's food products** within feeding relationships and moralities, and their implications for feeding practice and parental agency.

Conceptual approach

The conceptual approach joins together:

- Anthropological understandings of food as a key 'substance of relatedness' (Carsten, 1997), and consumer goods as (passive) building blocks of contemporary identity projects (D. Miller, 1987, 2010);
- Critiques of the subjectivising power of consumer culture (Ewen, 2001);
- New materialist understandings of matter as possessing its own agentic capacities or 'thing-power' (Bennett, 2010) which see foods as agentic and generative, with the ability to elicit affective responses in humans and shape both feeding practices and parental subjectivities; and
- Political economy critiques (Fox, 2024) interrogating how food products are carefully designed or 'orchestrated' (Abbots, 2017) to captivate children and their caregivers.

Research methods

- **Ethnographic research** with 34 mothers and other carers of children aged 1-9 in the city of **Brighton & Hove, UK** (Mar 2021-Aug 2022): children's food photo diaries; semi-structured interviews; extended participant observation in a wide range of child feeding settings. Sample included financially 'comfortable' (19) and financially 'constrained' (15) caregivers.
- **Supported by a broader review of the UK child feeding landscape**, including: five interviews with local public health professionals; three interviews with children's food brand executives, attending industry events and reading industry press; extensive observations of children's food and drink products and their promotion both online and offline; and autoethnographic reflections as a mother of young children.

Findings

1. Children's food products as alluring 'substances of relatedness'

Children's food is fundamentally bound up with the **manifestation and management of caregivers' relationships with their children**. Food was extensively used by B&H caregivers to demonstrate, sustain and "thicken" (Carsten, 2013) relationships with their children – including manifesting love and care through feeding that responds to a child's preferences and desires, and using food to materialise a relationship during separation and reconnection.

Children's food products were particularly **potent and valuable substances of relatedness** for B&H caregivers in these situations thanks to their 'liveliness' (Bennett, 2010) and **ability to enchant children** (Bennett, 2001) – **captivating their imaginations and eliciting affective, bodily responses** through their use of characters and children's cultural references, incorporation of play, ongoing novelty and child-appealing tastes. This enchantment renders these industrial products as valuable vectors of relatedness, as mined and reified by decades of brand communications (figure 2). FV meanwhile typically lacks this value within the manifestation of love and care (figure 1 and box 1).

Box 1: 'Mummy did you put one of those banana bars with eyes in my packed lunch?' 5-year-old B asks as we are getting ready to leave the house for school – referring to an Aldi banana oaty bar. 'Not today, you've got an actual banana,' I reply. 'But I don't like banana, I want one of those bars!' This is repeated at least ten times as I struggle to get his younger sister into her buggy, and his older sister complains that we are going to be late for school. Finally, needing to get out of the house, and actually wanting him to be happy when he opens his lunch box, I give in – 'Ok then!' – and quickly stick a bar in his lunch box with the actual banana. 'Thank you mummy. I love you, mummy,' he replies. At the end of the day when the lunchbox returns, the bar has been eaten but the banana is untouched (Field notes, 7/7/22).



Figure 1: The "banana bar with the eyes" and an actual banana (Image: Author)

This research was funded by UKRI/ESRC studentship (ref: 1939118)

As typically the object of children's desires, children's food products are also **vital parenting tools**, enabling parents to manage their children's behaviour within contemporary child-led parenting ideals – both in asserting and relinquishing control. Children's food products were widely used in the **non-authoritarian behaviour management** of young children by B&H caregivers, used to distract, keep quiet and manage transitions (figure 2 and box 2).

Children's food products were also used by B&H caregivers to **relinquish control and facilitate child-led feeding**. Though selected FV such as fresh raspberries were popular with B&H children, they typically gravitated towards packaged foods if given a choice. The long shelf-life and relative low prices of industrial children's foods also meant that that caregivers could offer a range of options at any one time.



Figure 2: Screenshot from Kiddylicious (2021) ad & social media content from The Collective (2024)



Box 2: "It's handy to have food he likes in case there's ever a need to bribe him to do something!" Liz, mum of 3-year-old

2. Children's food products as lively 'props' in performances of 'good' parenting

Children's food products also directly enchanted B&H caregivers as **solutions to competing contemporary parenting obligations**, or successful parenting 'props' (T. Miller, 2013). **Health and nutrition claims** on packaging and wider communications were a key aspect of their thing-power. Despite articulated cynicism by some caregivers about product claims when discussed in detail, and acknowledgment that children should ideally be consuming fresh FV, promotional claims such as "No nasties" and "No added sugar," as well as direct and indirect references to fruit and vegetables, were **vital in reassuring** B&H caregivers that these desired and convenient products are **positive feeding solutions**.

Industrial children's foods exerted further thing-power over B&H caregivers through their ability for **facilitate broader aspects of 'good' parenting** thanks to their **practical convenience** – including time for paid work to finance family life, extra-curricular activities and adventures, and time with one's child. These roles are widely amplified by brands.

While articulating a desire to feed their children more FV as advised by public health guidelines, B&H caregivers widely acknowledged that it was **harder to choose FV** and other non-industrial foods, particularly for on-the-go feeding – given their need for preparation (peeling, chopping and finding containers – with lids!), and the reality that they did necessarily transport well and went bad if not eaten quickly.

