frontiers in Sustainable Food Systems

TYPE Original Research
PUBLISHED 05 May 2026
DOI 10.3389/fsufs.2026.1698446

OPEN ACCESS

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RECEIVED 03 September 2025
REVISED 14 March 2026
ACCEPTED 26 March 2026
PUBLISHED 05 May 2026

CITATION
Zick A, Schmidt Rivera X, Reynolds C, Farinha C, Case-Humphries E and Cross P (2026) Beyond the kitchen: co-creating sustainable menu strategies through participatory action learning. *Front. Sustain. Food Syst.* 10:1698446. doi: 10.3389/fsufs.2026.1698446

Beyond the kitchen: co-creating sustainable menu strategies through participatory action learning

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Introduction: This study explores the systems-level dynamics of menu transformation in the hospitality and food service (HaFS) sector through participatory action learning (PAL) workshops with professional chefs. Framing the menu not merely as a list of dishes but as an "operating principle" within a business, the research investigates how chefs navigate competing priorities and stakeholder influences in the context of sustainability goals, particularly reducing food waste and greenhouse gas emissions (GHGE).

Methods: Two PAL workshops were conducted with professional chefs ($n = 8$ and $n = 12$). Drawing on Bronfenbrenner's ecological systems theory, stakeholder maps and menu priority artefacts generated during the workshops were analysed to identify the relative influence of micro, meso, exo, macro, and chrono-level influencing agents on menu decision-making.

Results: Findings indicate that meso-level agents, such as procurement teams, business owners, and restaurant managers, are perceived as the most influential on menu decisions, while micro-level agents, including chef colleagues and friends, are seen as the least impactful. Menu priorities were similarly ranked, with product/dish and customer-related factors dominating over sustainability and acceptability considerations. The workshops also revealed a shift in participant thinking from identifying "who" influences menus to understanding "how" decisions are shaped by systemic constraints such as shelf life, infrastructure, and profitability.

Discussion: The participatory format enabled chefs to surface tacit knowledge, reflect on their agency, and engage in systems thinking. While the findings are context-dependent, they highlight the need for multi-level stakeholder engagement in menu transformation and suggest that sustainability goals must be embedded within the operational logic of the menu to be actionable. This research contributes to the growing literature on participatory methods in food systems change and offers a replicable model for chef-led sustainability interventions.

KEYWORDS

food waste reduction, GHG emission reduction, hospitality and food service, participatory action learning and action research (PALAR), sustainable menus

Highlights

- Chefs ranked product/dish and customer factors above sustainability in menu design.
- Meso-level actors were seen as most influential in shaping menu decisions.
- Workshops enabled chefs to reflect on food waste and GHGE in their practices.
- GHGE calculations triggered critical learning and inspired recipe reformulation.
- Participatory methods surfaced tacit knowledge and fostered systems thinking.

1 Introduction

Menus are not merely lists of dishes; they function as an organization's operating principles that coordinate product quality, labor, infrastructure, guest satisfaction, and profit—yet sustainability goals such as reducing food waste and greenhouse gas emissions (GHGE) remain inadequately embedded in this operating logic. Consequently, we still know too little about how menus are transformed in practice, who shapes those decisions across system levels, and which priorities dominate when trade-offs arise. Participatory approaches are promising because they surface tacit knowledge, navigate power dynamics, and create reflective spaces where chefs can examine (and redesign) decision rules (Frasso et al., 2018; De Jaegher and Di Paolo, 2007). This study, therefore, investigates sustainable menu transformation through chef-led participatory action learning (PAL), focusing on the interacting system agents and menu priorities that facilitate or constrain shifts toward lower food waste and GHGE.

Research has previously highlighted that menu planning has five key dimensions: managerial, consumer, gastronomic, marketing, and external aspects, which require input from a variety of stakeholders, with the executive chef being seen as the primary key stakeholder of the process (Seyitoglu, 2017). This supports the notion of a microsystem which impacts menu planning and thus transformation. It means chefs have to navigate trade-offs between the key menu demands and negotiate those with other key stakeholders in the business, such as accounting departments, cost control clerks, restaurant managers, chefs, guest relations, food and beverage managers, purchasing departments, service staff and general managers, while also accounting for meso and macro systems factors described by (Nie et al., 2024).

Menus are increasingly recognized as a critical leverage point for sustainability because they shape purchasing decisions, ingredient throughput, portion sizing, preparation methods, and inventory planning (Alvarenga Nascimento, 2023; Ip and Chark, 2025; Pollicino et al., 2024; Reinders et al., 2024). These factors together contribute substantially to both food waste generation and the GHGE embedded within food service operations (Zick et al., 2026b). As a result, even minor changes to menu composition can have disproportionate impacts on a business's environmental footprint, making menu transformation a meaningful point of intervention for reducing food waste and GHGE.

This study aims to examine how chefs perceive system-level agents and menu decision priorities when co-creating lower-waste, lower-GHGE menus, and to assess the feasibility of a PAL approach for enabling sustainable menu transformation.

1.1 Theoretical background

Menu design is a multi-actor, multi-level process. To frame actors and decision logics systematically, we draw on Bronfenbrenner's ecological systems theory (EST; Bronfenbrenner and Morris, 2007; Zick et al., 2024a), and we employ a participatory action lens to elicit lived decision rules in context. Below, we briefly recap the core ideas that inform our design.

EST positions individual actors within nested systems—micro (immediate relations and settings), meso (organizational structures and interactions among settings), exo (wider organizational and market contexts), macro (cultural, policy and media frames), and chrono (temporal dynamics such as equipment age or historical spend; Bronfenbrenner, 1979). In this paper, influencing agents identified by chefs are mapped to these levels to make visible where leverage over menu decisions is perceived to sit. This framing helps interpret why meso-level actors (e.g., procurement, owners, restaurant management) often dominate decision space, while micro-level colleagues or personal networks appear less central.

Participatory action research (PAR) treats practitioners as co-researchers, emphasizing co-creation, reflexivity and actionability (Wood and Zuber-Skerrit, 2013; Zuber-Skerritt, 2015, 2018). PAL extends this by using collaborative tools (e.g., storytelling, mapping, design tasks) to surface tacit knowledge and test change ideas *in situ* (Frasso et al., 2018; De Jaegher and Di Paolo, 2007). In hierarchical kitchen environments and time-pressured service cultures, PAL can both minimize burden and legitimize practitioner agency, making it well-suited to investigate menu transformation.

Theory U (Presencing Institute, 2024) informs the workshop arc: moving from downloading existing patterns, to observing and sense-making, to co-creating and prototyping revised practices (e.g., recipe reformulation). We used its structure to sequence activities that first elicit current decision rules, then prompt reframing (e.g., through GHGE insights), and finally support actionable next steps. Theory U is a participatory change framework that guides groups through a structured arc from "downloading" existing assumptions, to deep sensing and reflection, and finally to rapid prototyping of new possibilities. Its relevance to this study lies in how it scaffolds chefs' progression from recognizing current practices to envisioning and testing alternative menu creation approaches.

Stakeholder-ecosystem mapping is rooted in concept/fuzzy cognitive mapping, which captures participants' mental models of who/what influences menu choices and the perceived strength/direction of relationships (Henly-Shepard et al., 2015). This legitimizes both human and non-human influencing agents (e.g., "deliciousness," "policies") and enables later systems-level aggregation. Fuzzy cognitive mapping is a systems-oriented technique for visually representing how participants perceive relationships between influencing factors.

In this study, it supports the externalization of chefs' mental models about stakeholder influence and menu decision-making processes, making implicit reasoning visible for collective discussion.

Taken together, these frameworks provide a coherent structure for the study. EST offers the multi-level lens for situating menu decisions within chefs' wider organizational and societal context. PAR and PAL supply the participatory foundation that enables chefs to co-create insights and negotiate meaning collectively. Theory U provides the developmental arc through which participants move from present practices ("Now") to reimagining alternatives. Photovoice brings forward personal values and lived experiences, while fuzzy/concept mapping externalizes participants' understanding of stakeholder relationships and system dynamics. Together, these approaches form a unified methodological framework, summarized in Figure 1, that grounds the workshop design and shapes the interpretation of its outputs.

All frameworks combine to guide the workshop activities, the structure of reflection and how outputs were interpreted.

2 Study design/methodology

2.1 Theoretical development

Menu and food offer design is a complex, multi-stakeholder process influenced by micro to macro-level drivers (Filimonau and Krivcova, 2017; Nie et al., 2024). Chefs play a central role, actively shaping menus within constraints like seasonality, cost, and sustainability values (Ip and Chark, 2025; Jones et al., 2025). PAR supports this agency by enabling chefs to co-create knowledge and influence both practice and theory (Cornwall and Jewkes, 1995; Macdonald, 2012).

