

Food consumption sustainability in the tourism industry: a study on stakeholders' beliefs about innovative animal feedings

Management
Decision

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Abstract

Purpose – The food tourism sector is increasingly recognized for its considerable ecological impact, yet it also holds significant potential to drive the adoption of sustainable food practices. Processed animal proteins (PAP) derived from insects are being explored as a sustainable alternative in animal feed. Among alternative proteins, products that are processed and familiar in form – such as PAP-fed animal proteins – are more likely to be integrated into tourism offerings with minimal disruption.

Design/methodology/approach – This study interviewed 12 experts to explore knowledge, beliefs and perceived risk regarding insect PAPs.

Findings – Two dominant and contrasting narratives emerged: the first highlighting insect PAPs' nutritional benefits and sustainability, the other reflecting skepticism especially driven by limited market experience. Results suggests practical implications regarding communication strategies and the integration of AP into hospitality and tourism curricula.

Research limitations/implications – Limitations, insights for further research and relevance for the tourism industry are discussed in the article.

Originality/value – Stakeholders' beliefs about the use of insect-based processed animal proteins (PAP) in livestock destined for human consumption have been the focus of only limited research.

Keywords Alternative proteins, Gastronomic tourism, Theory of planned behavior, Qualitative research

Paper type Research article

1. Introduction

In contemporary consumer culture, tourism and food are closely interwoven. Gastronomic experiences are central to the appeal of many destinations and function not only as cultural identity but also as critical vectors of environmental impact (Hall and Gössling, 2016). The growing global mobility of consumers, coupled with a desire for authentic and exotic culinary experiences, drives the demand for food products rich in symbolic value, often at the cost of significant environmental impacts. In this context, gastronomic tourism represents both an economic opportunity and a sustainability challenge, particularly in terms of resource consumption and greenhouse gas emissions.

Food-related tourism intensifies the demand for resource-intensive products – especially meat and animal derivatives – thus amplifying the ecological footprint of the tourism industry. Indeed, food production and transportation account for a significant share of tourism's greenhouse gas emissions, land degradation and water consumption (UNWTO, 2021). This ecological pressure challenges the tourism sector to align more closely with sustainability goals, particularly as consumers become increasingly aware of environmental issues and the

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ethics of food sourcing (Torres-Díaz *et al.*, 2024; Björk and Kauppinen-Räsänen, 2017; Simeone *et al.*, 2015).

In recent years, alternative proteins (AP) have become a focal point in scientific and political discourse in response to the increasing global demand for animal proteins. This demand is driven by factors such as population growth, urbanization in developing nations and rising disposable income (Aiking, 2011; Godfray *et al.*, 2018). In this context, insect-derived proteins present a viable solution, demonstrating high food conversion efficiency, diminished greenhouse gas emissions and minimal effects on land use and water resources (van Huis, 2013; La Barbera *et al.*, 2020). Furthermore, insect farming can support the development of a circular economy, as insects can be fed with organic agricultural waste, thereby reducing the environmental impact associated with traditional livestock production.

The adoption of AP has the potential to significantly reduce the carbon footprint of the tourism sector, especially in food-related services. Conventional livestock farming is responsible for roughly 14.5% of global greenhouse gas emissions (FAO, 2013), a share that is magnified in tourism due to the transport and logistics involved in global food supply chains. Insects, algae and lab-grown meat offer drastically lower emissions per kilogram of protein, as well as reduced water and land use (van Huis, 2013). Widespread adoption of AP in tourist destinations – such as hotels, resorts and cruise ships – could contribute to the decarbonization of the industry, particularly if supported by public procurement policies and green tourism certifications.

Nevertheless, the shift to alternative protein sources faces considerable challenges concerning psychological and cultural acceptance among consumers, especially in Western societies. The Literature categorizes insect consumption into three primary forms: direct consumption (raw or minimally processed), processed consumption (insects as concealed components in processed foods) and indirect consumption, which refers to the consumption of animal products (such as fish, poultry or pork) that are fed with feed containing processed animal proteins (PAP) derived from insects (Verbeke, 2015; La Barbera *et al.*, 2020). The last category exhibits greater consumer acceptance, yet it is the least researched, especially as regards experts' and stakeholders' attitudes and beliefs.

This article aims to help filling this knowledge gap through a qualitative study based on in-depth interviews with 12 Italian experts and stakeholders. We also propose a novel approach to the analysis of qualitative data – the dynamic narrative analysis – which could be further employed by future research.

The remainder of the article is organized as follows: Two theoretical paragraphs discuss pertinent scientific literature on novel foods and alternative proteins – and how they are accepted by consumers – in connection to the tourism industry. A following Materials and Methods section outlines the methodology of the empirical study conducted; the subsequent Results section reviews the results of the qualitative analysis, which are discussed in the next Discussion section. The final Conclusion examines the study's limitations, implications and potential development in the future.

1.1 Alternative proteins in the tourism industry

Tourism contexts are often associated with greater openness to novel foods due to a desire for authentic or exotic experiences (Kim *et al.*, 2019; Kivela and Crofts, 2006), yet this openness might not always translate into acceptance of AP, and actual consumption could be influenced by the form in which the AP is presented. Whole insects, for example, evoke high levels of disgust and food neophobia, whereas processed forms or indirect consumption via PAP tend to be more acceptable (La Barbera *et al.*, 2020, 2021).