Box 3: "I think that [BEAR Yo-yos] are probably pretty good as far as snacks go. I mean obviously actually having a piece of fruit would be better, but I don't really want to be putting fruit in my bag because it may just end up at the bottom, forgotten about. So it's easier to have things like the apple cereal bar, or the Yo-yos. So I know I've definitely got some snacks in my bag." Sophie, mum of 2 and 5-year olds



Figure 3: BEAR Yo-yos (Image: Research participant, used with permission)

Conclusion and implications

The findings provide a fresh perspective on the drivers of contemporary children's diets, understanding **industrial children's foods as agentic materialities and vital actors within contemporary feeding relationships and parenting moralities**. While many B&H caregivers had internalised nutrition guidelines around maximising FV in their children's diets, their **ability to feed children outside the commercial children's food imaginary is sorely constrained** – given the typically far **weaker thing power and appeal of FV** for children and caregivers. There is an urgent need for regulators to set FV on a level playing field and **limit the ability of children's food products to enchant** both audiences, restricting all child captivation tactics and positioning of products as 'good' parenting solutions – facilitating genuine agency for caregivers around feeding young children.

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Designing sustainable 5-a-day baskets: how fruits and vegetables selection impacts nutrition, environmental footprint and cost in France?

F. Vieux, R. Poinsot, C. Nuzzaci, R. Gazan, M. Maillot
MS-Nutrition, Marseille, 13005

Objective

How the composition of a "5 Fruits and vegetables a day" basket affects its
- nutrient content (vitamins, minerals, fiber)
- environmental impact (carbon footprint, water use…)
- monetary cost

Conclusion

More fruits (i.e. fewer vegetables) in the basket led to marked **increases in some nutrients** **BUT ALSO** marked **increases in certain environmental impacts** and a **higher cost** (with greater exposure to inflation)

→ **Fruits and vegetables are complementary from a sustainability perspective**

Materials & methods

A **Food Sustainability Database** (FSD) containing **25 fruits and vegetables** was built:

Dimensions				Addtional info
Metrics	Nutrient composition (74 components)	Environmental impacts (17 indicators)	Follow up of foods prices (2022 and 2025 selected)	Edible portion size
	CIQUAL 2025-ANSES	*AGB 3.2-ADEME/INRAE*	*RNM- Franceagrimer*	*INCA3-ANSES*

600 "5-a-day" baskets were generated through random selection from the FSD

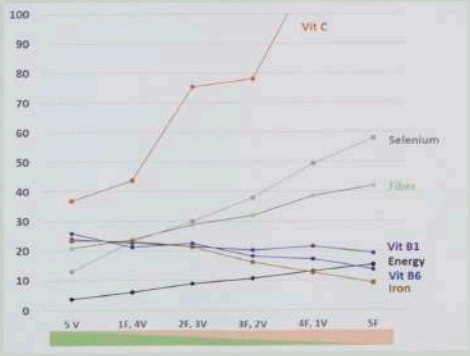
100 « 5 F, 0 V » baskets
100 « 4 F, 1 V » baskets
100 « 3 F, 2 V » baskets
100 « 2 F, 3 V » baskets
100 « 1 F, 4 V » baskets
100 « 0 F, 5 V » baskets

More Fruits
More Vegetables

- **Nutrient content, environmental impacts and cost were compared across "5-a-day" basket profiles**
- **Basket cost evolution from 2022 to 2025 was assessed**

Results

Nutrient content of the baskets (in % of recommended daily values for a 2000 kcal diet)



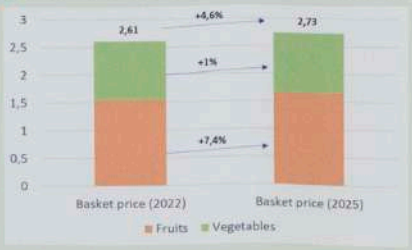
% variation in environmental impacts & cost of baskets relative to the "2F, 3V" basket



More Fruits in the basket were associated with

- **higher levels of energy, vitamin C, selenium and fiber and slightly lower levels of vitamins B1 and B6 and iron**
- **slighlty lower ionizing radiation & energy use BUT higher cost, water ressources and land use (especially for cherries and plums)**
- **Carbon impact (climate change) remains stable across baskets**

2022-2025 cost basket variation (€)



- **Average basket cost increased by 4.6% over 3 years, mainly due to the increase in fruit prices**

Limits

Lack of diversity: Results are limited to 14 fruits and 11 vegetables, mainly due to **difficulties in accessing food price data**

Perspectives

Develop a robust methodology to include a wider range of foods, beyond fruits and vegetables, in order to **estimate the cost of healthy and sustainable diets**

Fruit and vegetable amount in nutritionally adequate and environmentally constrained diets

Insights from individual-level diet modeling in France

C. Nuzzaci[1] M. Maillot[1] F. Vieux[1] D. Rémond[2] R. Gazan[1]

[1] MS-Nutrition, France [2] INRAE, Unité de Nutrition Humaine, France

How does dietary optimization reshape F&V intake while meeting nutritional and environmental targets ?

1. CONTEXT

Increasing fruit and vegetable (F&V) amounts is key to achieving nutritionally adequate diets, but may also affect environmental impacts, particularly water use.

2. OBJECTIVE

Assess how the daily amount and variety of F&V evolve when individual diets are optimized to achieve nutritional adequacy while reducing environmental impacts at the population level.

3. MATERIALS AND METHODS

1- DATA

INCA3
Individual observed diets
1,718 French adults

CIQUAL
Food composition database

AGRIBALYSE 3.2
Food environmental impacts

2- CONSTRAINTS

Nutritional adequacy
Compliance with the latest French recommendations for macronutrients, fiber, essential fatty acids, vitamins and minerals
For each individual

Environmental
- -30 % in total GHGE (CO_2)
- No increase in other environmental indicators, including water use

Globally

3- LINEAR OPTIMIZATION MODEL

Finding the optimal combination of foods that most closely match each individual's eating habits, while satisfying all constraints

4- INDIVIDUAL OPTIMIZED DIETS

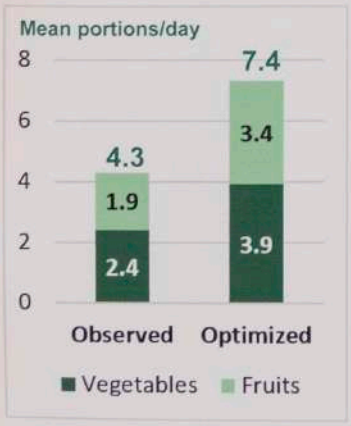
1,718 individual optimized diets
Complete diets at the food-item level