Given the hierarchical nature of kitchens, PAR and PAL help surface diverse perspectives and address power dynamics. PAL extends PAR through collaborative tools like storytelling and stakeholder mapping, which help chefs express tacit knowledge and adapt research to their context (Frasso et al., 2018; De Jaegher and Di Paolo, 2007). PAL is especially suited to culinary environments and neurodiverse audiences (Sommerlad, 2023).

PAL has proven effective in citizen science projects on food systems (Armstrong et al., 2020; Kluczkovski et al., 2020; Pateman et al., 2020), offering ethical, collaborative approaches that build trust and long-term engagement. These studies informed the design of two workshops with chefs (W1 in Sept 2023, $n = 8$, W2 in Sept 2024, $n = 12$), both ethically approved (44491-LR-Aug/2023-46866-1; 44491-A-Jul/2024-51843-1). Results from W1 indicated that insights were subject-specific and data analysis was deemed feasible, which validated the methodology. Ethical details are in Appendix A.

2.2 Workshop development

Operationalizing Theory U (Presencing Institute, 2024), sections 1–5 elicit "the Now" values via photovoice (PhotoVoice, 2025). Section 3 establishes baseline GHGE and food waste knowledge; sections 4–5 assess the current stakeholder system and menu priorities. Sections 6–7 then prototype alternatives (recipe reformulation using a GHGE calculator; backcasting and action planning). This choreography intentionally moves from descriptive mapping to decision-rule disruption and feasible next actions (refer to Table 2, for summary). Photovoice is a visual elicitation method in which participants use images to express values, lived experiences, and underlying assumptions. Incorporating photovoice enables chefs to surface tacit knowledge and personal

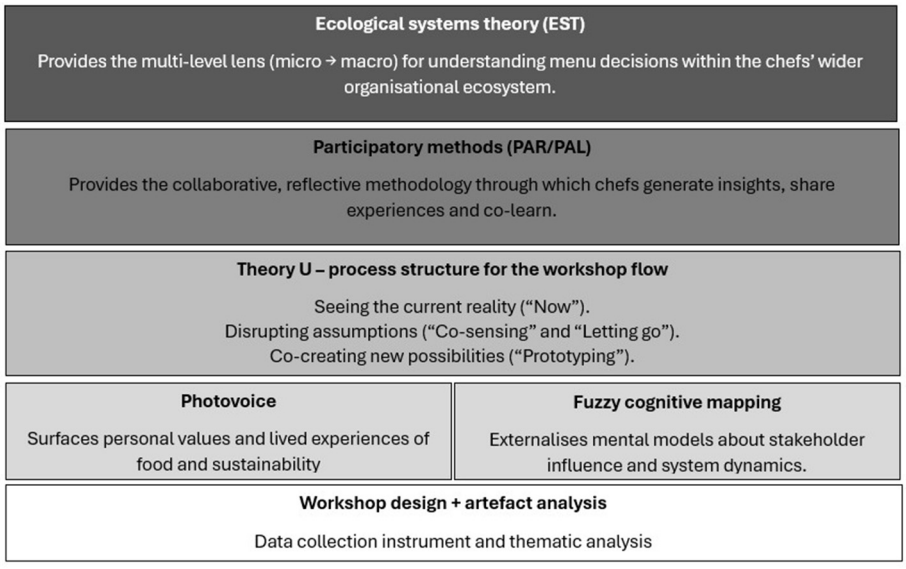

FIGURE 1
Integrated theoretical framework for this study.

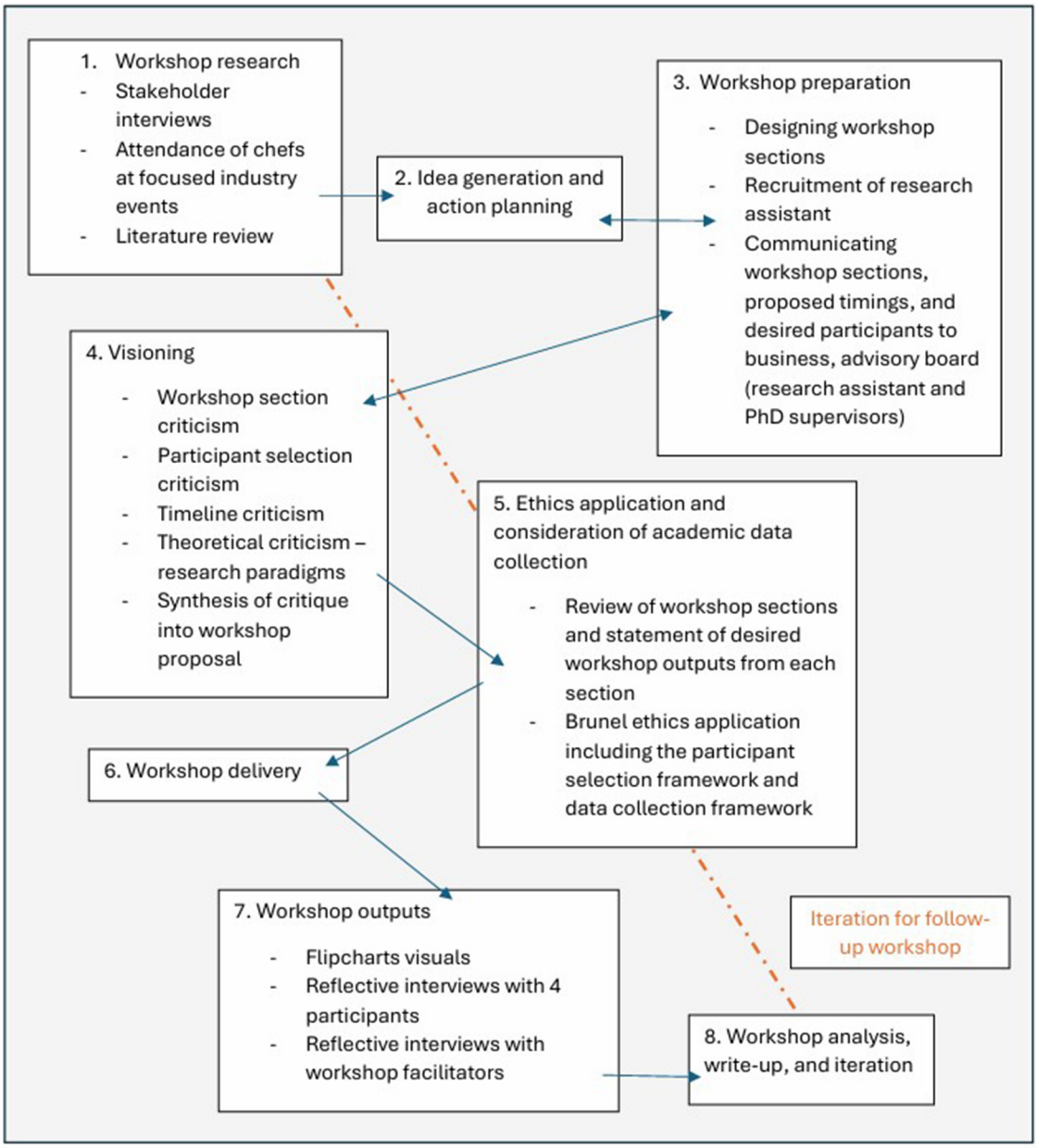

FIGURE 2
W1 development process.

food-system frames that might otherwise remain unspoken in group dialogue.

To explore the deliberation of chefs on menu transformation, a participatory workshop was developed and run as a pilot with eight chefs in September 2023. A follow-up workshop (W2) was carried out in September 2024 with 12 chefs. Figure 2 summarizes the workshop development graphically.

The overall design, activities and sections of the workshop were informed by insights derived from stakeholder interviews (Zick et al., 2024b), consultations with the partnering business involved in the workshop's implementation, and alignment with the overarching research question.

Recruitment for W1 began 6 months prior and included three engagement sessions (40–60 min each) with restaurant management, HR, and approximately 10 chefs ranging from junior sous chef to executive level for these pre-workshop recruitment and engagement talks. Workshop content was developed over 2 months through a site visit and four online planning sessions. W2 recruitment began 2 months in advance in collaboration with the Chefs Forum The Chefs Forum (2025), a UK-based organization engaging chefs in sector-facing events. They managed venue logistics, catering, recruitment, and media documentation. Recruitment materials were distributed via social media, direct outreach, and personal networks. Although the initial aim was to

recruit chefs from contract catering and independent restaurants, the scope was expanded to include hotel chefs and chef consultants due to limited uptake.

While PAL workshops could offer rich insights into chefs' micro food systems, they are resource-intensive and require small group sizes [no more than six participants (Camilleri et al., 2023)] to sustain meaningful dialogue, which in turn demands a high facilitator-to-participant ratio. In addition, power dynamics and hierarchies, unintentional co-option of the research outputs by the facilitator, as well as uneven participation, are other limitations of PAL. To reduce researcher bias and ensure contextual relevance, the workshop design in this study was co-developed iteratively with stakeholders and informed by multiple frameworks, as shown in Figure 1. Using these frameworks also informed the workshop design, content and considerations of relevant resources to minimize these practical drawbacks. Appendix B give a detailed description of the research assistant recruitment, participant recruitment and inclusion, workshop development, and the choice of workshop themes and structure.

