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Are apps for urban food purchasing and consumption meeting Italian consumers' needs? A mixed-methods analysis

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Abstract

The number of mobile phone apps downloads, especially those in the food and drink category, is growing worldwide. Such growth in digitalisation has brought the food industry and retailers to try and understand consumers new shopping needs and preferences to offer the best virtual experience to purchase food online. Past research rarely explore the features of the currently available apps for purchasing and consumption of agro-food products compared with consumers' perception, barriers and drivers of online purchasing. The present research aims to fill this gap, in three steps. First, investigating consumers' perceptions of apps currently available for food purchasing and consumption, as well as drivers and barriers towards of online food purchasing and towards online food shopping from (peri)urban initiatives using the theory of consumer values as a theoretical framework (Study 1). Second, analysing the features of existent apps used at (peri)urban level and/or supporting (peri)urban food purchasing and consumption adopting the technology acceptance model as a theoretical framework (Study 2). Third, cross-analysing consumer needs emerging from the survey with apps features. Quantitative data elaboration included a cluster analysis to group apps based on their features, and principal component analysis to identify consumers' key barriers and drivers. Results support how the desire to eat fresh and seasonal food is the main driver for buying from (peri)urban agriculture initiatives, whereas a more rational and aware food consumption are the drivers for choosing online over in person shopping. The most common type of apps are those aimed at food delivery, and those selling and buying food and providing food information. Restaurants and cafes are the main market channels for consumers' food online purchasing. When consumer needs (Study 1) and apps features (Study 2) are compared, a mismatch of the two emerges. Sustainability food profile and information on seasonal food are consumers' favourite features, but they are present in a limited number of apps. Results provide insights for marketing strategies and future research.

1 | INTRODUCTION

In 2020, the Food and Agriculture Organisation (FAO) launched the International Digital Council for Food and Agriculture. This new body was aimed to enhance worldwide cooperation and synergies to tackle the challenges of food security and sustainability through the currently available digital tools. Such decision by the FAO shows a growing interest in digitalisation and its possible impacts on the whole agro-food sector. In every step of the food chain, digitalisation can be part of the solution to many of the challenges the agri-food sector is currently facing (Food and Agriculture Organisation, 2020). The focus of the present research is the downstream part of the chain, where mobile phone apps shape consumers' food purchasing and consumption.

The number of mobile phone users and app downloads is growing worldwide, and the food and drink category contributes significantly to such growth. In 2020, the number of mobile phone users worldwide was 3.6 billion people (Statista, 2021a), with the majority being urban dwellers (Hong & Thakuriah, 2018). About 218 billion apps were downloaded (FinancesOnline, 2021), and of all the apps available in the Apple App Store, 3.7% are in the food and drink category (Statista, 2021b). Apps use became a consistent part of daily life, because of the ease of use and quick sharing of information (Samoggia et al., 2021). Apps provided consumers with a convenient, accessible and affordable way to get a wide variety of products compared to traditional purchases (Nguyen et al., 2019). Therefore, the development of apps, because of the rapid adoption of smartphones, has changed how brands and customers interact (Kapoor & Vij, 2018). Such growth in digitalisation has brought the food industry and retailers to try and understand consumers' needs and preferences to offer the best virtual experience to shop for food online. Thus, it became essential to investigate which factors affected consumers' choices to adopt the most effective selling strategy (Hong & Thakuriah, 2018).

Given how recent such topic is, there is limited research on the use of apps for purchasing and consumption of agro-food products, but after the global SARS-CoV-2 pandemic and the consequent lockdowns, the body of literature on the topic is growing. Studies analysing apps for food purchasing and consumption fall into two main categories. They are either presenting an app prototype characteristics and development process (Fauzi et al., 2017; Gilliland et al., 2015; Poelman et al., 2020) or analysing consumers' perception of a set of apps features or of a single app (Anib, 2019; Choi, 2020; Lee et al., 2022; Stancu et al., 2022). Such studies drew apps features to be analysed from the literature, rather than on the apps market. The novelty of the present study is therefore twofold. First, it provides a comprehensive perspective on consumers' perceptions on (peri)urban food purchasing and consumption barriers and drivers, based on the study of actual available apps features. Second, it focuses solely on apps for food purchasing at (peri)urban level, which is defined as the urban areas and the areas immediately adjacent to the city.

Thus, the present research aims to answer the following research question: are currently available apps for (peri)urban purchasing and consumption of agro-food products satisfying consumer expectations on food purchasing and consumption from (peri)urban initiatives?

The following sub-questions contribute to the main research question:

1. Which are consumers' drivers and barriers to food purchasing and consumption from (peri)urban initiatives, as well as to online food purchasing and consumption (Study 1)?
2. What are the features of the apps used at (peri)urban level and/or supporting (peri)urban food purchasing and consumption (Study 2)?

The research paper is structured as follows. Section 2 presents the literature review on both consumers' attitudes towards digital tools and (peri)urban food initiatives and on apps analysis, introducing the theoretical framework adopted in the present study. Section 3 illustrates the methodology, with focus on data collection and data analysis of the two studies. Section 4 presents the results of the cross analysis. Section 5 discusses the findings and limitations of the paper. Section 6 concludes the paper and suggests further areas of research.

2 | LITERATURE REVIEW AND ADOPTED THEORETICAL FRAMEWORK

Because of the SARS-CoV-2 pandemic, restrictions to movements and fear of contagion have made digital tools an important alternative to physical shopping in every economic sector (Statista, 2021c). In 2020, the whole B2C e-commerce sector was worth 4.280 billion dollars worldwide, a 27.6% increase on the previous year (Casaleggio Associati, 2021). In Europe, the Food and Health sector is the one growing the most in percentage terms (29.6%) and reached a turnover of 56 billion euros in 2021 (Casaleggio Associati, 2021). Such increase included the expansion of the online expenditures on daily groceries, a relatively new trend. E-commerce demands partially shifted from luxury goods and services towards everyday necessities in several countries. In the EU, online retail sales in April 2020 were 30% higher than April 2019, whereas total retail sales diminished by 17.9% (Organisation for Economic Co-operation and Development, 2020). Before the pandemic, companies worldwide made more than 30% of their sales online, while during the lockdown the percentage grew to 65% of sales (Casaleggio Associati, 2021). The SARS-CoV-2 pandemic rapidly changed consumer behaviour and food shopping experiences. New types of food environments, using innovations such as mobile phones apps and delivery services, have gained popularity, while formal markets were failing to guarantee food access (Ahmed et al., 2020). Mobile phone apps aimed at selling and buying agro-food products are now among the most popular digital technologies available for consumers.

2.1 | Consumers attitudes towards online and (peri)urban food shopping

The disruptive potential of such innovations has been addressed by several scholars, who analysed consumers' attitudes towards online food shopping according to several perspectives. Most studies examined consumers' values and attitudes affecting their decision-making processes in adopting food-related apps and platforms (Berger & Burkhalter, 2022; Kaur et al., 2021; Ray et al., 2019; Tandon et al., 2021; Wang et al., 2020). The extent to which consumers' personal benefits drive their behaviour is essential in behaviour studies. Several scholars developed theoretical frameworks to investigate why consumers make the choices they do. The theory of consumer values (TCV) proposed by Sheth et al. (1991) is one of the most adopted in the literature, as it identifies five consumption values influencing consumer choice behaviour: functional, conditional, social, emotional and epistemic. Tandon et al. (2021) found that consumption values mediated the link between visibility (epistemic value) and purchase intention on food delivery apps among US consumers. Similarly, Kaur et al. (2021) found that visibility is the main driver of purchase intentions on food delivery apps, followed by price (functional value) and prestige (social value).

The rise of mobile phone apps, that act as a digital third party in food shopping, not only influences consumers but may also create changes on producers' business models. The SARS-CoV-2 pandemic stimulated many farmers to start using digital technologies in order sell directly to consumers, avoiding intermediaries and consumers to carry out online shopping from local producers (Organisation for Economic Co-operation and Development, 2020). In the United States, 21% of adults has ordered groceries online or through a mobile app from a local shop because of the pandemic restrictions (Organisation for Economic Co-operation and Development, 2020). Such behaviour shifts may potentially have long lasting effects. On one hand, food entrepreneurs may take advantage of new e-commerce platforms selling products without the fixed costs of a storefront (Tefft et al., 2017). On the other hand, middle- and higher-income groups of consumers are increasingly interested in sustainability and equity issues, food characteristics often searched into short food value chains, as they allow a direct contact with producers (Tefft et al., 2017).