F&V outcomes assessed
1. F&V amounts
2. PNNS "5-a-day" recommendation
5 portions/day
(1 portion = 80 g)
3. Variety
19 categories; ≥5 g/day
4. Key F&V changes
Largest increases and water use

4. RESULTS

1 F&V amounts

Mean portions/day



4.3 → 7.4 portions/day
Observed → optimized

2 PNNS "5-a-day" recommendation

Higher F&V amounts for most individuals

92%
had higher F&V amounts

28% → <1%
Below 2.5 portions/day
Observed → optimized

35% → 89%
Above 5 portions/day
Observed → optimized

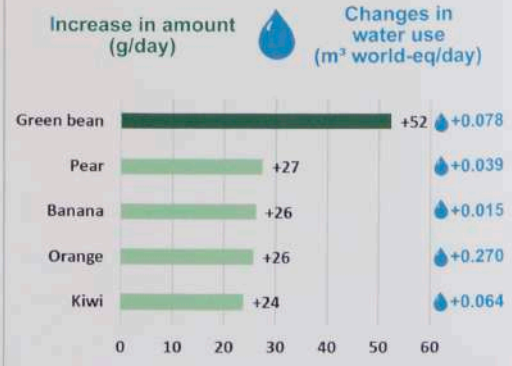
3 F&V variety

Higher variety of F&V in optimized diets

4 → 6
Different F&V categories
Observed → optimized

4 Key F&V item changes

Largest increases and associated changes in water use



Similar increases in F&V amounts can have contrasting effects on water use; higher-impact F&V may still be increased in optimized diets.

TAKE-HOME MESSAGE

Nutritionally adequate and environmentally constrained diets required substantially higher fruit and vegetable amounts for almost the entire population. Optimization nearly eliminated very low F&V amounts and increased F&V variety. These results highlight the need to support low F&V consumers towards the recommended 5 portions per day.

Designing climate-friendly and nutritionally adequate diets for Belgian adults: implications for food-based policy

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[2]Department of Medicine, Karolinska Institutet, Stockholm, Sweden
[3]Centre on Climate Change and Planetary Health, London School of Hygiene and Tropical Medicine, United Kingdom

Background & Aim

Dietary change can reduce greenhouse gas emissions (GHGE), but sustainable diets must also be nutritious, affordable, and culturally feasible. We optimized diets for Belgian adults across dietary patterns to inform guidelines, focusing on fruit and vegetable intake.

Results

- **Nutritionally adequate, climate-compatible diets** were **feasible** across all dietary patterns.
- All optimized scenarios **required more vegetables and whole fruit**, alongside more legumes and whole grains (Fig. 1).
- Optimized omnivorous diets **reduced GHGE** by up to **58%** in women and **70%** in men.
- **Meeting dietary reference values and Belgian FBDGs** did **not ensure climate compliance**; neither did vegetarian or vegan patterns, particularly in men.
- Key active nutrient constraints included free sugars, sodium, saturated fat, iodine, iron, vitamin B12, calcium and ω-3 fatty acids.
- Nutritional constraints improved alignment with EAT-Lancet 2.0 recommendations, but adding a climate constraint pushed some food groups outside recommended ranges (Fig. 2).

Methodology

We combined Belgian consumption, nutrient, price, and life cycle GHGE data for 416 foods in 112 FoodEx2 groups. Linear programming minimized departures from current diets while meeting dietary reference values, Belgian food-based guidelines (FBDGs), and, where applied, a 1,663 g CO_2eq/day GHGE limit aligned with EAT-Lancet 2.0 targets. Models covered women and men following omnivorous, pescatarian, vegetarian, and vegan patterns.



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Conclusion

- **Realistic dietary changes can substantially reduce diet related GHGE** without requiring fully plant based diets.
- **More vegetables and fruits**, and **fewer discretionary foods** and high emission **animal products**, support health and climate goals.
- Meeting climate targets requires explicit environmental criteria in Belgian dietary guidelines.
- These findings provide a **quantitative basis for updating Food-Based Dietary Guidelines (FBDGs)** and public health policy.

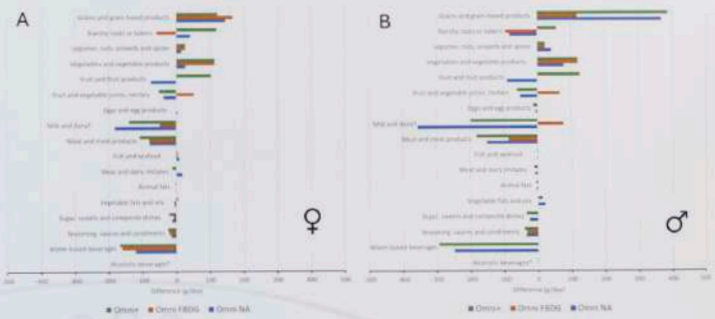


Figure 1. Absolute differences (g/day) of the intakes of major food groups in the optimized omnivorous vs. habitual diets after the introduction of constraints on nutritional adequacy criteria (Omni NA), FBDG criteria (Omni FBDG), and additionally constraining GHGE to 1663 g/day (Omni+) for females (A) and males (B).