The Theory U toolkit (Presencing Institute, 2024) was purposefully adapted to suit the specific contextual needs of the workshop. The structure was intentionally participant-centered, enabling engagement with the U process within the workshop setting. Within the workshop, there was a desire to foster systems-awareness; thus, the different activities also targeted micro, meso, exo and macrosystems frames of thought. This approach was underpinned by principles of transformational and experiential learning theory, as well as dynamic skills theory, to foster deep, reflective, and developmental learning experiences. The main objective was to allow participants to deeply reflect on their role within the menu and food offer curation; thus, two sections focused on the subject of the menu were at the core of the workshop.

The W1 development phase is outlined in detail in (Zick et al., 2026a). As seen in Table 1, the workshops consist of 10 sections, including a follow-up interview. Two sections of W1 required chefs to map and deliberate on the role of different stakeholders in the menu planning process, and how and where priorities are placed within the menu dimensions. Two previous studies were used to create prompts for the deliberation process (Mutlu et al., 2022; Ottenbacher and Harrington, 2007). See Table 10 in Appendix B.

For the stakeholder mapping, the chefs' ecosystem task, a table listing and comparing actors chosen by each group in descending order of relevance can be created, and then further reviewed themes recorded from generative dialogue after the workshop, so that inductive themes could be explored. This task is rooted in concept maps and fuzzy cognitive mapping (Henly-Shepard et al., 2015), thus helping to explore constructs of knowledge and worldviews of a group. Likewise, the outputs of the menu priorities task construct the views of menu decision priorities in descending order of relevance, allowing the research team to compare groups' views as well as investigate the outputs for patterns in responses.

W1 and W2 differed in two sections. For W2, input from W1 participants, the research assistant, and the advisory team, as well as preliminary findings from the pilot, led to a revision of W1 sections 3 and 6 (see Table 1). These sections were adapted to include an activity allowing participants to reformulate a dish, following the recognition that the pilot's brief exercise on assessing and adjusting the GHGE of a recipe was a valuable learning and sense-making experience. Each group had to agree on one dish, which would be evaluated first with the Greenhouse Gas Footprint Calculator (TUCO Ltd, 2018). The facilitators supported this by using a laptop and the web-based calculator while the group would share the specific recipe, its ingredients, and the ingredient volumes. After assessing the impact of the original recipe, a record of the GHGE impact was made, and the group were now able to redesign the dish, changing ingredients, volumes, and, if desired, the sourcing location of ingredients.

2.3 Workshop outline and set-up

Photovoice images: participants were asked to pre-submit one "good food" and one "sustainable food" image. Where pre-submission was not possible, we provided a curated set of 46 neutral food-related images (Pexels.com) solely as a prompt library; participants first selected and then interpreted any image they chose. To mitigate representational bias, facilitators explicitly de-linked image content from "correct" answers and required participants to justify meanings in their own terms, which were captured verbatim on flipcharts.

A detailed workshop outline, including planned timings and required materials, is provided in Appendix C. The workshop was designed to run for approximately 4.5 h, incorporating scheduled breaks to support participant reflection and learning integration. For both workshops (W1 and W2), approximately 1 week before the workshop, participants received information sheets, consent forms, and preparatory tasks. Each participant was asked to submit one image representing "good food" and another depicting "sustainable food." As a contingency, 46 food-related images sourced from Pexels.com were made available on the day for those who did not pre-submit.

A description of the key differences between W1 and W2 can be found in Appendix B.

2.4 Artefact analysis

To strengthen rigor, we treated workshop outputs as research artefacts: (i) generated *in situ* by participants, (ii) photographed and transcribed, and (iii) analyzed twice—first by participants during construction (group sense-making, negotiated placement and ranking), and later by researchers during cross-group aggregation and EST-level mapping. Linking artefacts to established mapping methods (concept/fuzzy cognitive mapping) and documenting decision rules during construction support dependability and confirmability of inferences.

Sections 4 and 5 required the participants to examine the menu creation process critically and specifically to consider the stakeholders involved in the menu process and how priorities of menu demands are being reconciled. This paper uses the artefacts which were created in the workshop as evidence.

As seen in Table 1, during workshop section 4, each group identified and sorted stakeholders by perceived influence on the menu creation. In the artefacts, the closer a stakeholder is to the

TABLE 1 Workshop sections, purpose, and systems dimension targeted.

Section number	W1 sections	W2 sections *(changed section)*	Purpose of the section	Objective of the section	Systems dimension targeted
1.	Welcome and creation of a "safe" environment and ground rules	Welcome and creation of a "safe" environment and ground rules	Connecting as people and balancing differences in power	Giving participants autonomy in their experience	Microsystem—intrinsic values
2.	Good food and sustainable food photo elicitation	Good food and sustainable food photo elicitation	The Now—what matters to us now, and how do we work now	Icebreaker and connection to personal views	Microsystem—intrinsic values and macrosystems frames
3.	Researcher presentation about food waste and GHGE of food Plenary GHGE calculation exercise	Researcher presentation about food waste and GHGE of food ***GHGE calculation example only***	The challenge to the status quo and now	Creating a knowledge baseline	Meso and exosystems frames
4.	Creating menus—chefs' ecosystem—fuzzy cognitive mapping	Creating menus—chefs' ecosystem—fuzzy cognitive mapping	Is the way we work now acknowledging the challenge, who reinforces the "now" and who might support a change?	Stakeholder mapping for the menu design process	Mesosystems frames and their interactions
5.	Menu onion/ladder—menu priorities—group deliberation	Menu onion/ladder—menu priorities—group deliberation	What matters most when writing a menu? How is menu content reinforced by the way we work "now"?	Sharing the priorities placed on the menu deliverables	Mesosystems frames
6.	Creating a sustainable dish	***Reformulating a chosen recipe***	Be free of the current limitations perceived? What if we shift the priority and order?	Getting chefs to think about their potential impact	Exosystems frames
7.	Blue-sky thinking—backcasting	Blue-sky thinking—backcasting	What else might be needed to allow different menu creation and working methods? Practical steps are possible today	Co-creating actionable next steps	Exosystems frames
8.	Reflections and feedback	Reflections and feedback	An invitation to consider how the past hours have shaped your thinking: where do we go from here?	Curating space to make sense of what was learned as an individual and as a group	Microsystem and reconnect to the intrinsic values and the macrosystems frames
9.	Graduation—gifting of a Carlin pea sprouts and a certificate	Graduation—gifting of a Carlin pea sprouts and a certificate	The gratitude of facilitators for trusting the process and planting the seed, as this can only be a start	Reinforcing the value created by coming together to explore this subject	Microsystems frames
10.	Follow-up 1 to 1 reflective interviews or questionnaires	Follow-up 1 to 1 reflective interviews or questionnaires	Allowing participants to reflect on the journey and deeper embed the acquired perspective	Gathering further research insights, but also giving an additional opportunity for reflection	Microsystem—and reconnect to the intrinsic values and macrosystems frames

center, the more relevant and essential that stakeholder is perceived to the menu design process. Hence, the maps created could be used to rank the stakeholders for each group. Ranks between 1 and 10 were allocated, with one being the most important and 10 the least important. This meant that for six groups (W1, two groups, W2, four groups), the ranks for each stakeholder could be summed, and the sum of the ranks would indicate the relative importance placed on those stakeholders collectively. Therefore, the lower the rank-sum for a stakeholder, the more critical all groups perceive this stakeholder.

For workshop section 5, a similar approach was taken; however, because the artefacts highlighted that some priorities were ranked as equal priority to others, these menu priorities were allocated the same rank. As a result, there are only 1–5 ranks, with 1 being the

most critical consideration for the menu creation and five the least. Additionally, this task had many prompts, which were excluded or not used by groups. If a group did not use a prompt, it was penalized by being given a rating of 6. Once again, the prompt ranks were summed up, and the lowest total score for a prompt indicated it was of the most significant importance for the groups collectively.

The findings were designed to be compared with those of Mutlu et al. (2022) and Ottenbacher and Harrington (2007) papers. In addition, the final ranking of the stakeholders was mapped onto Bronfenbrenner's EST dimensions, informed by a paper of Neal and Neal (2013) and previous research by the LR (Zick et al., 2024a), to understand where those stakeholders are positioned concerning the chefs creating the menus.

Thematic insights from generative dialogue and notes from facilitators further supported the inductive exploration of themes (curated with MS Excel) and are used to narrate the context of the ranking for both tasks.

2.5 Limitations and ethical and research considerations (safety and risk assessment)

We report limitations and ethical safeguards immediately after describing the methods, to aid replication and make positionality and procedural constraints explicit during method appraisal.