Beyond digitalisation, several studies conducted on the acceptance and perception of UA products revealed that potentially interested consumers are very often already responsive towards organic and local food production (Miličić et al., 2017; Short et al., 2017). Specht et al. (2016) found that consumers prefer UA products to conventional rural products if they fulfil specific criteria: high quality, regionality and organic production. Grebitus et al. (2020) too found that among respondents in Phoenix, the main urban farming attributes are generally positive, such as 'fresh,' 'healthy,' 'convenient,' 'organic' and 'local'. As reported by Joosse and Hracs (2015), produces from UA initiatives are expected to be fresher because of the shorter timespan between harvest and consumption. Sanyé-Mengual et al. (2020) reported that UA food production was highly appreciated by consumers in Bologna, who mainly referred to it with the concepts of resource efficiency and organic production. Ercilla-Montserrat et al. (2019) reported that, on average, nearly 70% of the participants in Barcelona considered tomatoes from rooftop agriculture to be more environmentally friendly than the tomatoes available on the market.

2.2 | Apps features analysis

Some scholars focused specifically on food delivery apps features, analysed with various theoretical underpinnings.

The technology acceptance model (TAM) was commonly used, as it focuses on two main attributes—that is, perceived usefulness and perceived ease of use of the technology (Davis, 1989). Choi (2020) studied food delivery apps extending the TAM by adding the familiarity variable, which captures how efficiently users are likely to search information online and save time exploring and ordering. They found that familiarity positively affects users' satisfaction and therefore intention to (re)use. Both Nguyen et al. (2019) and Wen et al. (2021) integrated TAM with the website trust variable, which refers to user beliefs about the security and reliability of retailers' websites, which is crucial for purchasing food online. In other studies using TAM, food delivery apps usefulness was also positively linked to delivery time and review quality (Lee et al., 2022) as well as convenience and food variety (Arora et al., 2023; Troise et al., 2020).

Fishbein and Ajzen (1975) adopted the theory of reasoned action (TRA), which argues that a person's behaviour is determined by their intention, which is in turn influenced by both attitude and subjective norm. TRA was used by Wang and Collins (2021), who first categorised fitness apps into four clusters based on apps features: tutor, recorder, game companion and cheerleader. Second, they matched the four clusters with consumers preferences, founding they individual differences (such as age, gender, BMI, eHealth literacy) affects user attitude towards the four clusters (Wang & Collins, 2021).

Other studies also focused on apps features, but not strictly food-related, are valuable within the present study because of their transferrable knowledge. Mauch et al. (2018) analysed 2881 apps for family food provision through the 'Mobile App Rating Scale', scoring apps in terms of engagement, functionality, aesthetics and information. The same scale was used by Sullivan et al. (2016) to study the quality of apps that estimate both the carbon footprint and the healthiness of personal behaviours. They found that most of the available apps are neither exhaustive nor providing both health and environmental information.

Felicetti et al. (2019) carried out a multidimensional analysis of how food information is presented in mobile apps. How information is conveyed is crucial as digital technologies, and apps in particular, can help rebalancing asymmetry of information in the food sector (Samoggia et al., 2021). Felicetti et al. (2019) supported that food apps provide better information than other technologies, as instead of conveying generic food information, apps can deliver context-based and consumer-tailored information.

One additional study focused on apps more generally as online food selling platforms. Oncini et al. (2020) categorised Italian online food provisioning services based on several variables, capturing both the characteristics of the platforms and those of the food they sell. Through the analysis of several variables they were able to distinguish platforms and pipelines as well as to capture their implications for both consumers and producers (Oncini et al., 2020). Their research captured the numerous online food selling platforms active in Italy, showing how mass retail channels are dominating the online market as well (Oncini et al., 2020).

2.3 | Research gap and theoretical framework adopted in the present study

None of the studies mentioned in Sections 2.1 and 2.2 combines consumer perceptions with the analysis of existing apps features, except for Wang and Collins (2021) that focus on non-food apps (i.e., fitness). The present study aims to fill this gap, by comparing consumers'

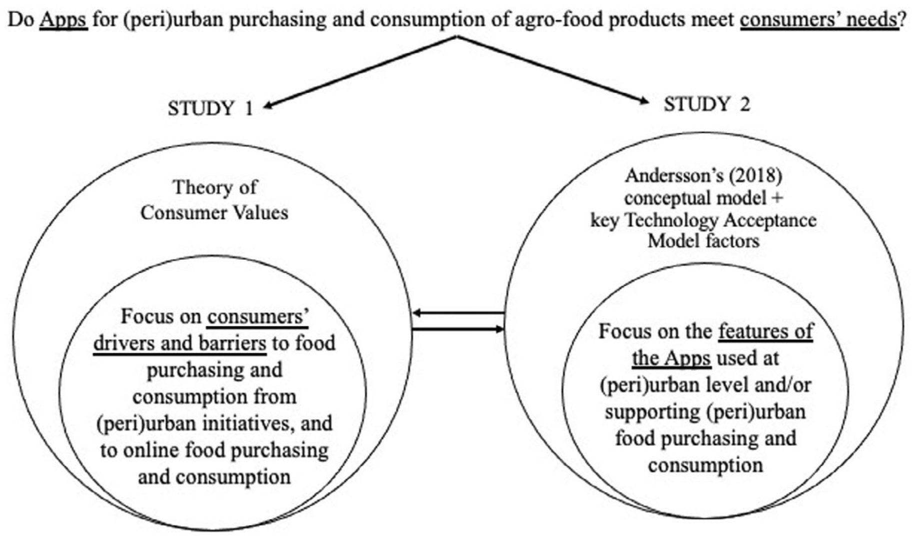

FIGURE 1 Visual representation of the present study theoretical framework. *Source*: Authors.

perceptions of (peri)urban food purchasing and consumption with existing apps features. To do so, a novel theoretical framework was developed by the authors, adopting TCV to analyse consumer perceived values in Study 1, and items drawn from Andersson et al.'s (2018) combined with key TAM factors to analyse apps features in Study 2 (Figure 1). In the present study, Andersson et al.'s (2018) categories that focus on apps features were enriched with interpretative elements from TAM that provides a consumers perspective.

3 | MATERIALS AND METHODS

Following a mixed-methods approach, the present research includes three different methodological phases.

1. A quantitative survey to identify consumers' perceived barriers and drivers towards online food purchasing and apps use, and towards food shopping from (peri)urban initiatives. Drivers and barriers were grouped applying three separate principal component analysis (PCA) (Study 1).
2. Currently available apps for online purchasing grouping and profiling thanks to a cluster analysis to identify what are the major functions and features (Study 2).
3. Comparison between consumer needs emerging from the survey (Study 1) and features of apps (Study 2).

3.1 | Consumer survey (Study 1)

3.1.1 | Data collection

The survey included four sections.

The first section included an initial question asking whether the respondent does food shopping from (peri)urban initiatives (yes/no answer), and the subsequent seven questions investigating what are the expectations, motivations and attitudes that drive the respondents' purchasing from (peri)urban agriculture initiatives. The drivers were divided into six categories: product characteristics, community benefit, health and nutrition benefit, economic benefit, environmental concerns and emotional values (Table 1).

The second section included three questions aimed to identify consumers' food purchasing channels (in-person or online); identify what food categories consumers purchased online; understand barriers and drivers of online food shopping (Table 2).

Both sections adopted a five-point Likert scale exploring the level of agreement, as reported in the relevant tables, ranging from 1 'strongly disagree' to 5 'strongly agree'.

The third section aimed at exploring respondents' willingness to use an app related to (peri)urban agro-food initiatives. Respondents were asked which drivers would motivate them to use an app related to (peri) urban agriculture initiatives and what information they would like to find on it. In this section, respondents expressed the level of importance of single items, ranging from 1 'not at all important' to 5 'very important'.

Finally, the last section included socio-demographic questions.

To ensure the validity and reliability of the survey questionnaire, items definition was based on the literature review (Tables 1 and 2). Among the drivers to food purchasing and consumption from (peri) urban initiatives, items included under the functional value were product characteristics, health and nutrition benefits and economic benefits. Environmental and community benefits capture social value, and emotion-related items capture emotional value. The barriers to food purchasing and consumption from (peri)urban initiatives are under the functional value category. Both the drivers and barriers of online food purchasing and consumption capture the conditional value, that is defined as the value that consumers derive from benefitting from a chosen alternative, such as shopping online instead of offline.

The survey was distributed with Qualtrics, an online data collection software, in August 2021 through a link shared on Instagram on a social media account reaching an Italian audience. Using a social media platform allowed to reach an audience that is familiar with technology and therefore knowledgeable on the topic, and likely to provide informed answers to the survey section on apps use.

TABLE 1 List of survey's barriers and drivers for food purchasing and consumption from (peri)urban initiatives and relative literature sources.