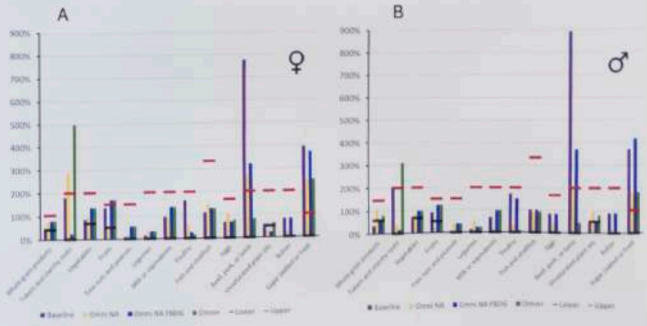


Figure 2. Energy-adjusted proportional coverage of the EAT Lancet 2.0 food category intakes as recommended by Rockström and colleagues in the Baseline, Omni NA, Omni NA FBDG, and Omni+ diets for females (A) and males (B). Red and black marks indicate the upper and lower threshold, respectively, of the acceptable range, as suggested by the EAT Lancet Commission 2.0.

Identifying dietary patterns in La Réunion: who eats what, and at what cost?

EGEA Conference, 10th Edition
7-9 October 2026

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CONTEXT

Like other French overseas regions, La Réunion has undergone a rapid socioeconomic transition, marked by an expanding supply of processed foods and growing dependence on food imports[1]. This has been accompanied by signs of a nutrition transition: the **prevalence of obesity, diabetes and hypertension now exceeds that of mainland France**, and available data suggest low intakes of fruits, vegetables and dairy products and high consumption of sweetened beverages[2]. Food choices are further constrained by lower household incomes and **food prices around 30% higher** than in mainland France[3].

Yet dietary data remain scarce and little is known about:

1. Which dietary patterns coexist on the island?
2. How they differ in sociodemographic profile and nutritional quality?
3. How much they cost?

METHODS

Population — Cross-sectional survey (2025) of adults aged ≥16 years, quota-sampled by sociodemographic characteristics. **N = 2,110**

Dietary data — Validated food frequency questionnaire (FFQ)[4]: frequency and quantity of 185 foods and beverages, grouped into 26 food groups. Depending on the share of non-consumers, intake of each group was categorized as consumer/non-consumer, tertiles, or non-consumers + tertiles among consumers.

Dietary patterns — Latent class analysis on food groups to identify mutually exclusive groups of individuals with similar food consumption.

Diet cost — Prices collected for each FFQ item.
Daily cost computed from median prices, adjusted for food refuse.

RESULTS

1 Four dietary patterns identified across the population

Pattern size (% of sample)	Prudent 21%	Moderate 28%	Convenient 35%	Traditional 16%
Wholegrains*	.85	.74	.62	.82
Tubers	.36	.45	.42	.49
Refined cereals	.45	.52	.45	.46
Rice	.66	.58	.42	.73
Traditional food	.54	.55	.42	.51
Fruits	.70	.58	.52	.58
Vegetables	.63	.51	.53	.42
Legumes	.45	.51	.50	.37
Eggs	.40	.50	.45	.45
Dairy products	.35	.47	.48	.44
Fish & seafood	.46	.46	.48	.40
Poultry meat	.44	.52	.43	.45
Red meat	.44	.48	.41	.42
Processed meat	.53	.50	.40	.53
Salty snacks	.34	.41	.37	.54
Fried food	.60	.44	.46	.49
Ready meals	.61	.47	.48	.57
Grain-based sweets	.52	.52	.42	.53
Confectionery	.60	.53	.43	.45
Breakfast spreads	.35	.39	.36	.50
Nuts & seeds*	.51	.84	.86	.93
Oil & animal fat	.38	.53	.52	.47
Sauces	.55	.47	.40	.42
Fruit juice	.40	.51	.39	.44
Sugary drinks	.54	.51	.41	.48
Sugar-free drinks	.45	.39	.36	.39

Most likely consumption level: Non-consumer · Low · Moderate · High / consumer

Figure 1. Most likely consumption level of each food group, by dietary pattern. Each tile shows the category that members of the pattern are most likely to fall into (non-consumer, or low, moderate or high intake). The number is the probability of being in that category: e.g., Prudent pattern members have a 70% probability of being high fruit consumers. *Binary food indicators: Consumer and Non-consumer

2 Sociodemographic profiles and diet quality

	Prudent 21%	Moderate 28%	Convenient 35%	Traditional 16%
Energy intake (kcal, no alcohol)	2246 ± 918	1110 ± 398	2516 ± 1070	2235 ± 860
PNNS-GS2 score	2.1 ± 3.7	1.6 ± 2.9	−2.7 ± 3.6	0.4 ± 3.5
Age (years)	52 ± 15	49 ± 16	36 ± 14	48 ± 18
Women	60%	61%	48%	42%
Born in mainland France	21%	6%	14%	4%
Household income > 1,500 €	46%	16%	23%	11%
Education > school diploma	37%	11%	24%	9%

Values are mean ± SD or %. Bars span 0–100%. PNNS-GS2: adherence to the 2017 French dietary guidelines (higher score = higher adherence).

3 Daily cost of each dietary pattern



Figure 2. Daily diet cost per 2,000 kcal, excluding alcohol. Dot = median, bar = IQR, dashed line = overall median.

Prudent diet costs €4.26 more per day than a Traditional diet (+39%).

Across all participants, vegetables and fruits are the two largest contributors to diet cost.

16% — **Vegetables** of diet cost · €2.16/day per person (mean)

12% — **Fruits** of diet cost · €1.63/day per person (mean)

CONCLUSIONS

Four dietary patterns coexist in La Réunion, suggesting different stages of dietary changes.

The Prudent pattern, characterised by high consumption of fruits and vegetables, has the best diet quality but is also the most expensive.

Healthier diets cost more in La Réunion: cost may be a barrier to healthy eating.