The lead researcher (LR) worked in the HaFS sector and kitchens for many years; this experience, together with literature, informed the research method selection, one which would be approachable for chefs, minimize the burden posed on the participants and consider their fast-paced ways of working. LR explored relevant literature for methods used in research with chefs. This highlighted challenges of working with chefs in research contexts, such as time constraints (Fooladi et al., 2019) or research methods which risk interfering with the business requirements, specifically health and safety or might require long-term commitments of chefs and researchers (Stephenson, 2012). Further, the literature indicated that very few researchers had used methods such as PAL. Other studies with chefs used more common research methods such as surveys (Ariza-Montes et al., 2018; Bertoldo et al., 2022; Chen and Wang, 2019; Cifelli et al., 2020; Condrasky et al., 2007; Kang et al., 2010; Kohli and Mehta, 2022; Marinakou and Giousmpasoglou, 2022; Obbagy et al., 2011; Swift et al., 2019) or interviews (Adhianata et al., 2023; Belardi et al., 2021; Cameron, 2001; Cooper et al., 2017; Escalante et al., 2022; Filimonau et al., 2023; Graham et al., 2020; Mrusek et al., 2022; Ottenbacher and Harrington, 2007; Richardson and Fernqvist, 2022; Wan et al., 2017) but these may be limiting due to time constraints, personal preferences for knowledge sharing, and neurodevelopmental factors such as ADHD, which is thought to be more prevalent in hospitality settings (Adamou et al., 2013; Hotte-Meunier et al., 2024; Sommerlad, 2023). PAL and focus groups offer more accessible, engaging, and flexible approaches that allow chefs to express their lived experiences meaningfully. These methods also foster a sense of value and mutual benefit, which is crucial for encouraging participation among time-pressured professionals.

Building on the strengths of PAR and PAL, these methods are particularly well-suited to the context of chefs' decision-making due to their ability to capture dynamic, in-the-moment processes. They also allow researchers to observe and engage with the sense-making process as it unfolds (van Dijk, 2024). This is crucial in kitchens, where decisions are often made rapidly and intuitively. These methods also help uncover the systemic dynamics influencing decisions, such as team hierarchies, resource constraints, and cultural norms (Luna-Reyes and Andersen, 2003). However, the embeddedness of the researcher in these processes requires careful ethical consideration. Issues such as researcher bias and power imbalances, sometimes referred to as "elite co-option" (Keahey, 2021), necessitate a transparent and reflexive approach to project design, data collection, and analysis. Maintaining detailed records and engaging in ongoing reflexivity are essential to uphold the integrity and equity of the research process.

3 Results

We organize the findings around the participatory backbone of the workshop: (1) values/frames (sections 1–2), (2) system agents (section 4), (3) menu decision priorities (section 5), and (4) prototyping/reflections (sections 6–10). Within each, we first report participant-generated artefacts (maps, ranks, images, quotations) and then interpret patterns using EST levels and the study aim of sustainable menu transformation. This structure aligns the participatory approach with the analytic narrative and keeps the focus on how participatory sense-making surfaces actionable menu levers.

This section presents first the workshop groups, followed by a brief outline of the outputs of W1 and W2 sections; then it details the findings of the artefacts analysis and the feedback received from workshop participants and facilitators after the workshops.

To support navigation, the findings are organized sequentially according to the workshop structure and are preceded by a summary (Table 2) of key observations. The section moves from descriptive outputs (sections 2–5) to prototyping activities (section 6) and finally to future-oriented reflections (sections 7–10).

3.1 Descriptive results

W1 achieved a higher invitation-to-participation conversion rate and better gender balance. For W1, 26 chefs (6 female, 20 male) were invited, with nine confirming attendance and eight participating on the day; one participant arrived late after sections 1 and 2. Participants were divided into two groups (P1A, P1B). For W2, 125 individuals were contacted: 92 chefs (74%), 14 education/research professionals (11%), 12 sector specialists (10%), four sustainability managers (3%), and three catering managers (2%). Only 12 chefs attended: 4 (33%) from contract catering, 3 (25%) from hotels, 3 (25%) from restaurants, and 2 (17%) consultants. Those who were not chefs were asked to share this with chefs in their professional networks. Initial confirmations 19 included 7 (37%) each from contract catering and restaurants, 3 (16%) from hotels, and 2 (11%) consultants. Two participants

TABLE 2 Summary of workshop stages and key observations.

Workshop section	Purpose	Key observations	Differences (W1 vs. W2)
2: "Good" and "sustainable" food (photo elicitation)	Surface values, build trust.	Participants expressed diverse value framings; images prompted reflection on personal and professional assumptions.	In W2, used more contingency images (Pexels.com); slightly reduced depth of personal storytelling.
3: GHGE and food waste input	Establish shared knowledge baseline.	GHGE sparked critical dialogue; led to reflection on constraints and agency.	W2 conversation more tool- and technology-focused due to shift in activity design.
4: Stakeholder mapping (fuzzy cognitive mapping)	Identify influencing agents.	Clear emphasis on meso-level actors; many groups added unprompted system factors.	W2 produced more additional agents but also had more participants; one group reversed activities.
5: Menu priorities	Explore decision drivers.	Product and customer factors ranked highest; sustainability lower (food waste and GHGE).	Both workshops rushed for time; W2 was similarly short on prompts.
6: Sustainable dish (W1)/recipe reformulation (W2)	Prototype alternatives.	Triggered learning about trade-offs; awareness of carbon impacts increased.	W2/s GHGE calculator improved engagement and concreteness.
7: Backcasting and futures	Identify future actions.	Strong interest in system supports and practical change.	Consistent across workshops.
8–10: Reflection and follow-up	Consolidate learning.	Participants valued peer learning, safe space, and practical relevance.	W2 more actionable feedback; stronger implementation mindset.

arrived late after sections 1 and 2 had been delivered. Participants were divided into four groups (P2 Blue, P2 Yellow, P2 Black, P2 Red).

Comparative data on outreach and attendance for both workshops are presented in Tables 3, 4.

3.2 Qualitative results

3.2.1 Workshop outputs

The following section briefly summarizes all workshop sections for context, highlighting any differences between W1 and W2.

3.2.1.1 Section 1—welcome and ground rules

Participants appreciated the collaborative establishment of ground rules (Appendix D W1 Artefact A), though the activity exceeded its planned duration; W2 used fewer prompts, which made the task shorter and maintained better engagement.

3.2.1.2 Section 2—photo elicitation—"good" and "sustainable" food

All participants actively contributed images and reflections, using the task to express their food-related values and positionality. In W2, fewer participants brought along their own images; this meant more examples of Pexel.com were used. These first two workshop sections were missed by one participant in W1 and two participants in W2, due to their late arrival.

3.2.1.3 Section 3—presentation on food waste and GHGE

In W1, the researcher-led presentation prompted critical discussion and reflection, particularly around GHGE calculations and recipe reformulation using MyEmissions (2025), which sparked debate on sustainability vs. health implications. This was less apparent in W2 because the GHGE calculation had been set up as an activity for workshop section 6. While an example was given, the conversation focused on different options and businesses that are helping with GHGE assessments of recipes.

3.2.1.4 Section 4—stakeholder mapping—chefs' ecosystem

Participants in W1 quickly engaged with stakeholder mapping using printed prompts, supported by facilitators who ensured inclusive dialogue and captured group insights (Appendix D, Artefacts B–I). Some additional "stakeholders" were added by each group in W1. Likewise, the activity was easy to follow for the participants in W2; however, the P2 Red used the prompts for the activity in section 5 during this exercise. There were a lot more "stakeholders" added by the groups, specifically P2 Blue.

3.2.1.5 Section 5—menu onion/ladder—menu priorities

This section enabled deeper deliberation on menu decision-making, though the volume of prompts led to time constraints and a sense of rushed completion in W1 for both groups (Appendix 6, Artefacts J–M). This section was also perceived as too short by at least two groups in W2, which meant they were not able to use all the prompts for the activity. P2 Red used the prompts from section 4 in this exercise and added a few additional ideas. Thus, while this was not intended, P2 Red carried out the activities in reverse order.

3.2.1.6 Section 6—W1 creating a sustainable dish and W2 recipe reformulation—"prototyping"

Participants in W1 found the open-ended nature of the sustainable dish creation task challenging, requiring facilitator

TABLE 3 Participant outreach.

Workshop	W1	W2	W1			W2		
Gender	N/A	N/A	Female	Male	Non-binary	Female	Male	Non-binary
Invites*	26	125	6 (23%)	20 (77%)	0 (0%)	32 (26%)	92 (73%)	2 (2%)
Attendees	8 (31%)	12 (10%)	4 (50%)	4 (50%)	1 (0%)	3 (25%)	9 (75%)	0 (0%)

*For W1, only chefs received the invitation for W2; the invitation was shared with other professionals to share with chefs.

TABLE 4 Participant kitchen experience level.

Participant seniority	W1	W2
Junior	2 (25%)	0 (0%)
Mid	4 (50%)	3 (25%)
Senior	2 (25%)	9 (75%)
Total attendees	8	12

prompts to sustain engagement and discussion, which is why this activity was revised for W2.