The acceptability of AP might differ significantly depending on whether the consumer is at home or traveling. In household contexts, consumers tend to rely more on established food habits, familiarity and long-term trust in product safety and quality. In contrast, the tourism context allows for more flexible attitudes due to temporary exposure, a suspension of routine

norms and greater openness to the unfamiliar (Mak *et al.*, 2012). However, even in tourism, the willingness to consume AP depends on factors such as perceived risk, cultural congruence and the presence of social cues. Tourists may be more willing to try AP in countries where such products are perceived as traditional or common, suggesting that geographical framing plays a significant role in shaping reactions (Tan *et al.*, 2016). Furthermore, the decision to search for or avoid AP while travelling may be influenced by a range of psychological and situational factors such as implicit and explicit attitudes, food neophobia, disgust sensitivity, perceived naturalness and attitudes toward technology in food production (La Barbera *et al.*, 2018, 2020; Siegrist *et al.*, 2021). In addition, social norms can act as facilitators or inhibitors of AP consumption, particularly in group-based tourism experiences. Trust in food chain actors – such as restaurants, tour operators and local producers – also may influence tourists' willingness to try unfamiliar food products (Macready *et al.*, 2020; Russo *et al.*, 2020). Environmental concern and ethical motivations may encourage some tourists to actively seek AP as part of a sustainable lifestyle, although these motivations often compete with hedonic and sensory expectations (Graça *et al.*, 2019).

Among AP, products that are processed and familiar in form – such as insect-based flours in pasta or bakery products, or PAP-fed animal proteins – are more likely to be integrated into tourism offerings with minimal disruption. These products benefit from low visibility and reduced emotional barriers. Conversely, highly visible or symbolically transgressive products – such as whole insects – may evoke strong aversion and pose reputational risks for destinations that position themselves as luxury or gourmet hubs (Pliner and Salvy, 2006). Tourism experiences built around local narratives of sustainability, circular economy or indigenous food traditions may offer better entry points for AP that might otherwise be rejected in conventional hospitality settings.

1.2 Alternative proteins, insects and their acceptance

Animal-based protein, though a key part of European diets, has a high environmental impact – accounting for over 75% of global agricultural land use and two-thirds of related emissions agricultural greenhouse gas emissions (Poore and Nemecek, 2018). To address these inefficiencies, the EU is increasingly exploring alternative protein sources and among the available alternatives, the utilization of insects as feed has emerged as a viable strategy to mitigate the EU's protein deficit, developing the principles of a circular bioeconomy (Van Huis, 2019; Sogari *et al.*, 2019).

Indeed, insects possess the unique ability to upcycle organic waste streams, including food waste and agricultural by-products, thereby contributing to waste valorization (Čičková *et al.*, 2015). Furthermore, their cultivation requires substantially lower land and water inputs compared to conventional feed sources, while yielding high-quality, nutrient-dense feed (Bosch *et al.*, 2019). In this context, there is a growing body of literature exploring the acceptability of insects as feed (Amato *et al.*, 2023; La Barbera *et al.*, 2020; De Faria Domingues *et al.*, 2020; Onwezen *et al.*, 2019). The acceptance of foods derived from animals fed with insects-based diets is shaped by a complex mix of attitudes, environmental concerns, emotions, demographics, knowledge and cultural values. For instance, consumer attitudes significantly influence support (Sogari *et al.*, 2019; Weinrich and Busch, 2021), but these positive attitudes do not always determine a willingness to try resulting products, considering that individual openness to innovation and trust in food production systems play a key role in shaping willingness (Giotis and Drichoutis, 2021; Szendrő *et al.*, 2020). Furthermore, demographic factors, including age, education and gender, also influence acceptance. Studies such as Baldi *et al.* (2021), Szendrő *et al.* (2020), and Laureati *et al.* (2016) show that younger, educated males are generally more favorable toward insect-based feeds (Baldi *et al.*, 2021; Laureati *et al.*, 2016; Szendrő *et al.*, 2020). However, several studies suggest that general acceptance is less tied to demographics than to personal openness to novel foods and trust in food actors (Popoff *et al.*, 2017; Rumbos *et al.*, 2021). Environmental concerns are also

significant – consumers with strong environmental priorities tend to be more supportive (Altmann *et al.*, 2022; Simeone *et al.*, 2025; Simeone and Verneau, 2024) – and emotions add another layer, with food neophobia and disgust toward insect-fed food products often found to be relevant but do not always result in outright rejection (La Barbera *et al.*, 2020; Bazoche and Poret, 2021; Ribeiro *et al.*, 2022).

Research consistently shows that direct consumption of whole insects elicits high levels of disgust and food neophobia, especially in European populations (La Barbera *et al.*, 2018, 2020, 2021). Conversely, when insects are processed into flours or used as secondary ingredients, consumer acceptance increases markedly. Research suggests that less visible forms are more acceptable than whole insects, also in tourism settings (Tan *et al.*, 2015). Even more acceptable is the indirect use of insects in Processed Animal Proteins (PAPs) as feed for livestock, aquaculture or poultry – indirect entomophagy (La Barbera *et al.*, 2020).

Recent studies suggest a Guttman-like pattern as regards the entomophagy acceptance (La Barbera *et al.*, 2020, 2021, 2023; Verneau *et al.*, 2020): from least to most acceptable – raw insects, processed insect-based products and finally, animal products derived from insect-fed animals.