REFERENCES

1 L. Tibère and J.P. Poulain, 2019
2 C. Méjean and al. (dir), 2020.
3 L. Jaluzot, F. Malaval and G. Rateau, 2016
4 E. Verger, S. Eymard-Duvernay, et al. 2025

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Mapping and Analyzing Fruit and Vegetable Flows at the Montpellier Marché d'Intérêt National (MIN)

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CIHEAM MONTPELLIER

Introduction

Food systems are undergoing major transformations, increasing the complexity of supply chains and reinforcing the importance of intermediary functions. At the same time, reterritorialization has become a key issue for reconnecting food supply with territories. Wholesale markets occupy a strategic position, as they organize flows, connect producers with professional buyers, and provide services that can support territorial food systems. This makes the Montpellier MIN a relevant case for examining how intermediary functions contribute to the territorial anchoring of fruit and vegetable supply.

Objectives

- Mapping and characterizing fruit and vegetable flows through the Montpellier MIN.
- Analyzing the functions and services provided by the MIN within the hidden middle.
- Examining commercial relationships and coordination mechanisms between producers and buyers.

Methodology

FRAMEWORK & GENERAL APPROACH

- Single case study: Montpellier Marché d'Intérêt National (MIN)
- Embedded case study design: producers and wholesalers as sub-units of analysis
- Phase 1 presented here: fruit and vegetable producers
- Mixed-methods approach: combining quantitative and qualitative data

DATA COLLECTION (July – August 2026)
Reference period for quantitative data: 2025

- Field Observations (at the MIN)
- Questionnaire survey of 23 producers
- Secondary Sources

DATA PROCESSING & ANALYSIS

1. Descriptive Quantitative Analysis (Food flows)
2. Qualitative Analysis (Statements & verbatims)
3. Mapping (Origins & destinations of F&V sold by producers at MIN)

Results

Geographical Distribution of Fruit and Vegetable Supply Flows

The fruit and vegetable flows reported by surveyed producers using the Montpellier MIN show a marked territorial concentration.

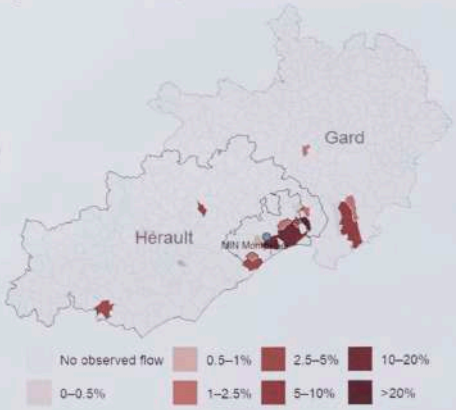
At the departmental scale, most of the observed supply originates from Hérault, while neighboring departments contribute to a lesser extent.

At the municipal scale, the largest shares are concentrated in a limited number of production areas located mainly around Montpellier and along the Mediterranean production corridor. More distant origins remain comparatively marginal. These results therefore suggest a strong local and regional anchoring of the flows marketed through the MIN by the surveyed producers.

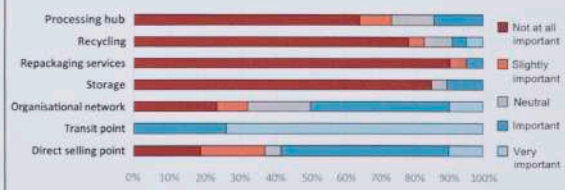
A. Wider sourcing extent (department level)



B. Regional structure (Municipality level)



Importance attributed by producers to the functions of the MIN

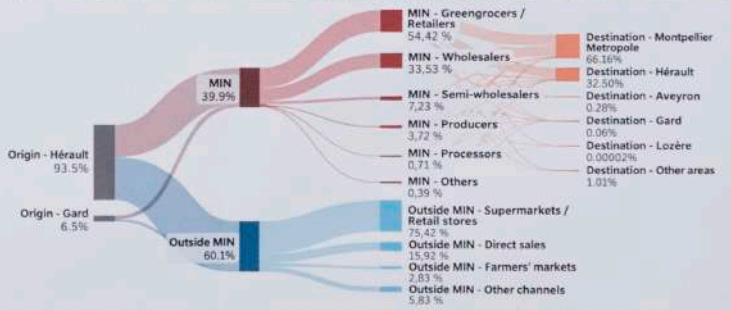


Producers clearly distinguish between the different functions of the MIN. Transit and direct selling emerge as the most important roles, while the organisational network is also widely valued.

In contrast, storage, repackaging, recycling and processing are considered much less important.

Overall, the results suggest that producers primarily use the MIN as a commercial and circulation platform rather than for downstream processing or logistical services.

Fruit and vegetable flows across marketing channels and destinations-all products combined



The surveyed producers combine several marketing channels rather than relying exclusively on the Montpellier MIN. Within the MIN, flows are mainly directed toward retailers and wholesalers, confirming the market's role as an intermediary platform linking producers with professional buyers.

Final destinations are concentrated primarily within Montpellier Métropole and the wider Hérault area, indicating a strong territorial anchoring of the flows transiting through the market. Outside the MIN, supermarket outlets represent the main alternative channel, alongside direct sales and producers' markets, highlighting the complementarity between wholesale, retail, and direct marketing strategies.

Conclusion

Despite the transformation of agricultural and agri-food distribution systems, strongly driven by the dominance of supermarket-led distribution, the MIN Montpellier persists as an alternative, niche distribution channel that favors local producers and the territorial embeddedness of production. Long-term relationships between producers, wholesalers, and retailers play an important role in producers' decisions to continue operating through the MIN. At the same time, producers diversify their distribution channels as a risk-management strategy to cope with market uncertainty.