	Drivers to food purchasing and consumption from (peri)urban initiatives	Sources
Functional	Product Characteristics: Organic quality	Specht et al., 2016
	Product Characteristics: Food taste and freshness	Specht et al., 2016 Izumi et al., 2018
	Product Characteristics: Local and Seasonal food	Moellers & Birhala, 2014 Hvitsand, 2016
	Product Characteristics: food safety	Kondoh, 2015 Vasquez et al., 2017
	Health and nutrition benefit: less processed food	Self-developed
	Health and nutrition benefit: food calories	Self-developed
	Health and nutrition benefit: healthy recipes	Vasquez et al., 2017 Seguin et al., 2017
	Health and nutrition benefit: more nutritionally balanced food	Vasquez et al., 2017 Seguin et al., 2017 Izumi et al., 2018
	Economic benefit: value for money (good price, compared to the product characteristics)	Moellers & Birhala, 2014
	Economic benefit: affordability	Moellers & Birhala, 2014
	Economic benefit: fair price for farmers	Moellers & Birhala, 2014 Van Oers et al., 2018
Social	Community benefit: Solidarity, as social cooperation	Hunt et al., 2012
	Community benefit: Sustaining local economy	Sanyé-Mengual et al., 2020
	Community benefit: Establishing a relationship with farmers	Hunt et al., 2012 Moellers & Birhala, 2014
	Environmental concerns: reduce food miles	Moellers & Birhala, 2014 Sanyé-Mengual et al., 2020
	Environmental concerns: less/no use of chemicals	Moellers & Birhala, 2014 Kondoh, 2015
	Environmental concerns: desire to eat in season	Specht et al., 2016 Sanyé-Mengual et al., 2020
Emotional	Emotional values: stress relief	Moellers & Birhala, 2014 Blättel-Mink et al., 2017
	Emotional values: life enrichment	Sanyé-Mengual et al., 2020 Moellers & Birhala, 2014
	Emotional values: escape from daily routine and/or urban chaos	Van Oers et al., 2018
	Emotional values: socialising with other people	Sanyé-Mengual et al., 2020 Moellers & Birhala, 2014
	Barriers to food purchasing and consumption from (peri)urban initiatives	**Sources**
Functional	Food preparation at home	Self-developed
	Not enough diversity of products available	Hvitsand, 2016 Vasquez et al., 2017
	Distance from home/workplace	Self-developed

Source: Authors.

3.1.2 | Sample

A total of 572 respondents answered the survey. The sample included mostly women (80%), the average age was 33 years, most of the respondents had an academic degree (68%), and were mainly employed full time (54%). A total of 29% of respondents had a net yearly family income between 15.001–28.000 euros and around 22% around 28.001–50.000 euros. A 91% of respondents belonged to a household with one to four members (Table 3).

3.1.3 | Data analysis

Data analysis followed two steps. First, a frequency analysis was carried out to outline respondents' consumption habits towards urban

TABLE 2 List of survey's barriers and drivers to online food purchasing and consumption and relative literature sources.

	Drivers to online food purchasing and consumption	Sources
Conditional	I save money	Troise et al., 2020
	I save time	Nguyen et al., 2019 de Bellis & Venkataramani Johar, 2020 Troise et al., 2020
	I resist to compulsory buying	Trude et al., 2021
	Good retailers have good variety online	Self-developed
	I support sustainable producers (ethical, organic, etc.)	Specht et al., 2016 Izumi et al., 2018
	I buy food from restaurants/ cafés/ fast food/ other	Troise et al., 2020
	I buy products that I can't find somewhere else (i.e., for geographical reasons)	Self-developed
	Barriers to online food purchasing and consumption	**Sources**
Conditional	I cannot be at home during home delivery/Too long waiting period between order and delivery	Barska & Wojciechowska-Solis, 2020
	I want to select items in person/ I enjoy the supermarket experience	Elms et al., 2016 Nguyen et al., 2019 Rogus et al., 2020
	I'm not familiar with tech	Bray et al., 2019
	It's not a service that is implemented where I live	Self-developed
	I don't trust the safety of payment/delivery, etc	de Bellis & Venkataramani Johar, 2020 Barska & Wojciechowska-Solis, 2020
	Restricted product offerings	Self-developed

Source: Authors.

TABLE 3 Respondents' socio-demographics characteristics.

Socio-demographics characteristics	%
Gender	
Male	19.33
Female	80.30
Non-binary	0.00
Prefer not to say	0.37
Total	100
Level of education	
With academic degree	63.03
Without academic degree	31.97
Total	100
Members of the household	
1–2	40.15
3–4	50.56
More than 4	9.29
Total	100
Employment status	
Employed full-time	54.65
Employed part-time	12.64
Unemployed looking for work	7.06
Unemployed not looking for work	2.23
Retired	1.86
Student	21.56
Total	100
Net yearly family income	
<15.000 €	16.99
15.001–28.000 €	28.96
28.001–38.000 €	19.31
38.001–55.000 €	21.62
55.001–75.000 €	6.95
>75.000 €	6.18
Total	100

Note: These data refer to the 269 respondents sharing their socio-demographic information.
Source: Authors.

agriculture and online shopping, as well as respondents' willingness to use an app related to (peri)urban agriculture.

Second, the data collected on consumers' barriers and drivers were elaborated through three separate PCA run on the statistics software (IBM, version 27, Armonk, NY, USA) to identify the key barriers and drivers to both (peri)urban agriculture initiatives shopping and online food shopping.

The first PCA was carried out to identify the factors driving consumers towards shopping at (peri)urban initiatives. The PCA and the Varimax rotation were applied on the initial 21 items (Table 1). No items had factor loadings below 0.5, therefore all items were kept in the analysis. The items grouped into five components. The cumulated variance explained by the five factors was 61.4%. The Cronbach Alpha (CA) values range between 0.67 and 0.88.

The second and third PCA were carried out to reduce the dimensions of the factors, respectively, driving or hindering consumers' online food shopping. The initial items were seven for drivers and six for barriers (Table 2).

As for the barriers, no items had factor loadings below 0.73 so they were all kept in the analysis and grouped into three components. As for the drivers, factor loadings were above 0.48, none of the six items were eliminated and they grouped into two components. The cumulated variance explained was 68.1% for the barriers and 57.0% for the drivers. The values of CA were calculated to test the reliability of the factors. The CA values range between 0.61 and 0.63 for the barriers and for the drivers. The Kaiser–Meyer–Olkin measure of sampling adequacy and Bartlett's test of sphericity were calculated to assess the appropriateness of the data for factor analysis. The Kaiser–Meyer–Olkin index were adequate. Bartlett's test of sphericity were highly significant (.000).

The choice of factors was made based on the Eigenvalue criterion being higher than 1. Factor-based scores were calculated using the Bartlett score as a refined method. Researchers adopted the listwise method when running the three PCA. The factors were saved as new variables by calculating their mean value. The values of CA were calculated to test the reliability of the factors. Past studies set the following classification of CA values: '>0.9. excellent; >0.7–0.9, good; >0.6–0.7, acceptable; >0.5–0.6, poor and <0.5, unacceptable' (Streiner, 2003). Thus, the present research CA values are valid.

3.2 | App analysis (Study 2)

3.2.1 | Data collection: Apps selection

Between December 2019 and July 2021, the identification of mobile phone apps was performed using the following sources. The final set of apps data were updated in July 2021.

- Google Play Store, the official App store for the android operating system, which is the largest App store, with 2.57 million apps accessible for users (Statista, 2020);
- App Store, the digital distribution platform developed by Apple, where mobile apps running on iOS and iPadOS operating systems can be found;
- App Annie website, one of the leading mobile data and analytics platforms;
- APKPure website, a website providing smartphones software downloads;
- Google search engine, where sources mentioning agro-food Apps were searched.

The following keywords in three different languages (English, Italian and Spanish) were used: local food, fruits and vegetables, fresh local, seasonal food, sustainable food, sustainable urban, urban farm markets, farmers market, local farmers market and local food farmers.

In order to identify the apps most relevant and in line with research aims, a number of inclusion criteria were applied. In particular:

- Title and description of the apps related to:
  - Possibility of purchasing agro-food products (for consumers) or of selling agro-food products (for producers)
  - Presence of food descriptions that help consumers choice and leads to food purchasing
  - Presence of food products from (peri)urban food markets and farms
  - Mapping of food outlets (restaurants, farms, local food shops, etc.)
  - Availability of urban food delivery service
  - Availability of food information (seasonality, healthiness, origin, etc.)
  - Initiatives to tackle food waste

3.2.2 | Data analysis: Apps profiling

The final data set includes 93 apps used at (peri)urban level and/or supporting (peri)urban food purchasing and consumption.

In order to acquire data for apps analysis, the study subsequently searched the apps in Google Play Store, which offers consistent parameters for analysis.