Paradoxically, the least accepted yet most promising form of insect consumption – indirect entomophagy – remains the least studied. In addition, the existing literature lacks a nuanced analysis of the beliefs that underpin and determine individuals’ attitudes (Fishbein and Ajzen, 2011).

Understanding these beliefs is essential to better grasp attitudes and design strategies for change. This study therefore aims to explore beliefs related to insect-based processed animal proteins (PAP), an area with limited prior research.

Finally, studies addressing the acceptability of insects as feed focus on consumer preferences, whereas little is known about beliefs and attitudes held by stakeholders most involved in the chain (Tiwasing and Pate, 2024).

Therefore, we carried out an in-depth investigation of the beliefs underlying individuals’ attitudes by interviewing stakeholders and experts from various fields directly involved in animal feed production for livestock for human consumption using insect-based PAP.

2. Materials and Methods

The research began in the months immediately following the entry into force of European Regulation 1372/2021 which, amending the previous regulation (999/2001), provided for the introduction of insect-based processed alternative proteins (PAP) in the feed of nonruminant farmed animals. Twelve interviews were conducted with experts in different fields related to PAP (Table 1).

Table 1. Description of the stakeholder interviewed

Subjects	Sector	Sex
Subject 1	Nutritionist for the aquaculture sector	M
Subject 2	Poultry producer	M
Subject 3	Director of a local section of the Italian Zooprophyllactic Institute	M
Subject 4	Nutritionist	F
Subject 5	Breeder	M
Subject 6	Researcher	M
Subject 7	Breeder	F
Subject 8	Animal rights activist	F
Subject 9	Feed technician in the aquaculture industry	M
Subject 10	Researcher	M
Subject 11	Large-scale retail worker	M
Subject 12	Breeder	F

Participants were selected based on (a) professional expertise in agri-food systems, food policy or related sectors and (b) direct involvement as stakeholders in the development, regulation, contestation or promotion of alternative proteins, particularly insect-based PAPs. Recruitment followed a purposive sampling approach (Patton, 2015), complemented by snowballing to identify additional experts within professional networks. This ensured diversity in perspectives across academia, industry, policymaking and engaged social groups. Data collection was stopped after 12 interviews because recurring themes and convergent perspectives emerged across stakeholder categories (Saunders *et al.*, 2018).

The aim of the interviews was to explore and understand the beliefs stakeholders hold regarding the introduction of insects as an ingredient in the feed of animals destined for human consumption. Drawing on previous research (Amato *et al.*, 2023; La Barbera *et al.*, 2016), the interviews were structured upon a theoretical framework based on three main domains, reflecting the rational action approach and theory of planned behavior (Fishbein and Ajzen, 2011):

- (1) Utilitarian beliefs: individuals' expectations about positive/negative consequences of the introduction of insect-based PAP in animal feeding;
- (2) Normative beliefs: individuals' expectations about others' approving/disapproving the introduction of insect-based PAP in animal feeding;
- (3) Control beliefs: individuals' beliefs about facilitating and hindering factors relevant to the introduction of insect-based PAP in animal feeding.

In addition to these three main domains, we also explored the level and type of knowledge individuals held on the topic, and their beliefs about potential risks related to the introduction of insect-based PAP in animal feeding. We decided to devote a specific area of the interview to participants' perceived risk because it has been shown as a relevant factor in previous research on entomophagy aversion (La Barbera *et al.*, 2021).

Therefore, the interviews were structured by five main constructs. Table 2 provides a summary of theoretical constructs and related interview areas, with example questions.

We analyzed and grouped beliefs across the five areas described. After that, we re-read the categories of beliefs emerged, in search of the prevalent narratives (Jovchelovitch and Bauer, 2000; Riessman, 2008), and we analyzed the dynamics connected to those. The main dynamics we planned to explore in relation to the narratives emerging from the content analysis were:

Acceptance/refusal: individuals and groups accepting/refusing the narrative, and why.

Concordance/discordance: the relationship between the narratives (e.g. conflict, overlap, mutual support).

Table 2. Main constructs areas and interviews questions

Constructs	Interview areas	Example questions
Knowledge	Previous knowledge about the topic	What do you know about insect-based PAP in animal feeding? Which sources your information derive from?
Utilitarian beliefs	Expected positive/negative outcomes of the introduction of insect-based PAP in animal feeding	In your opinion, what would be the advantages of the introduction of insect-based PAP in animal feeding?
Normative beliefs	Beliefs about others' opinions and expectations	In your opinion, what are the people (groups) who approve (disapprove) the introduction of insect-based PAP in animal feeding?
Control beliefs	Potential facilitating/hindering factors	Which factor could the introduction of insect-based PAP in animal feeding?
Perceived risk	Perceived risks about the introduction of insect-based PAP in animal feeding	Do you see any risks linked to the introduction of insect-based PAP in animal feeding?

Dynamic narrative analysis was intended as a way to capture the processual dimension of how stakeholders construct different meanings around alternative proteins. While thematic analysis (Braun and Clarke, 2006) focuses primarily on identifying patterns and categories across data, our dynamic narrative analysis emphasizes how narratives interrelate across interviews. This approach enabled us to move beyond static themes and to identify trajectories and dynamics in the qualitative materials.

All participants were informed that the duration of each interview would have been 20–35 min, and they would have had the option to stop the interview at any time. With the permission of each individual participant, the interview was recorded. Data collection ended after saturation was reached.