Limitations and Prespectives

- Limited sample size and availability constraints during market hours.
- Self-reported data on volumes and destinations introduced varying levels of precision, especially for spatial flow analysis.
- **Perspectives:**
  - Extend the analysis to wholesalers to better reconstruct sourcing and distribution flows and compare practices across actors.
  - Monitor flows over a longer period to capture seasonal variations and improve the spatial and quantitative characterization of supply

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CGIAR Science Program on Better Diets and Nutrition

Leveraging Agrobiodiversity and Food Systems Approaches to Meet Fruit and Vegetable Recommendations in Latin America and the Caribbean

Ramya Ambikapathi[1*], Johana Castillo[1], Jenny Gallo[1], Colin Khoury[2], Mark Lundy[1], Peter Wenzl[1], Maarten Van Zonneveld[3], Monica Carvajal Yepes[1], Jennifer Wiegel, Gina Kennedy[1]

*1 Alliance of Bioversity International and CIAT 2 New York Botanical Garden 3 International Potato Center (CIP) *Corresponding author*

1 Introduction

Fruits and vegetables (F&V) are foundational to healthy diets. Global guidance calls for a minimum of 400 g per person per day to prevent non-communicable diseases and support wellbeing across the life course (FAO, 2020). Across Latin America and the Caribbean (LAC), actual consumption falls dramatically short of this threshold.

33–207 g

VEGETABLES consumed per person / day

Honduras → Mexico (recommended: 270 g/day)

27–228 g

FRUITS consumed per person / day

Venezuela → Peru (global F&V minimum: 400 g/day)

Source: LAC Landscape Report, 2025; Global Dietary Database, 2018.

2 Objectives

Examine the food system, food environment, and cultural factors underlying the gap between F&V availability and consumption in LAC, and propose a demand-driven, biodiversity-centered approach to close this gap while staying within planetary boundaries.

3 Methods

- Structured review of regional dietary data & FAO food balance sheets
- Published literature & regional food-systems expertise
- Analysis of agricultural trade & institutional procurement
- Preliminary review of national germplasm collections and spatial distribution of F&V crop diversity





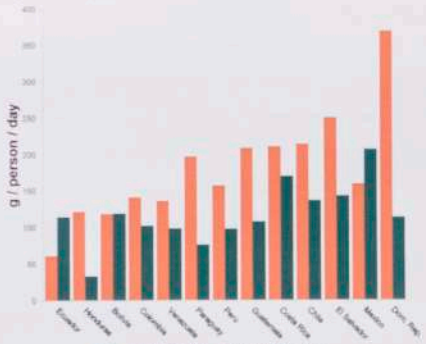
Colombia Biodiversity Based Dietary Guidelines, ICBF, 2025

4 Results: A Production Paradox

This gap is not primarily a production problem. LAC is one of the world's largest exporters of F&V, with an estimated regional availability of approximately 457 g/capita/day, yet production fails to translate into adequate consumption for millions of people.

> **LAC exports nutritious commodities that reduce diet-related mortality in importing nations, while its own populations remain unable to access or afford the recommended daily amounts.**
> *Springmann et al., 2023*

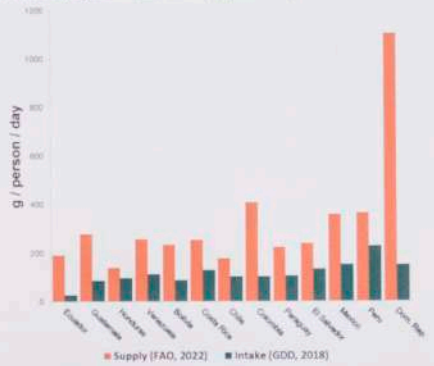
Vegetables: Supply vs. Measured Intake (g/person/day)



Source: FAO, 2022 (supply); Global Dietary Database, 2018 (intake). Adapted from LAC Landscape Report 2025, Table 8.

5 Results: The Fruit Gap

Fruits: Supply vs. Measured Intake (g/person/day)



Dominican Republic's high fruit supply reflects export-oriented banana/plantain production. Source: FAO, 2022; GDD, 2018 (LAC Landscape Report, 2025, Table 8).

6 What Mediates the Gap?

1. Women's empowerment and gender inequalities shapes household food choices, market access, resources and access to nutritious food.
2. Socioeconomic conditions determine whether households can afford fruits and vegetables.
3. Climate zone and geography affect local availability and seasonality of fresh produce.
4. Export incentives reduce domestic availability of fruits and vegetables
5. Erosion of traditional food cultures has weakened local food knowledge and practices.

7 Indigenous Knowledge & Crop Diversity

Countries with larger Indigenous populations show above-average vegetable consumption: for every 1% increase in the Indigenous population share, vegetable intake rises by ~0.52 g/day.

Preliminary mapping of national germplasm collections reveals concentrations of underutilized F&V diversity in areas where dietary gaps are most acute, signaling untapped potential to connect locally adapted crop diversity to domestic food systems.

Vegetables are 8% of seed accessions conserved in genebanks (Zonneveld et al., 2026)

4 of 17

Key micronutrients (vitamin E, vitamin D, calcium, folate) show the lowest adequacy ratios among LAC women — ELANS, 2014–2015

US$4.56 / day

LAC has the world's highest average cost of a healthy diet. A healthy diet costs 67% more than an energy-sufficient diet and is unaffordable for 28–35% of urban households in Colombia

Bolivia and Guatemala report the highest share of adults consuming dark-green leafy vegetables in LAC (42–46%) — coinciding with their larger Indigenous populations.

8 Conclusions: Pathways Forward

Closing the F&V consumption gap in LAC requires reorienting food systems around domestic nutritional needs while balancing export competitiveness. Demand-driven approaches offer pathways that simultaneously improve diets, support smallholder livelihoods, and conserve the region's extraordinary biological heritage within planetary boundaries.

1 Agrobiodiversity-Centered Dietary Guidelines
Embed local crop diversity into national food-based dietary guidelines

2 Institutional Procurement
Link school and public food programs to local & traditional produce.

3 School-Based Programs
Connect youth to crop diversity through food & nutrition education

4 Germplasm-Collection Missions
Target under-collected areas and biodiversity hotspots

5 Stable Conservation Funding & Linkages
Sustain germplasm collections, community seed banks, and link them to food-system actors.