In W2, the Greenhouse Gas Footprint Calculator (TUCO Ltd, 2018) was used by the facilitators to help calculate the GHGE associated with dishes for each of the four groups. The participants engaged well with the task, dishes selected included: katsu schnitzel, a soba noodle dish with poached chicken and two groups chose fish and chips. There was a rich discussion around the usability and practicality of the tool, but also the different reformulations and their impact on the GHGE of each dish. This included considerations of nutrition, cultural appropriateness, practicality, and cost, for example.

3.2.1.7 Section 7—blue-sky thinking—backcasting

In both workshops, W1 and W2, all participants contributed actionable ideas across three timeframes, followed by voting and generative dialogue that highlighted perceived agency in addressing food waste and GHGE.

3.2.1.8 Section 8—reflections and feedback

Due to time overruns and participant fatigue in W1, this session was less focused, though immediate feedback was still offered and captured. Time management was better; therefore, the reflections and feedback were more energized and content-rich than in W1.

3.2.1.9 Section 9—graduation ceremony

Participants in both workshops, W1 and W2, responded positively to the symbolic gifting of Carlin pea plants and certificates, reinforcing collective contribution and the workshop's thematic closure. The certificates in W2 were more critical to the participants as they confirmed their attendance at the event to their employer.

3.2.1.10 Section 10—follow-up interviews/questionnaires

The follow-up interview engagement was challenging for W1 and W2, with the chefs indicating that they were too busy to take time to complete questionnaires or schedule additional interviews. W1 received responses from four of eight participants, and for W2, responses were received for six of 12 participants, a response rate of 50% for both workshops. However, the interviews and questionnaires received for both workshops provided rich and contextual information, with some follow-up conversations taking more than an hour each for W2.

Additionally, for both workshops, informal post-event conversations at other meetings of the participants and the researcher provided further feedback and insights from most participants; however, these are not used as evidence because they do not fall within the consent given. This is reported here as it evidences the ability of PAL to build trust and long-term engagement with participants.

3.2.2 Menu activity artefact analysis

3.2.2.1 Creating menus—chefs' ecosystem—fuzzy cognitive mapping

Stakeholder maps (section 4) reveal meso-level dominance (procurement, owners, management) over menu decisions, with micro-level actors comparatively muted—an interpretation we revisit in the Discussion in relation to feasible leverage points.

To explore group perceptions of stakeholder relevance in menu creation, participants completed a task grounded in concept mapping and fuzzy cognitive mapping as shown in Figures 1, 3. Each group identified and placed stakeholders by perceived influence onto the flipchart, with results summarized in Table 5, images of the artefacts can be found in Appendix D.

Interview reflections reveal that the task surfaced the lived reality of organizational constraints. One participant described realizing the limits of their own agency: "I was thinking how much is in our hands… and that other person in my company will actually be the one who is capable to make the change." He highlighted elsewhere the supply-chain rigidity, noting that "we are limited in what we can buy… if we need beef, it must be British beef from our supplier." These insights demonstrate how chefs negotiate influence within tightly structured organizational and market systems.

Participants did add "stakeholders" in this section, some additions may not be conceived as stakeholders but are abstract constructs of stakeholders (e.g., "cookbooks" = non-human stakeholders), thus this paper refers to influencing agents rather than stakeholders. This table reflects both the relative importance assigned to each influencing agent (on a scale from 1 to 10, with one being most relevant) and the inclusion of additional, unprompted factors such as cookbooks, deliciousness, and financial

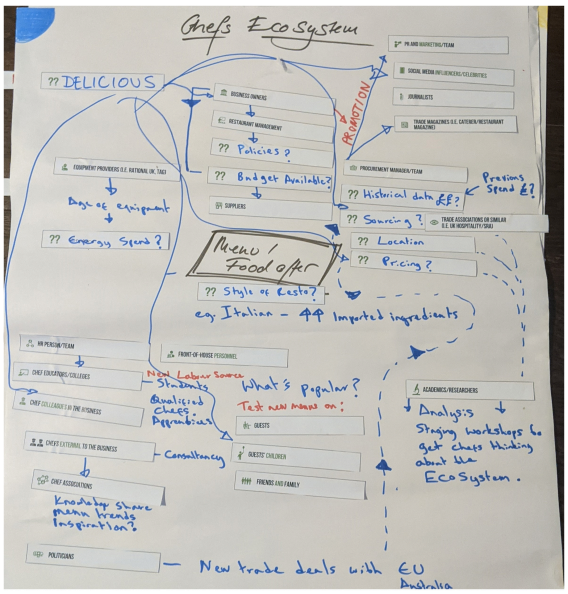

FIGURE 3
Sample stakeholder map from W2. Clustering of meso-level agents (procurement, owners, restaurant management) near the centre indicates perceived influence.

considerations. These additions suggest a shift from identifying who influences food offerings to how they do so. Thematic insights from generative dialogue further supported the inductive exploration of group worldviews and knowledge constructs about the various influencing agents.

The stakeholder prompts were readily understood by participants, facilitating engagement with the task. Notably, some groups developed a rudimentary causal loop diagram (Appendix D, Workshop Artefact C, E, and G), illustrating perceived interdependencies among influencing agents and their impact on the menu ideation process. The generative dialogue during the panel discussion further reinforced the perceived significance of various influencing agents. All participants actively engaged and contributed to the co-creation of supporting materials for this task. All artefacts produced by participants are provided in Appendix B (Workshop Artefacts B–I).

The stakeholder prompts were inductively categorized into the five systems dimensions of Bronfenbrenner's ecological systems theory Table 6, the ranks of each category were analyzed, and an average rank score and normalized rank score were calculated using Equation 1.

$$Normalized\ Score = \frac{Max\ Avg\ Score - Category\ Avg\ Score}{Max\ Ag\ Score - Min\ Avg\ Score} \quad (1)$$

The analysis reveals that Meso-level agents, such as procurement teams, business owners, and restaurant management, are perceived as the most influential in shaping menu decisions, with the highest normalized priority score (1.000). These actors operate within the organizational structure and have direct control over operational and strategic decisions.

Macro-level agents (e.g., cookbooks, media, and politicians) and Exo-level agents (e.g., suppliers, guests, and trade associations) follow, indicating moderate influence. These groups shape the broader context in which decisions are made through cultural, regulatory, or market forces.

Chrono-level agents, which include time-related constraints such as shelf life, historical data, and equipment age, are seen as having limited influence, though they still play a role in long-term planning and operational feasibility.

Micro-level stakeholders such as chef colleagues, infrastructure, and friends and family are rated as the least influential. Their impact is more localized and personal, often affecting day-to-day practices rather than strategic direction. This has been visualized in Table 6, where the most significant influencing system dimension is placed on the outside and the least influencing on the inside.

3.2.3 Menu onion/ladder—menu priorities—group deliberation

Menu priorities (section 5) place product/ingredient and customer-related factors above sustainability prompts (food waste, environmental impact), clarifying why stand-alone sustainability goals often struggle to enter the menu's operating logic.

To examine priorities in menu development, prompts were derived from two key academic sources (Mutlu et al., 2022; Ottenbacher and Harrington, 2007) and used to guide workshop activities.

Post-workshop interviews revealed a noticeable shift in participants' awareness as they worked through the tensions embedded in menu-priority decisions. For some, the activity created a moment of honest reckoning. One chef explained that "there were a couple of moments a bit tense because you realize that actually, stuff that you think is important isn't really in reality as high up the list as you want it to be." Such reflections highlight how the workshop structure encouraged deeper critical engagement with the implicit hierarchies shaping everyday menu practices.

Another described this as "a wake-up… when you realize what you actually do in reality." These reflections align with the workshop's aim to surface and challenge existing assumptions, supporting processes of transformational and experiential learning.

Table 7 presents the resulting group-specific priority rankings in descending order, while Appendix D (Workshop Artefacts J-M) contains the supporting data. Participants used the prompts to reflect on and rank factors influencing menu ideation. Notably, two priorities, environmental impact and food waste, which had been purposely added as menu priorities, only rank in seventh and ninth positions in the collective ranking order, as shown in Table 7.

The menu priorities from Mutlu et al. (2022) and Ottenbacher and Harrington (2007) had previously been inductively categorized into five distinct categories (Customer related, Product/ingredient related, Internal business tension, External business tensions, Acceptability). These categories are displayed alongside the collective rank of menu priorities in Table 7. For each category, the ranks of the individual menu priorities were summed up and then divided by the number of prompts within that category to gain an adjusted rank for the

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TABLE 5 Priority ranking of ecosystems influencing agents.