All interviews were recorded, transcribed, and coded using content analysis (Braun and Clarke, 2006), which is a methodology for analyzing qualitative contents at different level of abstraction (Silverman, 2000). Content analysis was supported by Atlas.ti and conducted through five steps:

Step 1: Familiarization with the data, transcription, reading and re-reading of the interviews.

Step 2: Codes identification.

Step 3: Grouping the codes. During this phase, some of the identified codes are grouped together. This process is repeated until a satisfactory map is created.

Step 4: In relation to main groups of codes, identifying the prevalent narratives.

Step 5: Analyzing the dynamics between the narratives.

The analysis has been conducted by three judges with different expertise (economics, social psychology and sociology), who have jointly analyzed the interviews, and the decisions and interpretations have been based on the consensus of all three, through open discussion and recursive coding.

3. Results

3.1 Main categories of beliefs across five interviews' areas

The interviews were structured around five key areas: knowledge, utilitarian beliefs, normative beliefs, control beliefs and perceived risk, which guided the analysis of participant responses.

3.1.1 Knowledge. We first examined respondents' knowledge of insect meal in animal feed. Most interviewees indicated familiarity with the topic since (about) 2020, attributed in part to *"the academic progress that has been made in Italy"* (S1), with deeper insights following regulatory changes in 2021. Specifically, participants four and eight (a nutritionist and an animal rights advocate) declared to have a good grasp edible insects as novel food, though their knowledge of insect-derived processed animal proteins (PAPs) is more recent. Scientific communication (articles and direct relationships with academics) was cited as the main information source, whereas stakeholders mainly involved in the production chain reported forming their opinions through direct and indirect experiences.

In Norway, it works in aquaculture, because they have higher margins, and it is viewed as a sustainable practice because it does not deplete other resources. (S1)

This is a small farm in The Netherlands that produces eggs from chickens fed with insect meal. They sell a small total number of eggs, but at a price double than the market price. (S5)

3.1.2 Behavioral beliefs. We next explored beliefs on the expected impacts – both positive and negative – of introducing insect meal into animal feed. A prominent category of beliefs

centered on *sustainability*, with interviewees agreeing that insect meal could benefit environmental sustainability by reducing harmful emissions, conserving of freshwater and land, and lowering energy use.

Breeding insects requires significantly less water than traditional farming and lower consumption of resources and lower emissions of gases into the atmosphere (S10)

The discourse of reducing land use for cultivation of protein sources is linked to the topic of recycling sources that would instead be lost; hence, it regards sustainability and circular economy which are very important (S6)

Some respondents mentioned that using insect meal could lessen reliance on imported soy from South America, which has a substantial environmental impact due to land competition with forests.

Soy meal is used for animal feed, but it seems to me that it has a somewhat catastrophic environmental impact and therefore insect meal could be a valid replacement (S4).

Insect meal is more sustainable than soy produced in Argentina because they are destroying primeval forests (S5).

In addition to environmental concerns, soy production raises ethical issues linked to labor exploitation.

The production of soy itself has a high environmental, social, and ethical impact, because of deforestation and exploitation of workers to produce soy. Having alternatives such as insects would allow, let's say ... in the perspective of reducing environmental and social impact ... an improvement (S10)

However, when interviewees talk about sustainability, they do refer also to economic sustainability, considering insect farming advantageous due to lower costs than conventional livestock breeding. *"From an economic point of view, they are also quite sustainable, because to start a farming activity ... starting an insect farm is much less expensive than traditional farming"* (S10).

A second belief category is *the (good) nutritional profile* of insects, in terms of quantity and quality of protein content. All participants recognized insects as having a high-quality protein content and a relevant amino-acidic profile, which they deemed relevant.

So, let's say this could be the first advantage, because the protein content of insects is about 60%, so it's really high. So, one of the needs for which one could move towards this food could be this: precisely the need to have a higher protein content (S4).

Insects are also valued for their fat content, derived from their muscle cells and larvae, with insects-derived fatty acids and oils helping meet animals' protein needs.

A protein meal that originates from an insect, even in its flour form, keeps a level of lipids, which are the fats of muscle cells, phospholipid cell membranes and others. The profile of those fatty acids is also interesting for meeting the protein needs of the animals we are going to feed. (S2)

Even the flour itself, if it has been made by a larva, it will have its own intrinsic characteristics ... it may have more proteins ... there are also oils that are produced. (S7)

However, these positive views are tempered by concerns over the *high price* of insect-based PAPs, viewed as a significant barrier to adoption.

Prices are completely out of any market benchmark. The unit cost of insect protein meal exceeds up to 5 times the value of other feeds and is therefore not economically sustainable and farmers have no room to further aggravate the costs of animal breeding in this way. (S1)

Experts acknowledge the high protein content of these feeds but consider price as an obstacle to their diffusion. While environmental and ethical factors hold value, economic

considerations are expected to primarily drive stakeholders' choices; if the product is not affordably priced, it is unlikely to be selected.

Until stakeholders did not find an economic advantage to change feed to be used for their farms, I imagine they will not buy, they will not use this product. Whether these breeders are also driven by environmental or ethical, moral reasons, I don't know, but I don't think that this is the main component (S10).