The apps were analysed according to the following categories:

- Download platform where they are available (Google Play Store, App Store, Both, Other)
- Category, as reported in Google Play Store (food and drink, travel and local Info, lifestyle/style and trends, education, health and fitness, business/affairs/finance, shopping, productivity, social, tools/utilities, news and magazine/communication)
- Number of downloads
- Latest update
- Country of origin
- App objective (information on local farms, selling food and buying food, delivering food, food promotion, health advice, seasonal food information, food information, urban agri-food information, travel information, sustainability information, networking among consumers, mapping, fighting food waste, supporting local producers/local community)
- Type of pipeline (alternative food networks/direct sales, independent stores, mass retail channels, online only, not applicable). The type of pipeline category, which is applicable only if a transaction between producers and consumers is present, can be of four types: online only includes those companies that sell exclusively through the mobile app and not in the brick-and-mortar style (including delivery apps); mass retail channels include big retail companies that have an e-commerce; independent stores includes the online selling organised by the local shop owners; alternative food networks/direct sales consists of online selling in the context of various alternative food networks initiatives (Oncini et al., 2020)
- Final app users (consumers, producers, both)

Both apps selection and profiling have been carried out by two researchers working in team, exchanging opinions to reach an agreement and ensuring unbiased assessments.

3.2.3 | Data analysis: Apps features analysis

Apps were then analysed with the theoretical framework created from the combination of Andersson et al. (2018) conceptual model with key factors of the TAM (Davis, 1989) (Table 4). Andersson et al.

TABLE 4 Theoretical framework used for apps categorisation.

Andersson's categories	Features	Additional studies to strengthen Andersson's categories	TAM
Customisation	• Household or single user or both • Tailored information • App personalisation (track personal data statistics, records credit card details, etc.)	Mauch et al., 2018 Felicetti et al., 2019 Märtin et al., 2021 Wang & Collins, 2021	Perceived usefulness
Information	• Nudging or descriptive • Detailed food offer information • Type of food offer presented/shown (Fresh food [fruits and vegetables]; fresh food [meat, fish and seafood]; ready-to-eat food [prepared meals from retailers/restaurants/shops]; beverages [alcoholic drinks, water, soft drinks]) • Food offer geographical scope (local, national and international) • Company geographical scope (local, national and international) • Area of service • Statements on a series of commitments (Food miles; local food; wellbeing; environment; equity of working condition; seasonal products; heritage/skills/traditions; nutrient needs of consumers; food waste; pesticide-free; GMO-free)	Sullivan et al., 2016 Felicetti et al., 2019 Gunawan et al., 2020 Oncini et al., 2020	Perceived Usefulness
Commitment	• Gamification • Reminders • Discounts • Incentives in the form of rewards (virtual or tangible)	Sullivan et al., 2016 Stephanidis et al., 2020 Wang & Collins, 2021 Stancu et al., 2022	Perceived usefulness
Design	• Ease of use/smooth functioning • Consistency of visual design and familiarity • Search function by ingredient, category, and so on • Various payment and delivery options	Mauch et al., 2018 Gunawan et al., 2020 Patel et al., 2020 Stephanidis et al., 2020 Kumar et al., 2021	Perceived ease of use
Sustainability feedback[a]	• Nutritional feedback/measurement on user behaviour • Environmental feedback/measurement on user behaviour	Sullivan et al., 2016	Perceived usefulness
Community[a]	• Community creation • Suggestions/recommendations/comments from other users	Bulut & Karabulut, 2018 Nazlan et al., 2018 Stephanidis et al., 2020 Wang & Collins, 2021	Perceived usefulness

Source: Authors, adapted from Andersson et al. (2018) and Davis (1989).
[a]These categories were added by the authors to provide a food sector perspective that was missing in Andersson's framework.

(2018) study identified four categories to classify the apps features: customisation; information; commitment and design. To those, the authors added two supplementary categories (sustainability feedback and community) which were found relevant in studies on apps in the food sector. These six categories were consolidated with other studies on similar topics that reinforced the framework proposed by Andersson. Andersson's categories and the two additional ones were interpreted valorising the key TAM factors (perceived usefulness and perceived ease of use) explicative power.

Customisation to the user is crucial for an app to be successful. It includes features such as the chance of setting it up for a single user or for the whole family (Andersson et al., 2018; Mauch et al., 2018) as well as receiving tailored information based on user preferences (Felicetti et al., 2019; Märtin et al., 2021; Mauch et al., 2018). Apps with a high level of personalisation are also appreciated by consumers, as they increase fidelity. Tracking the individual's behaviours, recording favourite restaurants/shops and credit card details help making the app use smoother and increase popularity (Sullivan et al., 2016; Wang & Collins, 2021).

The information category has various dimensions of analysis. First of all, information can be either nudging or descriptive (Andersson et al., 2018). The latter illustrates the product or the dish in a more informative way, whereas the former helps shifting consumers' behaviour towards healthier and more sustainable choices. Second, the app's food offer can be defined with credible and specific information that goes beyond the mere description of agro-food products (Andersson et al., 2018; Felicetti et al., 2019; Gunawan et al., 2020). Third, the Information category also includes indications on the type of food that is sold on the app, divided into four groups: fresh fruits and vegetables, fresh meat and fish and seafood, ready-to-eat food and beverages (Oncini et al., 2020). Fourth, Food offer geographical scope indicates whether agro-food products on the app are sold to customers only locally or nationally/internationally, whereas company geographical scope illustrates whether producers are locally and/or nationally/internationally based (Oncini et al., 2020). The last feature of the Information category is the presence of statements on a series of commitments that the app food offer may endorse. The identified statements (Table 4) are related to the field of sustainability—social, environmental and economic—as well as nutrition (Oncini et al., 2020).

Four features are included in the Commitment category: gamification, reminders, discounts and rewards. They are all aimed at increasing engagement, but are doing so in different manners (Andersson et al., 2018; Stancu et al., 2022; Stephanidis et al., 2020; Sullivan et al., 2016; Wang & Collins, 2021). For example, gamification triggers contest behaviours while discounts increase the return rate of customers after the first purchase.

The Sustainability feedback category includes both environmental and nutrition feedback on consumers behaviour, such as information on how consumption influenced GHG emissions or consumers well-being (Andersson et al., 2018; Sullivan et al., 2016).

Community consists of all the features that allow direct contact between producers and consumers or among consumers, both in person and online through comments, reviews and suggestions (Stephanidis et al., 2020; Sullivan et al., 2016; Wang & Collins, 2021).

Although the previous apps features categories are interpreted using the TAM factor of perceived usefulness, the last feature analysed, design, is explained through the lenses of the TAM factor perceived ease of use. An appealing design includes several aspects such as the ease of use, a consistent visual design (Andersson et al., 2018; Gunawan et al., 2020), and several search, payments and delivery options (Mauch et al., 2018).

3.2.4 | Cluster analysis of apps

The data elaboration of food app functions and features was also conducted on the statistics software SPSS (IBM, version 27, Armonk, NY, USA). A two-step cluster analysis was adopted as an exploratory tool to segment the food apps market. This clustering method allowed to handle categorical and continuous variables and to define the optimal number of clusters. The akaike information criterion (AIC) was chosen, together with log-likelihood distance measure. A total of 49 variables were included out of the initial 56 (Table A1). The platform where Apps can be downloaded (App store or Google Play) was not considered a relevant variable to distinguish app segments in the food app market, hence it was excluded. 'Latest update' and number of 'Reviews' were removed since it was not possible to obtain this information for all the apps included in the dataset. 'Household' versus 'Single user' were excluded since only 3 out of 93 apps showed an 'Household' mode within the customization features. 'Country of origin', 'Company geographical scope' and 'Area of service' were removed because these data have significant variability and are therefore inadequate for a cluster analysis. The variable related to the presence of the statement 'GMO-free' has proved not to be relevant, being negative in 100% of cases. The same happened for the continuous variable 'Ratings', which gave very similar results in all clusters. Therefore, these variables have been removed. Finally, a noise handling function was activated (25%) to exclude potential outliers. An outlier has been identified (WeFrood) and removed from the analysis. The 92 apps merged into five clusters, with a dimension ratio of 2.25 and a cluster cohesion and separation quality equal to 0.3.

4 | RESULTS

4.1 | Consumer survey results

4.1.1 | Consumers barriers and drivers towards food purchasing and consumption from (peri)urban initiatives

Small food retailers, such as local shops or box schemes, were the most popular type of (peri)urban agriculture initiative for the respondents' daily shopping (52.6%). About 28% of respondents were buying directly from farmers/fishermen, through community supported agriculture, farmers' markets, in-farm selling, agri-tourism, whereas 20% from restaurants and cafes.

The motivations of consumers shopping from (peri)urban agriculture initiatives merged into five main factors (Table 5).

The emotional factor groups the survey items on emotional values, such as escaping routine to enrich life and relieving from stress, as well as socialising with other people. Consumers expressed a limited interest on these issues when purchasing peri(urban) agricultural goods (mean equals to 3.4, and standard deviation equals to 0.9).