Ecosystem Influencing agent in descending order	P1A	P1B	P2 Blue	P2 Yellow	P2 Black	P2 Red^	Total Rank score	Rank	Systems level
	Distance (1 = very influential-–10 = less influential)								
Procurement manager/team	1	1	2	1	3	2	10	1	Meso
Business owners	1	4	1	1	3	1	11	2	Meso
Restaurant management	1	1	2	1	3	6	14	3	Meso
PR and marketing/team	2	2	1	2	7	2	16	4	Meso
Guests	2	3	8	1	1	1	16	4	Exo
Suppliers	1	2	4	5	5	1	18	5	Exo
Equipment providers (i.e., rational UK, TAG)	1	2	3	6	6	2	20	6	Exo
Chef colleagues in the business	1	1	8	3	4	4	21	7	Micro
Social media influencers/celebrities	3	2	1	6	7	2	21	8	Macro
Guests' children	2	4	8	6	1	1	22	8	Exo
Deliciousness*	5	5	1*	5	5	1	22	9	Micro
Cookbooks*	1*	3*	5	5	5	5	23	9	Macro
Trade associations or similar (i.e., UK hospitality/SRA)	5	4	4	6	2	2	24	10	Exo
Shelf life/prep time*	5	1*	5	5	5	5	26	11	Chrono
Concept*	5	5	5*	5	5	1	26	11	Meso
Front-of-house personnel	4	4	7	2	9	1	27	12	Meso
Finance/gross profit*	5	2*	5	5	5	5	27	12	Meso
Policies*	5	5	2*	5	5	5	27	12	Meso
MSC/MCS	5	5	5	5	5	2*	27	12	Exo
Halal/certifications	5	5	5	5	5	2*	27	12	Exo
Academics/researchers	5	2	7	3	8	3	28	13	Exo
Budget available*	5	5	3*	5	5	5	28	13	Micro
Historical data (previous spent)*	5	5	3*	5	5	5	28	13	Chrono
Infrastructure (layout of the restaurant/kitchen)	5	5	5	5	5	3*	28	13	Micro
Advertisement*	4*	5	5	5	5	5	29	14	Macro
Journalists	6	3	1	6	10	3	29	14	Exo
Trade magazines (i.e., caterer/restaurant magazine)	6	4	2	3	10	4	29	14	Macro
Age of equipment*	5	5	4*	5	5	5	29	14	Chrono
Sourcing*	5	5	4*	5	5	5	29	14	Exo
Politicians	5	1	10	6	2	6	30	15	Macro
Energy spent*	5	5	5*	5	5	5	30	15	Micro
Location*	5	5	5*	5	5	5	30	15	Exo
Pricing*	5	5	5*	5	5	5	30	15	Micro
Style of restaurant (e.g., Italian—imported ingredients)*	5	5	6*	5	5	5	31	16	Meso
Chefs external to the business	2	4	9	3	8	6	32	17	Exo
Chef educators/colleges	5	4	7	6	8	4	34	18	Exo
Friends and family	5	3	8	6	9	4	35	19	Micro
HR person/team	6	5	7	4	10	3	35	19	Meso
Chef associations	6	4	9	6	8	3	36	20	Exo

^P2 Red used the activity prompts for sections 4 and 5 in reverse order. This column is their contribution from workshop section 5 to enable comparison with the other groups.
*The groups added these stakeholders/agents.

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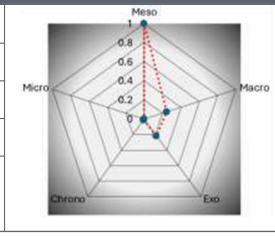
TABLE 6 Menu priority level of Bronfenbrenner's EST systems dimensions.

Bronfenbrenner's ecological systems dimensions (number of agents in category)	Average rank score for the systems dimensions*	Normalized priority score	
Meso$_{(n=10)}$ [connections between environments]	22.4	1	
Macro$_{(n=5)}$ [social and cultural values]	26.4	0.247	
Exo$_{(n=14)}$ [indirect environments]	26.57	0.215	
Chrono$_{(n=3)}$ [impact of time]	27.67	0.009	
Micro$_{(n=7)}$ [immediate environment]	27.71	0	

*Calculated from the average rank score for each category from the rank scores of each influencing agent, see Table 6. The normalized priority score considers the varying number of influencing agents in each group.

category, which is displayed in descending order in Table 7. Further to make the scores comparable on a 0–1 scale (where 1 = highest priority and 0 = lowest priority), we use min-max normalization (see Equation 1).

The normalized ranking of menu decision drivers reveals a hierarchy of influence. Product/ingredient-related factors (e.g., quality, availability, seasonality) hold the highest priority, followed closely by customer-related considerations such as satisfaction and demand. These findings suggest that practical and consumer-facing concerns are central to menu ideation.

Internal business tensions (e.g., labor costs, infrastructure) and external business tensions (e.g., supplier relationships, financial constraints) occupy a middle tier, indicating their relevance but secondary influence compared to product and customer factors.

In contrast, acceptability-related drivers such as alignment with colleagues' or friends' preferences are ranked lowest. This suggests that social or interpersonal validation plays a minimal role in strategic menu decisions, highlighting a more operational and market-driven approach among participants. This has been visualized in Table 8 with the highest priority category on the outside and the center being the least important menu category.

3.2.4 Workshop reflections

Feedback on the workshop was gathered collectively in section 8 of the workshop, and with reflective interviews and questionnaires, this section of the paper shares a summary of the feedback, highlighting what participants perceived as valuable, any suggestions for improvement and to what extent the input differed between the workshops.

Although the final segment of W1 was shortened due to time constraints and participant fatigue, feedback collected on the day, as well as through follow-up interviews and questionnaires, consistently affirmed the workshop's value. Participants across both workshops reported strong engagement, with differing emphases: W1 attendees highlighted the interactive and reflective nature of the experience, particularly the benefits of group work, idea sharing, and the opportunity to think differently outside the kitchen. In contrast, W2 participants focused more on practical applications, suggesting improvements such as better timekeeping, developing structured GHGE resources, and tools for supplier engagement as a sector output of this workshop. Across both sessions, participants found the structure and pace appropriate and expressed that the workshop empowered them to envision how they could influence food offerings within their business. The shift from interpersonal learning in W1 to implementation-oriented feedback in W2 suggests a progression in participant expectations and readiness for action.

Participants across both workshops demonstrated awareness of the complexities involved in sustainable menu development and food system transformation. In W1, learning was centered around collaborative exploration and personal reflection. Participants gained insights into the environmental impacts of food choices, the role of GHGE, and how individual actions can contribute to broader change. The workshop environment, removed from the kitchen, enabled critical thinking and perspective-shifting, allowing participants to consider new strategies and engage in meaningful dialogue. In W2, learning extended into more strategic and operational domains. Participants identified the need for structured tools and resources, such as GHGE data formats and supplier engagement strategies, and expressed interest in applying workshop concepts to different business models. The emphasis on practical implementation and systems-level thinking in W2 suggests a deepening of understanding and a readiness to translate learning into action.

4 Discussion

4.1 Method feasibility

This study demonstrates that while participatory workshops in hospitality settings require significant logistical, financial, and relational investment, they can yield rich, contextually grounded insights into menu transformation and sustainability practices. Despite the high-risk nature of this methodology, due to reliance on single events, small sample sizes, and potential for selection and researcher bias (Burgess et al., 2016), the workshops facilitated meaningful learning for participants and researchers alike. The co-creation process fostered trust, empowered chefs to reflect critically on their roles, and initiated actionable ideas for business change. Although the findings are context-dependent and not easily generalizable, the workshops served to further other evidence

TABLE 7 Menu priority hierarchy selection of each group and their menu categories.

Menu priority prompt	W1 Rating P1A	W1 Rating P1B	W2 P2 Rating Blue	W2 P2 Rating Yellow	W2 P2 Rating Black	W2 P2 Rating Red^	W1 & 2 Total Priority Score	Rank	Menu categories according to Mutlu et al. (2022), Ottenbacher and Harrington (2007)
	Priority (1 high-–5 low, 6 not used)								
Cost and profitability	1	1	1	2	1	1	7	1	Internal business tension
Menu pricing considerations	1	3	1	2	1	1	9	2	Customer related
Consideration of product quality	2	1	2	1	2	3	11	3	Product/ingredient related
Labor cost/requirement	2	2	2	2	2	1	11	3	Internal business tension
Guest satisfaction	2	1	2	1	3	3	12	4	Customer related
Accessibility of raw materials	3	2	1	2	2	2	12	4	Product/ingredient related
Menu/business concept	1	5	1	1	1	4	13	5	External business tensions
Consideration of seasonality	3	2	2	1	3	2	13	5	Product/ingredient related
Supplier relationship	3	2	1	1	3	3	13	5	External business tensions
Cooking style of kitchen/business concept	1	4	1	3	1	4	14	6	Customer related
Qualified personnel	1	1	3	4	2	4	15	7	Internal business tension
Balancing taste, texture, color	2	3	4	1	1	4	15	7	Product/ingredient related
Environmental impact of food offer	4	1	1	3	4	2	15	7	External business tensions
Target market/audience (business model/concept)	1	3	4	1	1	6	16	8	Internal business tension
Technical skills consideration	1	2	3	4	2	4	16	8	Internal business tension
Customer demand (i.e., new trends)	3	1	4	4	3	1	16	8	Customer related
Availability of ingredients/materials	2	2	2	3	2	6	17	9	Product/ingredient related
Food waste	4	1	3	3	4	2	17	9	Product/ingredient related
Cost of raw ingredients/materials	2	1	1	2	6	6	18	10	Product/ingredient related
Equipment needed	2	2	2	3	4	5	18	10	Internal business tension
Balancing menu (i.e., fish, vegetarian, vegan, etc.)	2	4	4	4	1	4	19	11	Customer related
Infrastructure (layout of restaurant/kitchen)	1	3	2	2	6	6	20	12	Internal business tension
Productivity of staff	3	4	3	4	2	4	20	12	Internal business tension
Fit with menu style	1	4	4	6	3	6	24	13	Internal business tension
Acceptability to customers	3	4	5	2	6	6	25	14	Customer related
Acceptability to trusted colleagues	3	3	5	5	6	4	26	15	Acceptability