Prices to date are completely out of any market benchmark. The unit cost of insect protein meal exceeds by up to 5 times the value of the finished feed and is therefore not economically sustainable and farmers have no room to further aggravate the costs of animal husbandry (S1).

However, experts lack clear information, as the production and market infrastructure are not yet established; therefore, they have no direct or indirect experiences with actual market prices. *"I don't know what price it really has . . . I was asked to do a test, two years ago, with the University of Camerino, which had this cricket flour, but being a test, I would not have paid for it."* (S5)

3.1.3 Normative beliefs. The third area encompasses beliefs regarding normative pressures for or against introducing insect meal in animal feed. Respondents believe that certain *activists may disagree* with the introduction of PAPs. S10 identifies the opposition group with the "environmental movement", while S9 provides insights from an animal rights activist perspective. She believes that animal rights advocates *"may not agree with animal exploitation,"* and that insects farming – conceived as sentient beings – could provoke strong reactions from activists focused on animal welfare. She argues that *"insects are sentient beings and this implies the ability to feel pain and discomfort (. . .) There are evidence of sensitivity."* Other respondents offer more generalized perspectives, not specifying particular groups but suggesting that *"there may be people or groups who wouldn't be in favor of introducing these foods. The communication of the last two years is teaching us that there are groups that are averse to the most disparate things . . . so there will certainly be someone contrary to this . . ."* (S7).

While some individuals and/or groups are perceived as opposed to the implementation of PAPs, others are seen as likely supporters, particularly those Subjects with potential economic benefits, such as large industrial groups, production consortia and industry experts. S8 notes the *"EU's political pressure"* for ecological conversion, while S10 suggests that certain EU decisions may be influenced by lobbying from specific industries. S8, however, ascribes the EU's interest in PAPs to environmental concerns or simply *"a good new story to tell"* (S8).

. . . the associations of producers of these flours . . . for example in the fish industry, which carries out a very important lobbying activity in the European Union, to ensure that there is communication on these topics . . . I imagine that pressure groups could be also those of some producers (S10).

Opinions on the final consumer vary. According to S10 and S11, *consumers may have a negative attitude* toward meat produced from insect-fed animals, potentially leading them to avoid products raised with PAP. *"They cause negative reactions of the consumer. Knowing that the animal I am eating has been raised using insect meal with protein supplements . . . it could arouse a sort of rejection by consumers"* (S10).

I wouldn't eat fish that has been fed with insects, because just hearing the word I might not even eat. I also don't like to go and eat sushi . . . these kinds of things. I am a little particular at eating, I like to eat well, I am a gourmet (S11).

S11 goes on to explain that he would avoid fish raised on insect meal and describes himself as a "gourmet," implicitly suggesting that those who choose differently may not prioritize quality food. Other respondents, however, do not consider this aspect to be of particular concern. Actually, they expect little consumers' aversion. *"We will not see it as a big problem, because those who have experience know that the pig eats anything, including insects . . . that the chicken eats anything, including insects"* (S2)

Consumers' negative attitudes are expected to be less impactful if good marketing actions and communication campaigns are implemented:

Communication should be built to improve the consumer's perception of the entire supply chain (S2).

Then certainly, from my point of view, I think that a marketing action must be carried out towards the end user, because when insect meal will be used, a world will really open up, because in any case it is a novelty. But, in my opinion, it is a question of what kind of communication . . . how communication would be proposed . . . it is difficult for someone not to accept the idea, if it's well explained to them . . . the advantages . . . from the point of view of breeding . . . also in terms of sustainability. (S12)

One respondent dismisses this issue entirely, stating that consumers are generally not informed of farmed animal diet. S7 points out that the specific composition of animal feed is usually not disclosed, so unless required by law, consumers will remain unaware.

I don't think consumer knows what a pig eats. So, unless they are manipulated by . . . let's say . . . people who have an interest in hindering this thing, consumer wouldn't know. Unless tomorrow's legislation would force the producer of the product that goes for direct sale to include a label that says, Look at this pig . . . it is also fed with insect meal (S7).

3.1.4 Control beliefs. The fourth area analyzed focuses on factors that respondents believe may facilitate or hinder the introduction of PAPs. A first category of beliefs refers to the *practical or structural difficulties* associated with producing and marketing insect-based PAPs. Interviewees pointed out that existing facilities are insufficient and establishing dedicated production facilities would be necessary. Currently, only five plants exist in Italy, of which *“three plants have mixed production . . . they produce chicken, pork and other species . . . managing on a completely separate line is a big constraint from this point of view, because the plants are not dedicated . . . so there is a considerable limitation from this point of view”* (S2).

The interviewees believe that a real supply chain does not exist in Italy: *“There are no production of this type of product . . . there are few insect farms, so few factories that produce this flour.”* (S5).

Another factor potentially limiting the insect PAP market could be the low stability of production, both in terms of quantity and quality. Interviewees expressed concerns over the scarcity and instability of current production levels.

The doubt that may arise for me is that there is no continuity of both production quantity and guaranteed quality, that is, a stable production. I mean . . . I have absolutely no idea, because I have no experience . . . if a breeding chain of these flours will be born . . . If this were the case, if an insect breeder fixes the genetic characteristics of the species, he guarantees stability and continuity . . . I mean . . . if I buy the meal of insect X from him, I know that it always has this nutritional value . . . otherwise the uncertainty about the continuity of quality and stability at the time of purchase may arise (S7).