The healthy factor merges consumers' perception of product characteristics, nutrition benefits and environmental concerns. Consumers purchasing foods from (peri)urban agriculture are driven by the belief that it is safe, organic and with less chemicals. This is a relevant motivation for consumers, as well as having a balanced diet with less processed food and less calories intake (mean equals to 3.8, and standard deviation equals to 0.6).

The community factor includes two items and expresses consumers' spirit of solidarity and willingness to support the local economy. Consumers have a rather positive inclination towards the community elements (mean equals to 4.3) when purchasing (peri) urban agriculture food.

The fresh and seasonal factor merges consumers' perception of taste, freshness and seasonality of food from (peri)urban agriculture initiatives. Consumers strongly appreciate these aspects and they are the most prominent motivations for purchasing (mean equals to 4.5, and the lowest standard deviation of 0.5).

The economic factor includes two items, affordability and value for money. Consumers support that food prices of (peri)urban agriculture initiatives are not perceived as convenient (mean equals to 3.6).

As far as the drawbacks of buying from (peri)urban agriculture initiatives were concerned, 'distance from home/workplace' was the most important aspect for 56.1% of the respondents. 'Food preparation at home' and 'not enough diversity of products available' were considered a barrier by less than 50% of the respondents.

4.1.2 | Consumers' barriers and drivers towards apps use for agro-food online purchasing

When asked whether they buy from the following market channels, consumers stated that they purchase food online mainly from restaurants and cafés (31.3%), followed by big retailers (24.5%), farmers and

TABLE 5 Results of the exploratory factor analysis on buying from (peri)urban agriculture drivers.

	Emotional	Healthy	Community	Fresh and seasonal	Economic
Product characteristics—taste and freshness				0.605	
Product characteristics—local and seasonal				0.795	
Environmental concerns— desire to eat in season				0.778	
Cronbach's alpha 0.67					
Community benefit— solidarity, as social cooperation			0.809		
Community benefit— sustaining local economy			0.763		
Cronbach's alpha 0.793					
Product characteristics—food safety		0.628			
Product characteristics—organic		0.576			
Health and nutrition benefit— less processed food		0.638			
Health and nutrition benefit—food calories		0.590			
Health and nutrition benefit— healthy recipes		0.550			
Health and nutrition benefit—more nutritionally balanced food		0.631			
Environmental concerns—less/no use of chemicals		0.601			
Cronbach's alpha 0.735					
Economic benefit— value for money (good price, compared to the product characteristics)					0.837
Economic benefit— affordability					0.854
Cronbach's alpha 0.821					
Emotional values— stress relief	0.850				
Emotional values— life enrichment	0.842				
Emotional values— escape from daily routine and/or urban chaos	0.867				
Emotional values—socialising with other people	0.767				
Cronbach's alpha 0.886					
Mean values of factors	3.4	3.8	4.3	4.5	3.6
Standard deviation	0.9	0.6	0.7	0.5	0.9

Note: These data refer to the 269 respondents answering this section.
Source: Authors.

farmers' markets (13.6%), minimarkets (11.5%) and small/medium local shop and drugstores (7.4%) (Figure 2).

Ready-to-eat food, that is food and meals from retailers, restaurants and shops, was the most bought online, as it was chosen by 34.8% of respondents, while fresh food (fruits and vegetables, meat, fish and seafood, etc.) and beverages (wine and alcoholic drinks, water, soft drinks) by 22.6% of respondents.

Barriers to online food shopping

The factor analysis on the barriers to online food shopping, led to the definition of three factors, which are bad shopping experience; tech-unsavvy and inconvenience (Table 6).

The unsatisfactory online shopping experience factor-merged items related to disadvantages of online shopping and positive aspects of in person shopping experience. In particular, it included issues of inconvenient delivery timings and the satisfaction of in person food products selection (especially with regards to fruits and vegetables that are more perishable). The unsatisfactory shopping experience was the consumers' key barrier to online food shopping (mean equals to 3.5 and standard deviation equals to 0.8).

Contrary to expectations, the lack of familiarity with technology and the safety of platforms (the tech-unsavvy factor) were not considered a barrier by respondents as the mean is 1.9.

It can barely be considered a barrier the inconvenience factor, which encompassed a restricted product offering and the absence of the service in the respondents living area. This factor-merged issues which cannot be related to the consumer, but rather to the food system offer. Consumers perceived that online food shopping is not convenient (the mean value is 2.6 with a standard deviation equals to 1).

Drivers to online food shopping

There were two key factors driving online food shopping, as the PCA supported (Table 7). These are: rationality and awareness.

On one hand, the rational consumer chooses to shop food online, because it is less time consuming and less expensive, and it allows to resist compulsory buying. The aware consumer, on the other hand,

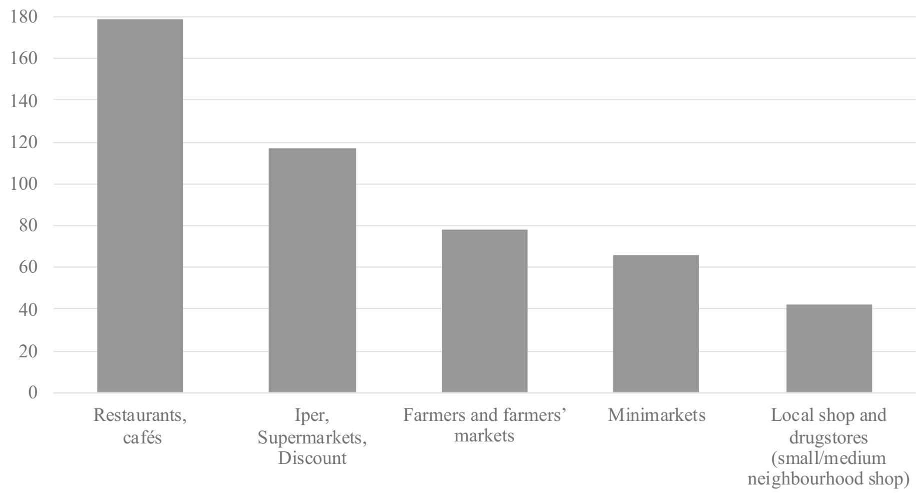

FIGURE 2 Online market channels where respondents purchase food (multiple choice with yes/no for each channel). *Source*: Authors.

TABLE 6 Results of the PCA on online food shopping barriers.

	Unsatisfactory online shopping experience	Tech-unsavvy	Inconvenience
I cannot be at home during home delivery/Too long waiting period between order and delivery	0.752		
I want to select items in person/I enjoy the supermarket experience	0.826		
Cronbach's alpha 0.610			
I'm not familiar with tech		0.879	
I don't trust the safety of payment/delivery, etc.		0.788	
Cronbach's alpha 0.607			
It's not a service that is implemented where I live			0.829
Restricted product offerings			0.732
Cronbach's alpha 0.595			
Mean	3.5	1.9	2.6
Standard deviation	0.8	0.8	1

Source: Authors.

TABLE 7 Results of the PCA on online food shopping drivers.

	Rationality	Awareness
I save time	0.702	
I save money	0.627	
I resist compulsory buying	0.795	
Cronbach's alpha 0.605		
Good retailers have good variety online		0.483
I support sustainable producers (ethical, organic, etc.)		0.789
I buy products that I can't find somewhere else (i.e., for geographical reasons)		0.780
Cronbach's alpha 0.610		
Mean	3.2	3.5
Standard deviation	0.8	0.8

Source: Authors.

believes that online facilitates better-quality shopping. The aware consumer believes that online food shopping presents a good variety of products that are difficult to find in other outlets and that it is easier to support sustainable producers (ethical, organic, etc.). The level of agreement with this item and among respondents is fairly good, as the mean is 3.5 for aware and 3.2 for rational and the standard deviation is 0.8 in both cases.

4.1.3 | Consumers perceptions of apps features

Respondents were asked what would motivate them to use an app related to (peri)urban agriculture initiative and what information available on an app related to (peri)urban agriculture initiative would motivate them to use it.