Better diets • resilient smallholder livelihoods • conserved biological heritage — within planetary boundaries.

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Acknowledgments & Funding

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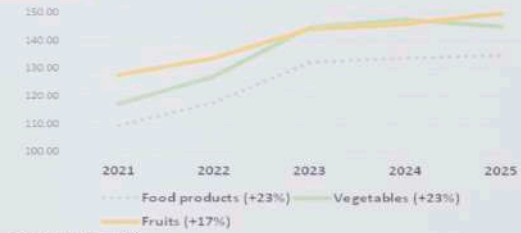
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To what extent is resilience to rising food prices associated with fruit and vegetable consumption and dietary adjustments?

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Context

An increase in food prices in France - index (2021 = 100)



Source : INSEE, 2026

Objectives

- Identify the different resilience profiles in response to rising food prices
- Analyze differences in fruit and vegetable consumption and consumption adjustments across resilience levels
- Examine intentions to increase fruit and vegetable consumption and the associated budgetary trade-offs

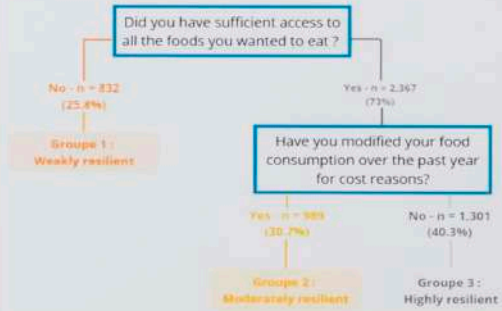
Methods

1. Sample

An online survey of 3,225 participants was conducted in the Île-de-France region in 2025.



2. Construction of resilience groups



3. Econometric analysis

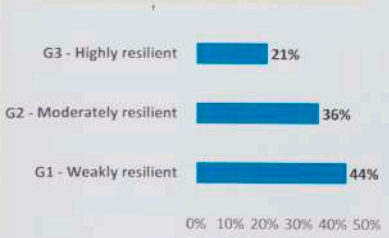
Probit & Heteroskedastic Probit models

- Factors influencing daily F&V consumption
- F&V reductions due to rising prices
- Intention to increase F&V consumption

Comparison across resilience groups
Average marginal effects

Results

Weakly resilient participants are twice as likely to overestimate food price increases



Among weakly resilient participants, believing strongly in the health benefits of fruit and vegetables is no longer associated with a higher probability of daily consumption.

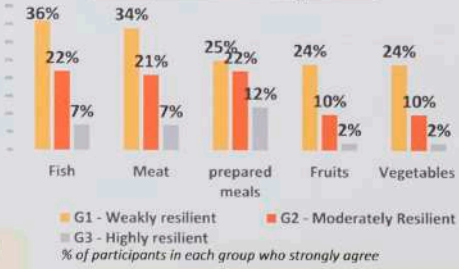
Average marginal effects - Probit models

	Daily vegetable consumption	Daily fruit consumption
G1 : Weakly resilient	1.7 pp	3.4 pp
G2 -Moderately resilient	10 pp ***	0.9 pp
G3 - Highly resilient	10 pp ***	8.5 pp ***

*** = Significant (p < 0.01) ; pp = Percentage points
Adjusted for sociodemographic characteristics, perceptions & attitudes

Amid inflation, weakly resilient households report cutting back on food far more than strongly resilient households

"Has the overall increase in food prices led you to reduce your consumption of the following products:"



% of participants in each group who strongly agree

All else being equal, weakly resilient participants are significantly more likely to reduce their fruit and vegetable consumption than highly resilient participants.

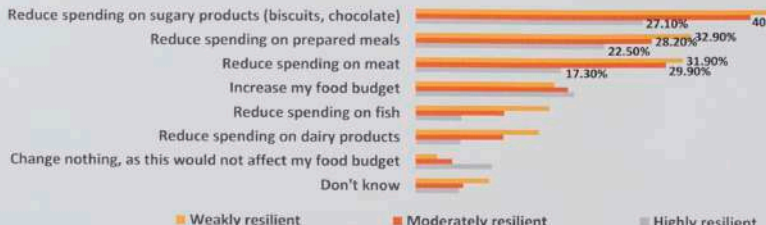
Average marginal effects - Probit models

(Reference: G3 - Highly resilient)	Reduction in fresh Vegetable consumption	Reduction in fresh fruit consumption
G1 - Weakly resilient	+38 pp ***	+40 pp ***
G2 - Moderately resilient	+21 pp ***	+22 pp ***

*** = Significant (p < 0.01) ; pp = percentages points
Adjusted for sociodemographic characteristics, perceptions & attitudes

Weakly resilient participants report having to make broader trade-offs in their food budget to increase their fruit and vegetable intake.

If you plan to increase your fruit and vegetable consumption, how will you adjust your food budget?



Conclusion

- **Strongly believing in the health benefits of fruit and vegetables** is associated with a **higher probability** of daily **consumption**, but no longer among the least resilient participants.
- Our results highlight **substantial inequalities in individuals' ability to maintain their diets amid rising food prices. Weak resilience** is associated with **stronger perceptions** of **inflation**, greater **reductions in fruit and vegetable consumption**, and **more constrained trade-offs in budgets.**
- **Inequalities in resilience** are **important amid future shocks**, including climate-related ones, as these could further
- undermine access to healthy diets.

Perception of locally produced fruits and vegetables in consumer purchasing practices: understanding preferences, information gathering and trust mechanisms in Guadeloupe (French West Indies)

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Context:

Guadeloupe, a French overseas territory, is facing increasing challenges regarding its food provisioning, along with a raising rate of diet-related diseases [1]. More than 80% of the consumed food is imported, and its agri-food system is still deeply influenced by the legacy of the plantation economy system. Today, public and private stakeholders advocate for more local, responsibly grown and produced food, but these changes involve many challenges [2]. One of the main concerned food group is fruit and vegetables (FV), for both agricultural and nutritional reasons.