The absence of regulations is also seen as a major barrier. Many interviewees highlighted and complained about the absence of legislation regulating insect farming, the production of insect meal and, in general, the use of PAPs.

There is a lack of production regulations, because in any case we are talking about something that is not covered by regulations, so this is a gap that will need to be fixed. Speaking of pork, for example, today the use of fishmeal is admitted in a certain range, but insect meal is not present in these regulations (S2).

There is concern that the regulation process might become overly complex, whereas *“streamlining the regulatory process could be a facilitating factor”* (S10).

Nevertheless, EU regulations protecting health and consumer rights could eventually impose stringent production requirements, potentially complicating the process and raising

costs. This could put EU products noncompetitive on the market compared to non-EU products, which are subjects to less rigorous standards. “A European producer has limits that lead to higher costs and makes the product economically unsustainable for European supply chains” (S1).

3.1.5 Risk perception. The fifth area addresses perceived risks, with experts expressing concerns about *food safety*. Given Italy’s lack of experience in insect production, respondents worry that the substrate used to rear insects may impact the quality of the resulting flour.

It could be a risk linked first of all to the substrate that the insect is reared upon. I have no idea what a breeding plant can be like, because obviously the risk of the substrate is associated with the breeding, with respect to the conditions, the process of transformation into flour. In short, it is difficult to say today because we have no experience of this kind (S12).

Respondents agree that the substrate choice directly affects product quality and ensure food safety.

Breeding insects on urban waste that could contain pollutants . . . I mean . . . in my opinion, is a risk. The breeding of insects, if it is done on waste from other processes . . . such as the skin of tomatoes, the skin of potatoes . . . or the pulp of citrus fruits after pressing . . . it is safe (S5).

According to the interviewees, unregulated substrates could lead to chemical or bacterial contamination, underscoring the need for thorough oversight.

If these insects are raised in environments where we find chemical contamination, if there is chemical contamination, it could be transferred to the feed and then to the animals (. . .). There is always the need to carry out controls, upstream and downstream, about contamination, chemical rather than bacteriological (S3).

Although the interviewees underline some concerns related to the lack of experience and the current absence of legislation, interviewees are confident about the controls and processes implemented during the transformation of these insects. “When it is then processed into a flour, it is clear that this whole process will be medically controlled and therefore any risk should be zeroed” (S7).

Importantly, despite the perplexities, they are confident about the health controls that will be established when the production chain is complete. Experts show confidence in the EU’s rules and in the presence of institutions such as EFSA, which is responsible for food safety.

Manufacturers in Europe are controlled. Manufacturers must comply with food safety regulations and standards, work according to ISO standards, according to HACCP hygiene standards. Any food product placed on the market must be healthy and healthy. Outside the borders of the EU, it is produced according to other laws (S1).

I trust EFSA, I trust scientific research and I trust the European Union (S10).

3.2 The prevalent narratives: a dynamic analysis

The content analysis conducted provided a rich and diverse collection of beliefs, grouped in categories representing stakeholders’ beliefs about PAP in five areas tapping into knowledge, perceived utility, normative pressure, control and perceived risk. Re-reading the analysis conducted so far, as anticipated, two prevalent narratives have been identified. The dynamics of acceptance/refusal and concordance/discordance were analyzed in relation to them.

3.2.1 A good story to tell. Scientific literature consistently highlighted the nutritional and sustainability benefits of insect-based flours. These two themes emerged in interviews, with stakeholders largely receptive to the “story of (potential/future) success” of insect-based PAPs built upon these two alleged strengths.

Advantages of nutritional profiles are acknowledged by experts, not due to direct familiarity with the products, but rather through information communicated to them. Another recurring “leitmotif” is the theme of sustainability: from energy saving to circular economy,

insect meal production appears to address the demands of ecological transition. Here, too, most stakeholders provide a detailed description on this critical point, even in the absence of direct experiences.

Breeding insects requires significantly less water than traditional farms and lower consumption of resources and lower emissions of gases into the atmosphere (S10).

... from an environmental point of view ... because ... if I remember well, soy flour is mostly used for feeding animals, but ... however ... it seems to me it has a catastrophic environmental impact ... this is what I have read (S4).

This narrative, however, is somehow less accepted by stakeholders mainly involved in the production chain. They are acquainted with the basic themes of the narrative (nutritional values and sustainability), yet they report about them rarely and sparsely, and in a more cautious fashion, using hypothetical construction in their discourses. "... but ... so to say ... a potential advantage could be that of having an alternative for proteins ... in the perspective of circular economy ... we hope with costs ... let's say, lower, interesting, at least competitive ..." (S7).

Figure 1 provides a visual synthesis of the two dominant narratives identified through the dynamic narrative analysis: the optimistic "A good story to tell" and the skeptical "They just don't exist." The figure highlights how stakeholders' beliefs cluster around contrasting views of insect-based processed animal proteins (PAPs), oscillating between acceptance and skepticism depending on their professional background and perceived familiarity with the topic.

3.2.2 They just don't exist. In stark contrast to the previous narrative, another prevalent narrative reveals experts' doubts and uncertainties about products that are currently unavailable on the market. Experts feel they lack in-depth information on issues related to PAP and, above all, believe that Italy lacks experience in this sector. Importantly, this lack of experience is perceived as a potential risk for consumer.

For us it would be a new product, we should have experience of the fact that the product is really safe. Here, therefore, also the aspect of food safety for users is certainly a fundamental main aspect that could promote its diffusion (S2).