Tackling food waste through the app was the motivation that would push consumers to use an app the most. The other relevant

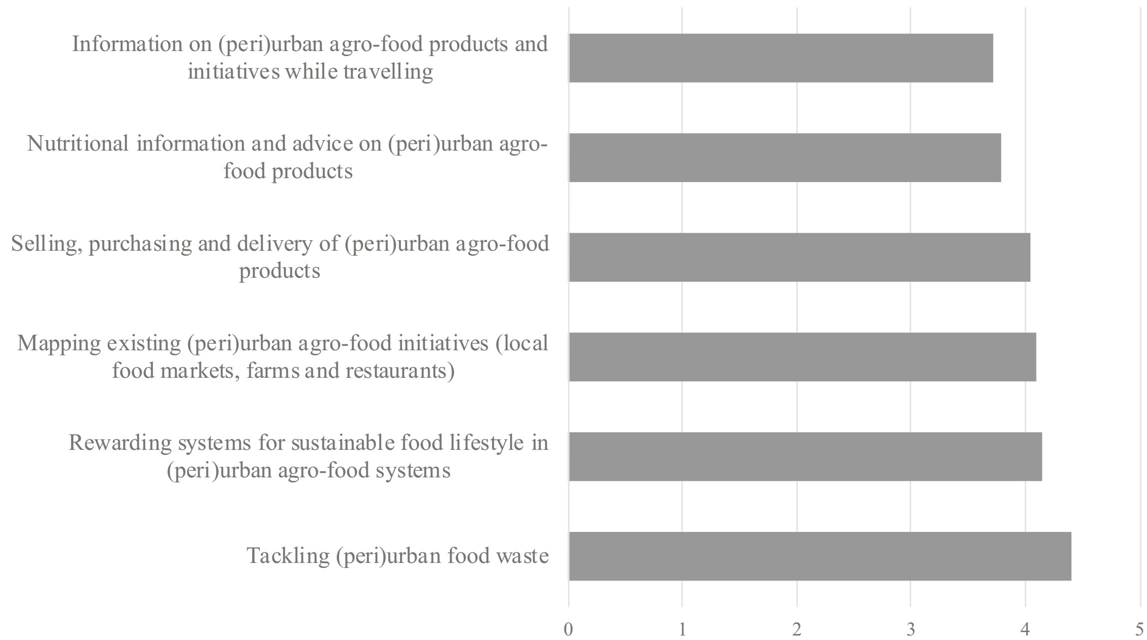

FIGURE 3 Features that would motivate respondents to use an app related to (peri)urban agriculture initiatives. *Source*: Authors.

motivating factors were rewarding systems for sustainable food lifestyles and mapping existing (peri)urban agriculture initiatives (Figure 3).

The most popular information available on an app related to (peri) urban agriculture initiative stimulating its use were information on seasonal and/or organic food from (peri)urban agro-food systems (mean equals to 4.20) and on sustainability practises of (peri)urban agro-food systems (mean equals to 4.15). Such results were in line with the interest on sustainability and environment-friendly consumption growing in recent years.

4.2 | Apps features results

Apps grouped into five clusters labelled according to their main objectives (Table A2).

- 'Food delivery' was the biggest cluster, including 27 apps whose main aim was selling, buying (96.3%), and delivering food (88.9%).
- 'Going Local' consisted of 21 apps, meant mostly to support local producers (81%), to provide local farm information (57.1%), to sell and buy food (76.2%). Contrary to the previous one, in this cluster selling and buying was rarely linked to a delivery service and the food provided was mainly fresh and local, whereas in the 'Food delivery' cluster it consisted mainly ready-to-eat food of international origin.
- 'Travel advice' encompassed 18 apps, aimed to provide travelling information and/or a mapping service (88.9%).
- 'Well-being', including 14 apps, had the main objective of providing food information (78.6%) and/or health advice (57.1%).
- 'Food waste' was the smallest cluster consisting of 12 apps, and 75% designed to tackle food waste. The second main objective of this cluster was 'food promotion', which was the main objective of the remaining 25% of apps. Providing 'discounts' and/or 'incentives in the form of rewards' was a typical characteristic of the apps designed to address food waste.

In 'Food delivery' the type of food offer consisted mainly of beverages (96.3%) and ready-to-eat food (74.1%). They stood out for app design, as 88.9% had 'consistency of visual design'. All of them had 'various payment and delivery options' and 'search function by category' implemented in the app. They offered attractive functions to increase shopping convenience and user commitment too, such as discounts (92.6%) and/or, in few cases, incentives in the form of rewards (33.3%). For eight of these apps one of the main objective was to provide food promotions. For instance, JustEat guarantees a 20% discount if the user orders food for a value higher than 25 euros. Furthermore, 16 platforms enabled users to personalise the application, providing the possibility to make a list of favourite stores or restaurants (e.g., Swiggy, Takeaway, Vivino), to personalise the ordering experience (e.g., Carriage-Food Delivery) or to save an order history to quickly reorder from the favourite menus (e.g., McDonald's Italia, Foodhub).

'Going Local' was the second cluster for dimension (21 apps), but with few downloads—only 17.345 on average—while the 12 most downloaded apps have a mean of 42.500.000. Indeed, despite having 'selling and buying food' as the second most frequent objective (76.2%), these apps rarely offered a food delivery service (47.6%) and very often lack 'consistency of visual design' (positive only in 52.4% of cases) and/or the provisioning of 'various payment and delivery options' (missing in 71.4% of cases). Moreover, compared with the other groups, they lacked some relevant features to increase app customization and user commitment. First, they did not offer app personalization functions (only 38.1% of the apps have them), and foremost, they completely lacked 'incentives in the form of rewards'. 'Discounts' too were provided only by three apps. In this cluster, a general lack of features essential to increase user engagement and shopping convenience was compensated by a strong commitment to foster social innovation and environmental sustainability. The type of food offer consisted mainly of 'fresh food, fruit and vegetables' (95.2%), and/or 'meat, fish and seafood' (85.7%). A total of 14 apps aimed at fostering 'community creation', favouring a more direct contact between producers and consumers, or boosting consumer networking. Mangio a km0, an app aimed at shortening the food supply chain, enables producers and consumers living close to connect by chatting directly on the app. Furthermore, 38.1% of apps was committed to 'equity of working conditions', meaning that they generally avoid the use of intermediaries or middlemen, making sure that producers receive a fair price. L'alveare che dice sì, as reported also by Oncini et al. (2020) allows user to visualise how profit is distributed along the food supply chain so to raise awareness about this issue.

'Travel advice' group included Apps mainly aimed at sharing tourist information. Most of them (88.9%) also included a mapping service to localise the closest restaurants or point of interests. They were not designed to buy and sell food and lack functions increasing user convenience to do shopping, such as discounts and incentives in the form of rewards, both present only in 11.1% of Apps. The type of food presented was mainly ready-to-eat food (88.9%) and beverages (61.1%). Only three of them had 'local food' as one of the main statements and six of them had the provisioning of 'urban agri-food information' as the third principal objective. The 'consistency of visual design' was positive in 17/18 apps. Moreover, a 'search function by category' was present in 16/18 apps. Zagat, for example, allows to filter restaurant based on rating, price, cuisine and features, such as 'reservations,' 'parking' and 'full bar'. 'App personalization' (83.3%) was another very important characteristic of these apps, which helps users to tailor their travelling experience to their needs. Ulocal allows users to create personalised tours according to their interests and destinations. These types of platforms performed well in terms of 'community creation'. 77.8% of them included a section for suggestions, recommendations, or comments provided by other users to foster information and knowledge sharing. Zagat, for instance, offer users the opportunity to rate their experience at a restaurant based on three qualities: food, service and atmosphere. About 50% of these apps aimed at boosting consumer networking: tripadvisor for example, allows to share a travel plan with other users and to cooperate for its implementation.

The third cluster of apps for dimension was 'well-being', whose main aim was to provide food information (78.6%) and health advice (57.1%). Only few apps were designed to sell and buy food, (14.3%). About 85.7% of them was focused specifically on consumers' 'nutrients need', 64.3% on consumers' 'well-being' and a small part was committed to promote the consumption of 'seasonal products' (42.9%). Willmeal and Deliciously Ella, for instance, created meal plans of different recipes tailored to the user nutritional needs or wellness plan. The approach in the provisioning of food information was mainly prescriptive, meaning that 57.1% of the apps used nudging as a tool to influence positively consumer consumption behaviour. To do so, four of these apps provided nutritional feedback and three of them an environmental feedback. The so called 'food scanners', which allow users to receive different types of information related to food products belonged to this group of apps. Open food facts, for instance, provides feedback related to the food carbon footprint and the environmental impact deriving from food packaging for each product scanned. The food presented in these platforms varied from fresh food in the form of fruit and vegetables (50%) and/or meat, fish and seafood (42.9%) to ready-to-eat food (50%) and beverages (50%). The apps included in this cluster were all consistent in visual design (100%) and had good 'personalisation' features (71.4%), which were very often related to cuisine and dietary or culinary tips.