Objective:

To analyze purchasing practices and perceptions of Guadeloupean consumers regarding FV (where, why, what criteria and trust mechanisms), and their potential role in promoting local FV consumption and general knowledge about food.

Methods: mixed-method analysis consisting in

a) Budget des Familles dataset analysis (INSEE, 2017)(3) for general context on purchasing practices. b) Questionnaires and semi-directive interviews (Elmira, 2023-2024) for trust mechanisms, preferences and information gathering strategies (n=28). c) Fieldwork observations (2023, 2024, 2026) to document the population's practices.

Where does the population purchase FV and how do they chose ?

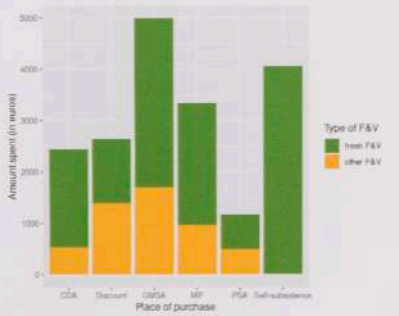


Fig 1. **Purchasing practices of Guadeloupean households regarding fresh and other FV.**
Data source : Budget des Familles (INSEE, 2017) [3], one-week of food purchases. N = 1035 households.

Legends:
→ Purchasing places
CDA: specialist retailers (greengrocers)
Discount: discount stores (Ecomax, Maximax)
GMSA: supermarkets and hypermarkets (Carrefour, U, Auchan)
PSA: small-size general stores and supermarkets (grocery shops)
MP: markets and producers

→ Labels used in the questionnaire

national | local

FV purchases: most of expenses for FV are done in supermarkets, both conventional and discount stores. However, **"local associated" places (markets, greengrocers, self-production) are valued and trusted** by a large part of the participants.

Labels are rarely used to determine purchases. When they are used, AB (organic agriculture) is the most Influencial (49 persons put it first). Very few local labels exist, but one is starting: Moso Te La, which promotes locally-produced, chlordecone-free FV, see photo →



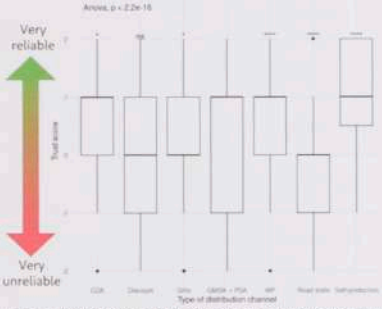


Fig 2a. **Level of confidence in distribution channels.** Participants' answer to a Likert scale from very reliable (2 points) to very unreliable (-2 points). Test: pairwise comparison with GMSA+PSA as a reference.

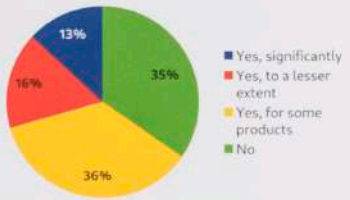


Fig 2b. **Answers of participants to the question: "Do labels influence your food purchases ?".** Data source Fig 2a and 2b: questionnaire about food purchasing practices (Elmira, C). N = 245 individuals.

Local FV: barriers and strategies

Fig 3. **Quotes from semi-directive interviews.** With sociodemographic profiles of interviewees.
a) *"It's true that it's more expensive [about the cost of local products]. Like a kilo of carrots costs 4 euros, whereas a kilo of carrots in the supermarkets is 1.50 [. . .] a family with 4 kids, they would think twice about it."(Consumer1, man, fifties, 2023)*
b) *"In general I prefer local food, but regarding local products here, that are affected by chlordecone, for me the quality for the body won't be good" (Consumer24, man, thirties, 2024)*
c) *"I think we could produce more in Guadeloupe. But even the farmers struggle, because of the climate conditions and all sorts of diseases I think." (Consumer2 , woman, fifties, 2023)*
d) *"About food, I think, given our richness, we are a reservoir, we can produce, we can transform, we have everything we need here to live well and eat well." (Consumer7, woman, thirties, 2023)*
e) *"For example fruit and vegetables I don't buy them, [...] I take them from friends [...] otherwise purchasing food here is really really expensive" (Consumer12, woman, thirties, 2023)*

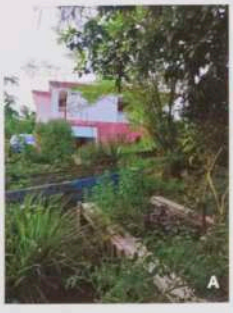






Fig 4. **Pictures from observations (taken by Elmira, C.).** A: A traditional garden next to a house. B: Visit of a garden with planter boxes to grow vegetables on polluted soils. C: High price of local zucchini at the supermarket (in euros).

Summary of the thematic analysis regarding local FV issues

→ **General consensus:** Interviewees value local products, in particular local FV.

→ **Main barriers**: prices, lack of diversity, pesticides pollution (chlordecone) (Fig 3a and 3b).

→ **Perceived problems with FV production**: high costs of production, multiple difficulties with the production, abundance within the ecosystem that remains under/unutilized (Fig 3c and 3d).

→ **Solutions/strategies**: trust in the producer (on markets for example) by personal experience, getting FV from friends and family's gardens (Fig 3e), public and associations' initiatives to create and promote gardens despite the pollutions (see photos Fig 4).

CONCLUSION: Participants of the study value local FV and "local associated" places of purchase, although they experience a lot of obstacles to purchase and consume them. Trust mechanisms are largely based on interpersonal knowledge, as the general context does not promote trust in the labels. These elements ought to be considered when implementing strategies to enhance the quality of the diet in Guadeloupe.

Acknoledgments We thank all the interviewees and questionnaire participants.

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