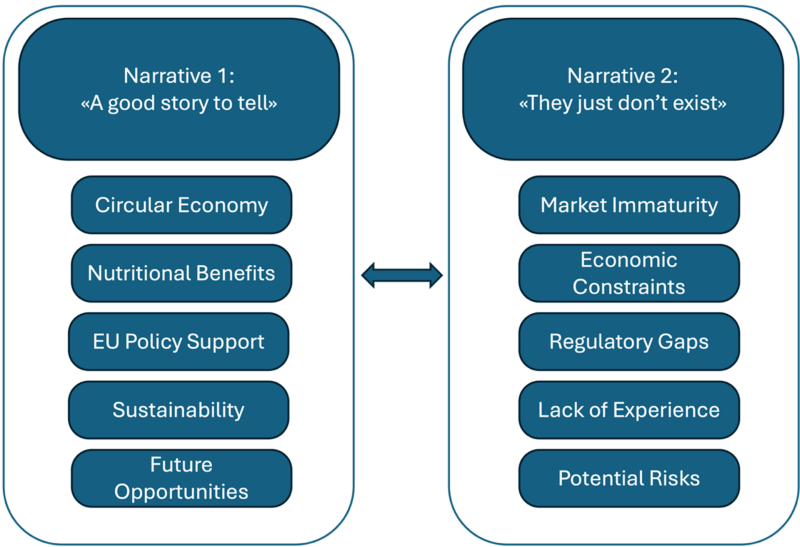


Figure 1. The two dominant narratives

Another aspect that puzzles experts is related to the breeding methods. With no prior experience in this area, they can only speculate on the possible consequences.

I have no idea what a breeding plant can be like, a pilot plant, because then obviously the risk of the substrate is associated with the farming, with respect to the conditions, with the process of transformation into flour. In short, it is difficult to say today because we have no experience of this kind (S12).

The economic factor is also important, as it affects the product's competitiveness in the market. Once again, experts lack direct experience and precise information about the economics of these products, relying instead on general assumptions.

In summary, despite the scientific vulgate, respondents often claim they do not have specific information about these products. Experts have heard about them, yet they remain unavailable on the market. In contrast with the previous narrative, which is more accepting, the current one emphasizes interviewees' skepticism; they believe that this supply chain is still underdeveloped and that establishing it may require significant time. S9 warns that "*the story is so appealing that the market will gravitate toward it*" instead of potentially more effective alternatives.

With elements of both narratives appearing across the interviews, a clear distinction emerged, particularly as regards researchers (S6 and S10) and the head of the Institute of Zoo Prophylaxis. These individuals are more inclined to accept the narrative in which insect meal is portrayed as a mostly positive, existing reality. In contrast, other interviewees express varying degrees of uncertainty and skepticism, viewing insect meal as a possible future alternative but one that is not yet present or accessible in the market, at least within Italy.

To sum up, the two prevalent narratives are definitely in contrast; as regards the acceptance/refusal dynamics, breeders emphasized regulatory barriers and market uncertainty, researchers focused on positive aspects (good nutritional profile and sustainability), while activists raised ethical and cultural concerns.

4. Discussion

Current study contributes to scientific knowledge about acceptance of entomophagy and indirect entomophagy, particularly focusing on Italian stakeholders' multifaceted perceptions surrounding insect-based protein sources (PAPs) for animal feed, a particularly relevant topic considering the lack of scientific literature on this regard. Our qualitative analysis of interviews reveals key insights into stakeholders' knowledge, perception of benefits and risks, normative pressures, control beliefs and perceived challenges within the specific Italian context.

The findings are novel and original in several respects. One prevalent narrative that emerged describes the production of these insect-based meals as a tangible reality. Political discourse and public debate in Italy, primarily concerning raw and processed insects as novel foods – may have contributed to enhancing the perceived entitativity (i.e. the psychological existence) of insect-based PAP. Compared to raw or minimally processed insects (e.g. cricket flour), which have been subject to an intense proliferation of opinions and public statements in Italy following recent EU legislation, insect-based PAPs might appear to stakeholders as a less contentious form of alternative protein. Nevertheless, several interviewees voiced skepticism about the economic viability and market development prospects for insect-derived proteins. As S9 effectively stated, there could be "*a gap between the numbers, technical reality, and perceived reality*".

In discussing the sustainability and nutritional advantages of insect-based meals, respondents highlighted reduced land use, water consumption and greenhouse gas emissions as primary benefits. These views align with studies advocating for insect proteins as viable alternatives to traditional feed ingredients like soy and fish meal, which are often associated with biodiversity loss and deforestation (Oonincx and de Boer, 2012). However, despite enthusiasm for these perceived benefits, economic factors remain a major barrier for Italian stakeholders; the high cost of these alternatives compared to traditional feeds was frequently noted, echoing findings that market adoption hinges on cost competitiveness. Recent policy advances, such as

the [EU 2021](#) Regulation permitting insect protein in poultry and pig feed, present new opportunities to promote local production and reduce dependency on imported feed. As global firms like Cargill and ADM have made substantial investments in scaling up insect-based feed production ([World Grain, 2024](#)), Italy stands to benefit from these developments, which exemplify global efforts to offset costs through economies of scale and innovation. Yet, many stakeholders remain uncertain about when or how significant cost reductions might materialize, consistent with findings from other studies ([Smetana et al., 2019](#); [Tiwasing and Pate, 2024](#)).