(Continued)

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TABLE 7 (Continued)

Menu priority prompt	W1 Rating P1A	W1 Rating P1B	W2 P2 Rating Blue	W2 P2 Rating Yellow	W2 P2 Rating Black	W2 P2 Rating Red^	W1 & 2 Total Priority Score	Rank	Menu categories according to Mutlu et al. (2022), Ottenbacher and Harrington (2007)
	Priority (1 high—5 low, 6 not used)								
Location*	5	5	5	1	5	5	26	15	External business tensions
Acceptability to sommelier	3	5	5	5	4	5	27	16	Acceptability
Compatibility with the current menu	5	4	4	4	6	4	27	16	Internal business tension
Economic sustainability = cost*	5	5	5	5	5	2	27	16	External business tensions
Consideration of available crockery	5	5	3	5	4	6	28	17	Internal business tension
Acceptability to friends and family	5	5	5	5	6	5	31	18	Acceptability

^P2 Red used the activity prompts for sections 4 and 5 in reverse order. This column is their contribution from workshop section 5 to enable comparison with the other groups.
*The groups added these priorities.

which used participatory action learning in food systems research (Armstrong et al., 2020; Kluczkovski et al., 2020; Pateman et al., 2020), offering a valuable model for future inquiry and practice.

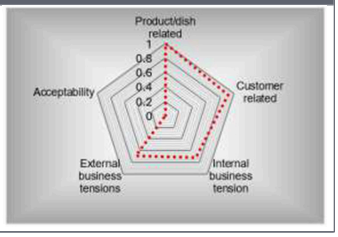
Given the exploratory nature of this research project, a lot of time and effort was invested into the ethical considerations, workshop design and participants' recruitment as reported by other PAR and PAL researchers (Burgess et al., 2016; Zuber-Skerritt, 2015). Not all data and impacts can be captured as the ethical application process defines before the event what data can and cannot be included. However, the open nature of PAR and PAL means that unexpected events and insights can be gathered. For example, in this project, two of the research assistants in W2 were deeply inspired by the work and decided to explore the methodology in their contexts. Another unexpected outcome after W2 was that the workshop format was commissioned and delivered for work with NHS England (The Chefs Forum, 2025); however, the data from these workshops cannot be included due to the ethical approval limitations.

4.2 Systems insights into menu transformation

Positioning the menu as an operating principle clarifies where change is most tractable. Because meso-level actors (procurement, owners, management) dominate perceived influence, chef-led interventions are most likely to scale when they explicitly enlist meso-level levers (e.g., supplier specifications, gross profit targets, prep-time allowances) and translate GHGE/waste benefits into product- and customer-centered value propositions. This helps shift decision rules (e.g., acceptable protein swaps, default sides, portion standards) and can produce spill-overs into adjacent domains—supplier relations, front-of-house practice, and consumer decision environments. The reported perception among chefs of limited decision authority emphasizes the need to co-design targets and incentives with meso-level stakeholders so that sustainability becomes embedded in the menu's operational logic rather than added as an external goal.

The main aim of this paper was to share insights into the menu transformation process. It was proposed that the menu needs to be seen as an operating principle which defines how a catering business agrees to work for some time. The menu is co-created, whether overtly or covertly, and this has influenced the research design. Other research (Mutlu et al., 2022; Ottenbacher and Harrington, 2007) previously shared insights into who influences menu decisions and how priorities are being placed in the menu design process. The evidence of these projects was used to curate specific prompts for the menu design sections (4 and 5) to encourage the groups to deliberate on the role of stakeholders and the priorities they place on the menu. After the completion of both workshops, the menu influencing agents were categorized into the five systems dimensions proposed by Bronfenbrenner's ecological systems theory (Bronfenbrenner and Morris, 2007) as part of the data analysis. The ranking of the stakeholders by each group made it possible to create a collective rank for each stakeholder. These influencing agents are not exclusively "stakeholders" (e.g., "deliciousness" or policies = non-human), thus

TABLE 8 Category importance in descending order.

Categories derived from Mutlu et al. (2022), Ottenbacher and Harrington (2007) [number of menu priorities in category]	Sum of priority score for category	Average priority category score	Normalized priority score for menu categories	
Product/ingredient related [7]	103	15	1	
Customer related [6]	95	16	0.916	
Internal business tension [11]	202	18	0.725	
External business tensions [5]	94	19	0.692	
Acceptability [3]	84	28	0	

Category importance in descending order.

we refer to influencing agents as abstracted stakeholders from the chef's perspective. It was then possible to create a normalized rank for the five system dimensions. The findings indicate the Meso-level agents are perceived as most relevant in the menu design process, which reinforces the proposed framing for understanding the menu as an operating principle for a catering business, because those Meso-level agents need the menu to deliver outcomes also for those influencing agents. That means the menu transformation requires active and ongoing deliberation between those influencing agents, and working exclusively with chefs to transform menus will not enable those agents to align to support a menu transformation.

Further, the impact of the micro-level agents was the least relevant to the participants; this is unexpected because other research argues that kitchen practices are influenced by communities of practice (de Oliveira et al., 2024) and in this context, the expectation was that the micro-level stakeholders are perceived to be more influential in the menu curation process. This has also been proposed by Ottenbacher and Harrington (2007), who argue that the personal network of Michelin star chefs is of great importance in the menu innovation process. Filimonau et al. (2024) used Bronfenbrenner's EST to explore the food waste practice development in their work; the microsystem boundary was set in a way which aligns closely with the original theory by Urie Bronfenbrenner Bronfenbrenner and Morris (2007), where only the close family is included in the Microsystem level. Based on earlier research (Zick et al., 2024b), the boundary for the microsystem for this study was more aligned with Neal and Neal (2013), who aimed to expand Bronfenbrenner's theory to adult contexts and acknowledged that the influence of family members changes in adulthood and shifts toward other social networks. These findings support the view that menu design is a systems-level process influenced by micro, meso, and macro structures (Nie et al., 2024) and chefs' practice development is also influenced by this systemic interplay.

Because the allocation of the system levels was done inductively by the researcher without active input from the participants, there is a possibility that the ranking could be affected if the influencing agents were grouped in a way which does not align with the participants. Further, while there is emerging academic discourse on including non-humans in stakeholder analysis (Shachat, 2024), it would be valuable to explore the meaning and associations of chefs with the non-human stakeholders in this study. Thus, there is a desire by the LR to follow this up with chefs and sector specialists to critique the influencing agent categorization, interrogate non-human stakeholders and assess the usefulness of the concept for the menu design process. Finally, it should be noted that any boundary setting is arbitrary because these boundaries are, in reality, soft and vary between contexts. While patterns can be observed as seen in this work, and the system levels can help as mental models to understand the complex decision process of menu creation, it is essential not to see this theory as universally applicable.

4.3 Menu priorities and trade-offs

Reverting to the menu priorities, these were also assessed through a ranking method after inductive allocation into categories. The analysis of menu decision priorities revealed a clear hierarchy: product and ingredient-related factors were ranked highest, followed by customer-related considerations, while acceptability-related drivers, such as alignment with colleagues' or friends' preferences, were consistently deprioritized. This suggests that chefs prioritize operational and consumer-facing concerns over interpersonal or reputational factors. Notably, sustainability-related prompts such as food waste and environmental impact were not among the top priorities, indicating that these considerations remain secondary in current menu planning practices. This finding echoes earlier research by Mutlu et al. (2022), Ottenbacher and Harrington (2007), and Filimonau and Krivcova (2017), who highlight the persistent dominance of economic and logistical concerns in menu engineering.