'Food waste' was the smallest cluster, presenting 'food waste' as the main objective (75%), followed by 'food promotion' (50%). Only 41.7% of apps included in this cluster aimed at 'selling and buying food'. Their food offer, mainly international (75%), was diverse, ranging from all types of fresh food ('fruits and vegetables' and 'meat, fish and seafood', respectively, in 75% and 66.7% of apps) to ready-to-eat food and beverages (83.3% and 66.7%, respectively). These digital platforms performed well in terms of visual design, as well as in 'search function by category'. 'App personalization' functions were present in all of the apps in various forms. In Karma and Too good to go users can create lists of favourite shops and restaurants to be updated when they upload unsold food to rescue. To increase user commitment, 58.3% of these apps used 'discounts', 'incentives in the form of rewards' and/or 'reminders'. Gamification (41.7%) was another important design tool used by the apps tackling food waste to increase user commitment. Too good to go is a good example, having implemented a system where 'magic boxes', containing food that otherwise would have gone to waste, can be ordered from various local shops. These boxes are called 'magic' because consumers cannot know in advance what is contained inside (van der Haar & Zeinstra, 2019). About 75% of these apps adopted 'nudging' tools to promote virtuous food consumption habits, for instance rescuing unsold or expiring food. Nudging can take very different forms depending on the platform approach. Best before—food tracker uses notifications to remind users when products in the fridge have been open for too long or when they are about to expire. Lastly, three of these apps also allowed user to receive environmental feedback related to the user consumption behaviour. OLIO, for example, indicates the number of meals and the amount of water saved rescuing unsold or expiring food.

5 | DISCUSSION

The present research aimed to understand whether apps for (peri) urban food purchasing and consumption meet consumers' expectations on food purchasing and consumption from (peri)urban initiatives. The answer comes from comparing consumer perceptions on (peri)urban and online food shopping with existing features of available apps aimed at this purpose.

To answer the main research question, two sub-questions were addressed. First, the analysis of the drivers and barriers of (peri)urban and online food purchasing and consumption. Second, the categorisation of features of available apps used at (peri)urban level and/or supporting (peri)urban food shopping. In line with previous literature, the present research supports that the most relevant driver for buying from (peri)urban initiatives are those pertaining to the functional value category according to the TCV: access to food that is fresh, local and seasonal (Ercilla-Montserrat et al., 2019; Grebitus et al., 2020; Joosse & Hracs, 2015). Beyond product characteristics, the research findings also confirm how the social and community aspects are key for consumers when choosing to buy food from (peri)urban initiatives (social value). This confirms Sanyé-Mengual et al. (2020) results on the multifunctionality of urban agriculture that attracts citizens for a number characteristic, not just for the quality of its products. In terms of apps features, the research partially confirms the results of Sullivan et al. (2016) and Felicetti et al. (2019), who state that apps potential is not yet fully exploited, as the availability of tailored information and of sustainability feedback—much appreciated by consumers, and both under the perceived usefulness category of TAM—are still an uncommon feature. The potential for apps development to better fit consumers' needs is recognised by both previous literature and this study findings.

The categorisation of apps features has both academic and managerial implications. As for the former, the categories of analysis drawn from previous literature are confirmed and expanded. This is inserted into a stream of literature that aims to provide contemporaneity and further specificity into the TAM (Choi, 2020; Nguyen et al., 2019; Wen et al., 2021).

As for the managerial implications, features of apps (Study 2) for (peri)urban food purchasing were compared with results on consumer needs emerging from the survey (Study 1). As shown in Figure 4, they do not perfectly match.

Findings support how networking between producers and consumers and among producers are appealing characteristics of the 'Goinglocal' cluster, in line with the results of the consumers survey, where the community factor was the second one in terms of level of agreement (4.3 on a maximum of 5). Furthermore, 8 out of 21 apps in this cluster provide both consumers' and producers' interfaces, potentially favouring a closer relationship with farmers. 'Sustaining local economy' (one of the two items of the community factor) was again addressed by apps in the 'Going Local' cluster, which includes apps that support local producers, provide local farm information and/or commit to promote local food.

The items included in the healthy factor of the consumers' drivers, despite having received a medium level of agreement among respondents, found a strong response by the food apps market offerings, especially in the apps included in 'Well-Being' cluster. Food information and/or health advice are rather often provided through tailor-made recipes or weekly meal plans. However, when asked which food products are usually bought online, ready-to-eat foods were the most popular choice among respondents.

As far as the economic factor of the consumers' drivers is concerned, 'Going Local' was the only cluster to touch on price distribution issues. A 8 out of 21 Apps included in this cluster are indeed concerned about the 'equity of working conditions' and committed to address the so-called 'price squeeze', or 'margin squeeze', linked to the increasingly vertical integration of the current agri-food chain. At the same time, these digital platforms do not report how prices are established yet, with the only exception of L'Alveare che dice sì. This app explicitly indicates the price distribution, as producers get 80% of the final price to consumers, l'Alveare (the organisation distributing the products) gets the 10% and the remaining 10% is acquired by the platform for labour and infrastructure costs (Oncini et al., 2020). However, apps included in 'Going Local', despite being very promising in terms of fostering social innovation, still lack proper features to meet consumer needs in terms of food affordability (such as discounts or incentives in the form of rewards), aspects where the 'Food waste' and 'Food Delivery' cluster perform better. Even L'Alveare che dice sì or Cortilia, which aim to promote local food and a fairer economy, exert a form of intermediation that make local products more expensive than grassroots direct food networks, excluding low-income households from accessing this market (Corvo & Matacena, 2018). Prices or shopping convenience in general are not the main drivers of online (peri)urban food shopping within the respondents of the survey as well, as the economic factor is the second to last.

The 'Going Local' cluster, where promoting local food is the main commitment and supporting local producers is the main objective, is in line with the fresh and seasonal factor. However, albeit supporting sustainable behaviour, none of apps in this cluster provides environmental feedback or measurement on user behaviour, two of consumers' favourite features. Consumers desire for tasty and fresh products are met by the apps in this cluster but the 'desire to eat in season', the second most popular driver within the environmental issues, does not find a corresponding offering in the Food App market. Only 13 of all the apps analysed commit to promote seasonal products and only 8 of them provide seasonal food information. Similarly, the statement 'pesticide-free/organic' is present in only 11 apps, whereas 17 apps include environmental claims. This is not in line with the survey results, where the fresh and local factor is the one with the highest mean (4.5) and the lowest standard deviation (0.5), or with the literature, where (peri)urban agriculture is often linked to the concepts of fresh, local and organic (Grebitus et al., 2020; Sanyé-Mengual et al., 2020; Specht et al., 2016).

The emotional factor was the least appreciated, with the lowest mean (3.4) and the highest standard deviation (0.9). In this regard, the apps included in the 'Travel advice' cluster perform better, as they are often aimed at boosting users networking and including a section for suggestions, recommendations, or comments.

'Food delivery' apps, providing a vast food offer of mainly international origin, respond to the growing demand of various ready-to-eat foods in big cities (Organisation for Economic Co-operation

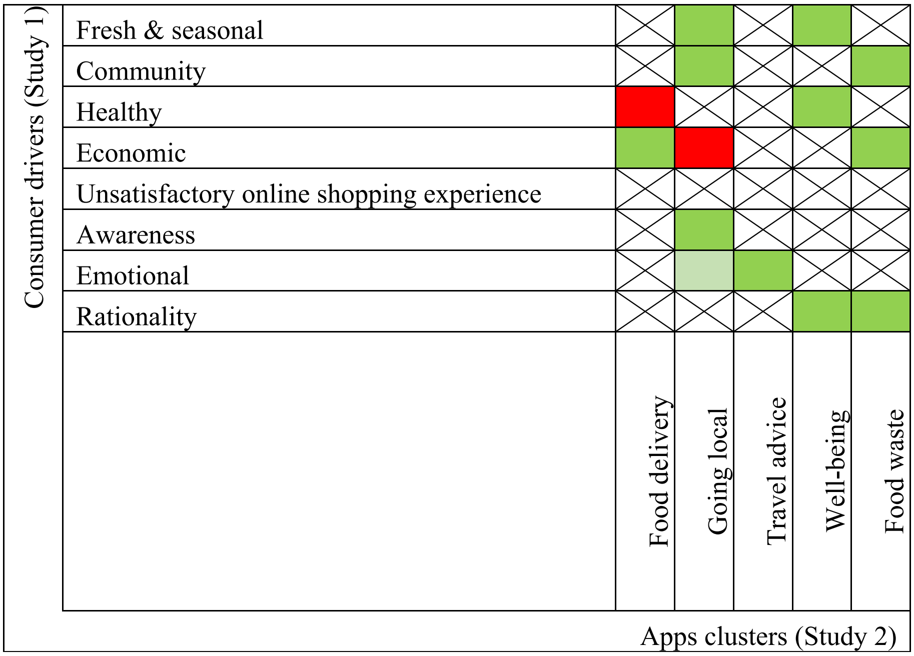

FIGURE 4 Comparison between Study 1 and Study 2 results. Green cells represent a positive match, red a negative one and a cross means no match. *Source*: Authors.

and Development, 2020). As highlighted by Tefft et al. (2017), the demand of packaged, processed and ultra-processed food comes from greater disposable income and changing lifestyles, increasing the share of food consumption away from home. Survey respondents, indeed, expressed a preference for buying online ready-to-eat food. Often, many of these digital platforms (such as Deliveroo, Uber Eats, Glovo, The Fork) have the capability to extend their area of service worldwide, which further explains the popularity of this service.