Cultural and ethical obstacles also surfaced during discussion further complicating stakeholders' acceptance. A considerable challenge remains the potential consumer apprehension – the so-called “yuck” factor ([La Barbera et al., 2018](#)). Interviewees expressed mixed feelings, seeing both the public outreach as essential but also recognizing the significant stigma around insects in food chains.

In addition to economic and cultural barriers, stakeholders point to significant regulatory and infrastructural challenges that could hinder the adoption of insect-based PAPs.

Interviewees highlight the scarcity of dedicated insect farming facilities in Italy, observing that only a few farms currently produce insect-based proteins at a scale necessary for widespread use in animal feed. Participants also noted that existing feed production facilities are not adapted to process insect meal, underscoring the need for investments in infrastructure to support a sustainable supply chain. The absence of clear regulations governing insect farming and PAP production adds further uncertainty. Stakeholders express concerns that without streamlined and supportive regulatory policies, the insect-based PAP sector may struggle to develop. Some participants suggest that Italy should look to regulatory models emerging across Europe that support insect farming and PAP production, potentially offering Italy a roadmap for establishing a compliant and stable market aligned with broader EU directives ([Lähteenmäki-Uutela et al., 2021](#)).

Thinking about concrete strategies and practical implications to suggest, building on these insights, several concrete strategies can be derived to address the barriers and leverage the opportunities identified by Italian stakeholders. First of all, economic and industrial development: encourage public–private partnerships to co-finance pilot insect-meal plants and regional innovation hubs linking insect farms, feed producers and researchers. Moreover, culturally sensitive communication campaigns could emphasize environmental benefits, food safety and familiar uses and tourism can act as a “laboratory of change,” providing liminal settings where consumers are more open to novelty. Introducing meat (pork and/or poultry) from animals fed with PAP derived from insects to prepare traditional dishes in agritourism and culinary tourism experiences can help to normalize these products. Collaborations with hospitality schools and tourism operators may further integrate this poultry and pork meat into sustainable and authentic culinary narratives. Future studies and cross-sectoral workshops and EU-level collaborations could facilitate the exchange of best practices and support Italy's alignment with emerging European models.

Together, these strategies suggest that the development of an insect-based PAP sector in Italy depends on a balanced interplay between economic feasibility, cultural adaptation and educational innovation.

5. Conclusion

Food tourism represents a privileged context for experimentation and the exposure to novel foods, including AP, according to the notion of liminality in food consumption ([Cohen and Avieli, 2004](#)). Touristic contexts allow for experimentation with novel foods that may be rejected in everyday life, but this openness is fragile and conditional. Tourists often display greater openness to culinary novelty when abroad – a phenomenon associated with both a temporary suspension of food norms and a desire for authentic experiences. As such, tourism settings may serve as laboratories of behavioral change, where consumers confront their food taboos and form new food preferences. The acceptability of insect-based foods in tourism

contexts could therefore act as a gateway for wider adoption upon return to daily life. Nevertheless, this process is not automatic. Factors such as social trust, communication strategies and alignment with sociocultural values significantly shape consumers' responses. The integration of APs into tourism requires not only technological and regulatory alignment but also nuanced attention to psychological drivers such as attitudes, and socially shared narratives and beliefs which underpin them.

Our research helps to fill a knowledge gap on stakeholders' beliefs about PAP containing insects, a promising food product that is evoking progressively larger interest. Twelve respondents made up the limited sample size for the study, as they represent a variety of knowledgeable and significant PAP-related roles in Italy. Their answers reveal a number of crucial but little-known opinions, including the idea that there is a distinct difference between what occurs at the level of production and consumer protection inside and outside of European borders, as well as the crucial role that the EU and its policies play in fostering trust. The dynamic analysis of dominant narratives effectively reveals both significant opposition and areas of partial overlap between the views and beliefs of the industrial production sector and the research community.

Future works are needed to indicate effective communication strategies for overcoming consumer resistance to AP, in household and tourism contexts, as strategies should be tailored, culturally sensitive and context specific. In Western countries, where food neophobia and concerns about unnaturalness are prevalent, messaging should emphasize environmental benefits, food safety and familiar formats. In regions where entomophagy is traditional, communication can instead focus on authenticity, heritage and identity. Importantly, transparency and trust-building are universal requirements – consumers must feel that APs are not only safe but also endorsed by credible actors (Macready *et al.*, 2020; Siegrist *et al.*, 2021).

In addition, conducting studies – with interviews and other tools – with stakeholders directly involved in the tourism industry may be another promising research path. In the best of our knowledge, there is little scientific evidence available as regards tourism operators' knowledge and beliefs on PAP; hence, this could represent a relevant evolution of the current study.

As a final suggestion for future paths, the integration of AP into hospitality and tourism curricula seems to be essential for preparing future professionals to navigate the evolving food landscape. This includes not only the technical aspects of preparing and sourcing APs but also knowledge of consumer psychology, sustainability communication and cross-cultural food norms. Curricula should include modules on the environmental and nutritional rationale for APs, case studies of successful market integration and hands-on experiences with preparation and tasting. Education can indeed play a transformative role in shaping attitudes, reducing stigma and building confidence among hospitality workers, who often serve as intermediaries between novel foods and the general public.

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