The findings of this study suggest that product and customer-related priorities are at the forefront of menu decisions. The product focus appears to challenge the conclusions of Mutlu et al. (2022) because their highest-ranked menu priorities were overall more customer-related. Contextual differences might explain this, as the study by Mutlu et al. (2022) was carried out in Turkey and was not designed to explore the menu design context from an environmental impact of the food perspective. The research

presentation workshop section 3 focused on the effect of food waste and how GHGEs are linked to food, which made the context more overtly about food, and this could be perceived as part of the product category. However, food waste, albeit being product-related, was ranked lower than the environmental impact of the food offer, which fell into the external-business tension category. This could be driven by the content of the workshop too, because the emphasis was on GHGE in the workshop invitation, and the greater public discourse around GHGE may have made the environmental impact more at the forefront of participants' minds. Alternatively, the dominance of product-related priorities could depend on the menu development phase, as Ottenbacher and Harrington (2007) suggest from their research that the menu curation has seven phases, and the priorities placed on the menu in these different stages may vary. Thus, considering the temporal relevance of menu development and how dishes with lower GHGE and food waste deliver toward the product and customer-related menu priorities may support menu transformation.

4.4 From "who" to "how"

A notable shift in participant thinking emerged during the stakeholder mapping task: from identifying who influences menu decisions to exploring how these influences manifest. Several groups introduced unprompted factors such as shelf life, preparation time, and financial constraints, indicating a move toward process-oriented reasoning. This transition reflects a deeper engagement with systems, which appears to surface the underlying structures and feedback loops that shape decision-making. The artefacts and generative dialogue suggest that chefs are aware of the systemic nature of menu development, even if sustainability is not yet a primary driver.

4.5 Learning outcomes and participant reflections

Participants in Workshop 1 reported that the workshop provided a rare opportunity to step outside the kitchen and reflect on their roles in shaping food offers. The safe, collaborative environment enabled peer learning and critical dialogue, fostering awareness of the broader implications of menu decisions. This aligns with the principles of experiential and transformational learning, where reflection and dialogue serve as catalysts for perspective shifts (Armstrong et al., 2020; De Jaegher and Di Paolo, 2007; Zuber-Skerritt, 2015). The workshop structure allowed chefs to explore their agency within the food system and consider how their everyday decisions contribute to larger sustainability challenges.

In contrast, Workshop 2 participants focused more on practical applications and strategic tools. Requests for GHGE calculators, supplier engagement frameworks, and sourcing knowledge banks reflected a desire for actionable resources to support sustainable decision-making. This shift toward implementation-oriented learning suggests a maturation of understanding and a readiness to operationalize sustainability goals.

A key moment of learning occurred during the GHGE calculation and recipe reformulation task, which triggered what facilitators described as a "disorienting dilemma." Participants expressed surprise at the carbon impact of familiar dishes and engaged in critical discussions about trade-offs between sustainability, nutrition, and cultural expectations. This moment of discomfort aligns with transformational learning theory, which posits that disorientation can prompt deeper reflection and behavioral change. The aim for W2 was to expand this section and allow the participants more time to actively engage with assessing the GHGE impact of a dish; this activity appeared to tap into a competitive spirit, with the teams seemingly aiming to create the greatest GHGE savings on their dishes.

The participatory nature of the workshops enabled chefs to surface tacit knowledge and articulate the constraints and values that shape their menu decisions. Through tools such as stakeholder mapping and menu ladders, participants co-constructed insights that reflected both individual experiences and collective sense-making. This co-creative process aligns with the goals of participatory action learning and has been shown to foster trust, engagement, and long-term impact (Cornwall and Jewkes, 1995; Frasso et al., 2018). The workshops demonstrated that when chefs are treated as knowledge holders rather than passive recipients, they are more likely to engage meaningfully with sustainability challenges.

4.6 Study limitations

This study employed a PAL approach, which, while generating rich and contextually grounded insights, presents several methodological limitations. First, the sample size was smaller than intended. W1 did not reach the target of 12–16 participants, and W2 required a broadening of the inclusion criteria to include hotel and consultant chefs. This limits the specificity of findings to particular catering contexts, as menu design processes are known to vary across business types (Jones et al., 2025). Although the small group sizes (W1: $n = 4$; W2: $n = 3$) facilitated deep discussion and content-rich artefacts, the self-selecting nature of the sample and limited scale constrain generalizability. Nevertheless, attendance levels were comparable to sector events such as Climate Smart Chefs ($n = 61$ online; Martin et al., 2023) and Sustainable Restaurant Association (2024) roundtables (40 businesses across four sessions), suggesting alignment with sector norms. Future research could build on these findings through larger-scale surveys to validate the system-level stakeholder mapping and menu priority categories.

Second, the findings are context-dependent. As with many participatory methods, outcomes were shaped by the specific location, facilitator-participant dynamics, and the broader discourse on GHGE and food waste at the time of the workshops. These factors limit replicability and suggest the need for further validation across diverse settings.

Third, the dual role of the lead researcher as both facilitator and insider introduces potential for confirmation bias and reduced

objectivity, a common critique of participatory action research (Onwezen et al., 2021). To mitigate this, the study incorporated early involvement of an advisory team and research assistants in workshop design and delivery. Multiple facilitators (W1: 1; W2: 3) supported group activities and reviewed findings to reduce bias. However, the high level of participant engagement may still have encouraged socially desirable responses, particularly regarding sustainability actions. Anonymous follow-up surveys could help triangulate these findings.

Fourth, PAL is a high-investment, high-risk methodology requiring sustained trust and communication among researchers, participants, and collaborators. The success of data collection hinges on single events, making contingency planning essential. While this approach may not suit all research contexts, it fostered meaningful engagement and generated opportunities for future collaboration. The participant network established through this study offers a foundation for follow-up research, including validation of stakeholder-system mappings and menu priority frameworks.

Finally, ethical and practical considerations are central to this research approach. Trust, transparency, and participant autonomy are essential (Keahey, 2021; Luna-Reyes and Andersen, 2003; Mercer-Mapstone et al., 2017). This necessitates open access to findings and prohibits the commercialization of co-produced knowledge. Sensitive topics may remain unexplored due to the relational nature of the method, but the ethical imperative to share outputs with participants and the wider public remains paramount.

5 Conclusion

This study demonstrates that participatory, chef-led workshops can generate rich, context-specific insights into the complexities of sustainable menu transformation. Chefs identified a wide range of stakeholders and decision drivers, with meso-level actors and product-related priorities emerging as most influential. Despite growing awareness of environmental concerns, sustainability-related priorities such as food waste and GHGE were not consistently ranked as central to menu decisions, highlighting the tension between operational demands and environmental goals.

The findings suggest that creating reflective, collaborative spaces outside the kitchen enables chefs to critically engage with sustainability challenges and identify actionable opportunities for change. Practical tools, such as GHGE calculators and stakeholder mapping, can support chefs in navigating trade-offs and aligning menu decisions with broader sustainability goals. By adopting the menu as an "operating principle," chefs and foodservice professionals can use the menu not just as a list of offerings, but as a strategic framework to embed sustainability, health, and ethical considerations into everyday decision-making. Businesses may benefit from embedding such workshops into professional development strategies to foster systems thinking and innovation.

This research contributes to the growing body of literature on participatory methods in food systems research, particularly within the hospitality sector. It highlights the value of integrating systems theory and experiential learning into methodological design. Future research should explore the longitudinal impacts of such interventions and examine how chefs' agency interacts with organizational and policy-level constraints.

The workshops surfaced key paradoxes in sustainable menu design, between cost and carbon, tradition and innovation, autonomy and hierarchy. By embracing these tensions through participatory learning, chefs were able to reframe their roles as agents of change. While the findings are context-dependent, they offer a compelling case for the use of participatory action learning in advancing sustainable food system transitions.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Professor Simon Taylor, Chair of the College of Engineering, Design and Physical Sciences Research Ethics Committee, Brunel University London. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

AZ: Investigation, Conceptualization, Writing – original draft, Resources, Validation, Data curation, Project administration, Writing – review & editing, Visualization, Formal analysis, Methodology. XSR: Supervision, Writing – review & editing. CR: Supervision, Writing – review & editing. CF: Resources, Writing – review & editing, Data curation. EC-H: Data curation, Writing – review & editing. PC: Data curation, Writing – review & editing.

Funding

The author(s) declare that financial support was received for the research and/or publication of this article. AZ, CR, and XR are funded by the UK Food Systems Centre for Doctoral Training (The Partnership for Sustainable Food Future Centre for Doctoral Training (PSFF-CDT); Project Reference: BB/V011391/1. CR was funded by the Healthy Soil, Healthy Food, Healthy People (H3) project (Project Reference: BB/V004719/1). These are funded by the 'Transforming UK Food System for Healthy People and a Healthy Environment SPF Programme' delivered by UKRI, in partnership with the Global Food Security Programme, BBSRC, ESRC, MRC, NERC, Defra, DHSC, PHE, Innovate UK and FSA,

UKRI and NIHR as part of the Building a Green Future Strategy the THRIVING Food Futures research hub (MR/Z506485/1), and UKRI (through the Building a Green Future and Building a Secure and Resilient world across UKRI themes), Defra and NERC and administered by NERC.

Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fsufs.2026.1698446/full#supplementary-material

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