The apps included in 'food waste' cluster, that have become rather popular in recent years, best respond to the desire of 'tackling food waste', the highest motivation to use an app related to (peri) urban agriculture initiative. Too good to go recorded the highest growth rate in Italy in 2019: 2.5 million Italians downloaded it in a year and a half, and more than 9.000 businesses registered with 1.6 million meals 'saved' in 2020 (Casaleggio Associati, 2021). In apps of this kind, 'gamification' was very often present as an essential function, as confirmed by the literature. Gamification represents a special way of increasing user commitment, based on the users' motivational trigger points (Heckmann et al., 2020), therefore increasing the perceived usefulness. The so-called 'magic boxes' of Too good to go exploit the 'surprise or game-like element' to be appealing for consumers by creating a sense of exploration and curiosity to try new products that could make consumers more proactive in fighting food waste, even when they are already conscious about this topic (van der Haar & Zeinstra, 2019). Apps in this cluster also match consumers' needs for another feature of the commitment category: promotion, which is the seventh most preferred feature by consumers, is present in half of the apps tackling food waste. The commitment category represents a higher increase in perceived usefulness compared to the other Andersson et al.'s (2018) categories falling into this TAM factor (Table 4).

Results support that social innovation and environmental issue are best addressed by a niche of apps included in the 'Going Local' cluster. Despite potentially being very appealing for consumers sensitive to sustainability issues, these apps lack functions that may increase user commitment and engagement in the long term. The opposite resulted to be true for 'Food Delivery' apps that, despite a general absence of any statements related to sustainability, obtained great success, especially during the pandemic lockdowns, and work effectively in terms of user-friendliness and interface personalisation.

The research findings support the definition of some managerial implications for companies and apps developers to define apps that better fit consumers' preferences as far as peri(urban) food purchasing and consumption is concerned. First, for apps in the 'Going Local' cluster, there is need to increase the value for money creating more promotions and discounts that boost consumers' commitment, such as inserting feedback on consumers' choices to track their behaviour and reward sustainable consumption. Second, there is need to create a sense of community through comments and suggestions, which increases both consumers' loyalty and sales. Third, apps in the 'Food delivery' cluster should stop offering mainly ready-to-eat food and increase the healthy food offer that is highly requested by consumers.

5.1 | Limitations of the study

The research presents two main limitations. First, the sample size is limited and not representative of the general population, as it mainly composed of women with an academic degree. Yet, it is consistent with the target group of the research objectives and issues analysed. This is because of the sampling method, which was time-constrained and therefore restricted to social media channels. However, distributing the survey on social media allowed to reach an audience with a higher degree of familiarity with technology. Second, apps, and digital tools more generally, are a fast-changing field, as new apps emerge—and disappear—quickly from the market, making it possible to analyse a time period which could be then subject to change.

6 | CONCLUSION

This study examines an emerging issue with potential consequences for sustainable consumption and marketing strategies for (peri)urban food purchasing and consumption. Compared to previous studies, the present exploratory analysis offers a novel approach. It gathers consumers' perceptions on online and (peri)urban food shopping to compare them with the features of apps used at (peri)urban level and/or supporting (peri)urban food shopping that are currently available for download.

The mismatch between consumers' needs and apps features emerging from this research should set the basis for more accurate marketing developments for agro-food companies in the apps sector and for future research. A better understanding of the effectiveness of apps features and their appreciation by users can lead agro-food companies to increase their implementation of digital technologies, improving their online selling capacity. Apps should consider adopting a 'user-centred focus', an approach that may help, not only to engage consumer effectively in the use of new ICT tools, but also to promote behaviour change and encourage more sustainable consumption choices and food shopping behaviour in the long term. There is need to take into account other stakeholders when analysing the effectiveness of digital tools in the agri-food sector, as it is crucial to consider if the economic, social and environmental benefits deriving from digital transformation are shared among the wider community.

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APPENDIX A

TABLE A1 List of variables for apps profiling and clustering.

Categories and features	Included in the cluster analysis
1. Platform	
App Store	No
Google Play	
2. Category (as reported in Google Play Store)	Yes
Business/Affairs/Finance	
Food and Drink	
Healthy and Fitness	
Lifestyle/Style and Trends	
Productivity	
Shopping	
Travel and Local Info	
3. Downloads	Yes
4. Latest update	No
5. Country of origin	No
Objectives	
6. Local farms information	Yes
7. Selling and buying food	Yes
8. Delivering food	Yes
9. Food promotion	Yes
10. Health advice	Yes
11. Seasonal food information	Yes
12. Food information	Yes
13. Urban agri-food information	Yes
14. Travel information	Yes
15. Sustainability information	Yes
16. Networking among consumers	Yes
17. Mapping	Yes
18. Fighting food waste	Yes
19. Supporting local producers/local community	Yes
20. Type of pipeline (only if selling and buying is present)	Yes
Alternative food networks/direct sales	
Independent stores	
Mass retail channels	
Online only	
NA	
21. Final app users	Yes
Consumer	
Producer	
Both	
Customisation	
22. Household versus single user	No
23. Tailored information	Yes
24. App personalisation	Yes

TABLE A1 (Continued)

Categories and features	Included in the cluster analysis
Information	
25. Nudging versus descriptive	Yes
26. Detailed food (offer) information	Yes
Type of food offer presented/shown:	
27. Fresh fruits and vegetables	Yes
28. Fresh meat and fish and seafood	Yes
29. Beverages	Yes
30. Ready-to-eat food	Yes
31. Food (offer) geographical scope	Yes
32. Company geographical scope	No
33. Area of service	No
Presence of statements:	
34. Food miles	Yes
35. Local food	Yes
36. Wellbeing	Yes
37. Environment	Yes
38. Equity of working condition	Yes
39. Seasonal products	Yes
40. Heritage/skills/traditions	Yes
41. Nutrient needs of consumers	Yes
42. Food waste	Yes
43. Pesticide-free	Yes
44. GMO-free	No
Sustainability feedback	
45. Nutritional feedback/ measurement on user behaviour	Yes
46. Environmental feedback/ measurement on user behaviour	Yes
Commitment	
47. Gamification	Yes
48. Reminders	Yes
49. Discounts	Yes
50. Incentives in the form of rewards	Yes
Community	
51. Community creation	Yes
52. Suggestions/recommendations/comments from other users	Yes
Design	
53. Simplicity or ease of use/Smooth functioning	Yes
54. Consistency of visual design	Yes
55. Search function by ingredient, category, etc.	Yes
56. Various payment and delivery options (only if selling and buying is present)	Yes

TABLE A2 Apps in relevant clusters.

	Food delivery (27)	Going Local (21)	Travel advice (18)	Well-being (14)	Food waste (12)
1	Swiggy	Fresh and Local	Mapstr	Weeshop–Scegli meglio	Too good to go
2	Everli	Mangio a Km0	iTerranostra	MyCIA—Personal Food Advisor	MyFoody
3	Esselunga online	NetEat	Eatwith	Seasonal fruits and vegetables	Esselunga
4	Takeaway	Abalobi Marketplace	Zagat	NaturMia	OLIO
5	Sayurbox	A casa tua	Wine searcher	Etiquettable	Empty my fridge
6	Cortilia	M'app local food guide	Osterie d'Italia	Opena food facts	Best Before
7	Deliveroo	L'alveare che dice sì	ilGolosario Ristoranti	WillMeal	Coles App
8	Uber Eats	Buy Fresh Buy Local Hampton Roads	Pint Please Beer Finder	Deliciously Ella	Sprouts
9	Glovo	Natoora	Ulocal	HelloFresh	Phenix
10	Vivino	Farmers e market	Mathanthverk	Fruit Time	Karma
11	GrabFood	WhatsGood	Tastebook	Plant Jammer	Encantado de Comerte
12	Zomato	Maano	Tripadvisor	Seasonable	Inventario alimentare
13	Foodpanda	Local food App	Open table	Whisk	
14	JustEat Italia	LocalFarmers	Spotted by locals	Yuka	
15	The Fork	FarmToHome	Restaurant Guru		
16	Burger King	Farmer Direct	HappyCow		
17	Jumia Food	Farmstand Finder	Delitbee		
18	Carriage	Croft-Urban Farms	Going Local Berlin		
19	Veggiebox	My Urban Farms			
20	Get Farm Fresh	Farmizen			
21	Woolworths Fresh	AgroMarketDay			
22	Farmdrop				
23	McDonald's Italia				
24	Mas que fruta				
25	Frumix				
26	Ulabox				
27	Foodhub				