Food Systems in European Cities

Deliverable 3.8 - Review of theories and techniques for app designs

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1. Task objectives

The present deliverable is part of FoodE project Work Package (WP) 3 activities. WP3 aims to build and nourish healthy, active and sustainable relationships between food chain actors, thanks to the definition and implementation of networking opportunities and tools. The project will involve and stimulate active participation and promote knowledge exchange between European CRFS, involving public decision makers, companies, consumers, and other citizens. This sub-task will develop a theory-based and evidence-based set of tools for networking and will implement effective tested initiatives and instruments for the creation of an interactive community of actors contributing to active CRFS.

More specifically, WP3 will:

• Create an inventory of networking initiatives in the domain of urban food systems, to identify and comparatively assess most relevant experiences in Europe and initiate the MyLocalFoodE initiative;
• Develop an online App to mobilise and interconnect the different categories of users/stakeholders
• Promote awareness and engage school pupils in co-designing and monitoring of sustainable CRFS.

In this context, the "FoodE App" will be a major outcome of the FoodE project easing citizen active engagement in identifying, monitoring and assessing CRFS initiatives. The current deliverable is part of Task 3.2 sub-task 3.2.1. The task aims at developing a theory-based framework (T3.2.1) for the App development. The App will first be released by M14 (T3.2.2). Furthermore, a continuous update and amelioration of the FoodE App will be guaranteed until M30, building on users' feedback. Citizen engagement to the FoodE App will be actively addressed by promoting the tool in the FoodE public/dissemination events (e.g. T3.1) and overall project communication strategy (T7.2), but also passively fostered by word-of-mouth between CRFS stakeholders that through the App can both access a loyalty programme (FoodE ZeroMiles), special benefits and awards (FoodE Hero) and relevant information on CRFS sustainability and FoodE outputs.

1.1 Subtask objectives (T3.2.1): Theory-based framework development for a CRFS-oriented App

As foreseen by the Grant Agreement, this subtask reviews the theoretical foundations incorporated into existing CRFS Apps' design. The task identifies available literature on the topic, the existing relevant Apps from Google Play and iTunes App Store, and analyses the existing Apps against the available theoretical framework. The task carries out a literature review on past studies focused on ICT solutions in the agro-food system. The aim is to ensure that T3.2.2. is based on past research on ICT solutions and experience on Apps in the agro-food system. The subtask explores ICT solutions and Apps in the framework of food purchasing, food production, consumer behaviour change, and other economic, social, and political implications of CRFS. Sound theoretical foundations of the App can sustain higher potential for long-term influence of CRFS use. The aim is to

define a theory-linked framework of Urban Food System actors' behaviour and approaches, such as provide instructions, encouragement, contingent rewards and feedback on performance, as well as prompt self-monitoring on behaviour, provide opportunities for social comparison and agree on behavioural contracts. The results set the basis for FoodE App development foreseen in Task 3.2.

2. Introduction

As reported by the Food and Agriculture Organisation (FAO), digital technologies can contribute significantly towards addressing the challenges currently faced by our global food and agricultural system (FAO, 2020a), and they can do so at different levels of the food supply chain. The FAO argued that digital technologies at farm level, such as sensors, robots and drones connected to the Internet of Things, can provide precise information to farmers and help them increase yields. Moreover, blockchain technology can enhance traceability and sustainability by monitoring the food chain from the field to the final consumer (FAO, 2020b). The opportunities offered by digital technologies in the field of nutrition have recently been explored by the United Nations, while warning against their potential risks such as privacy of health information (UNSCN, 2020). In conclusion, the FAO argued that "digital technologies can trigger major changes or "disruptions" in the food system that not only improve efficiency and speed, but also redistribute information and power along the value chain" (FAO, 2020b). FoodE approach towards ICT tools use for CRFS initiatives is consistent with the position expressed by FAO.

FoodE project aims at involving local initiatives all around the European Union in the design, implementation and monitoring of environmentally, economically and socially sustainable City Region Food Systems. While the diversity of European cities and regions is currently a barrier to the systematisation of CRFS initiatives in the continent, FoodE will enhance the common characteristics through sustainability assessment and cross-pollination. Therefore, FoodE ICT assets will be crucial to reach these aims and encourage exchange among the stakeholders and the FoodE App will have a fundamental role.

The project chose to focus on the research, development and implementation of an App because of the following reasons. The growing of mobile phone users worldwide is 3.5 billion people in 2020 (Statista, 2019a). This data is matched by a consistent number of Apps downloads: in 2019, consumers downloaded 204 billion mobile Apps to their devices (Statista, 2020a). Among all the available Apps, the Food and Drink category represents a share of 3.4%, and Health and Fitness 3.3% (Statista 2019b). In particular, previous research has highlighted how the latter has been subject to an exponential rise in availability and popularity (Lowe et al., 2015; Schoeppe et al., 2016; Allman-Farinelli & Gemming, 2017). Healthy lifestyle Apps are the most studied, as they are considered a low-cost and efficient solution to instigate behaviour change and improve people's diets (Rabbi et al., 2014; Coughlin et al., 2015; Elbert et al., 2016; Schoeppe et al., 2016; Mummah et al., 2016; Covolo et al., 2017; Samoggia and Riedel, 2020). There is limited research focused on Apps use for agro-food products' purchasing and consumption.

Relevant past research on these issues are Doub et al. (2015), Gilliland et al. (2015) and Okumus et al. (2018) who focused on grocery shopping, local food and food orders respectively.

3. FoodE App Aims

As foreseen in the GA, the main objective of the FoodE App is to mobilise and interconnect different categories of users and stakeholders along the food supply chain (T3.2.2). The App will also aim at easing citizen awareness on CRFS sustainability (mapping and describing sustainable CRFS initiatives) and their engagement in monitoring and reviewing CRFS (T3.3). It will also allow citizens to engage in "serious game" activities where their effort in data compiling will be awarded with benefits on CRFS accessibility (T3.3). Annex A provides a detailed reporting on FoodE App as provided by the GA. Below section is a summary.

As per T3.2.2, "Development of an online App to mobilise and interconnect different categories of users and stakeholders", the implementation of the FoodE App (D3.7) will allow for easy accessibility and immediate interaction from users. The CRFS review system will be accessible to CRFS users, through QR code embedded in product and services receipts and attendance ticket. Based on the number and completeness of reviews, users will be able to access dedicated reward programmes (e.g. FoodE ZeroMiles) for accessing discounts and benefits in CRFS projects. CRFS projects will be ranked based on both the user feedback on the app and the score received on sustainability indicators (T2.3 and T2.4) and awarded with the FoodE Hero award during the MyLocalFoodE initiative (T3.1.3).

As per T3.2.3, "FoodE App updates and improvement", during the project development, the FoodE App will evolve based on the following elements:
- Users feedback: users will be involved in reviewing the accessibility and user-friendliness of the tool.
- Sustainability assessment tools: key indicators identified in T2.4 will be integrated in the App and will be voluntarily filled up by CRFS managers.
- App scale-up: further CRFS will be included based on the voluntary subscriptions from other CRFS projects. By M30, the App will likely host more than 200 CRFS across the whole EU.

As per T4.1, the "FoodE challenge", an open challenge for the design of innovative CRFS pilot projects, will be launched. Regardless to the possible monetary award provided by existing competitions, winning teams will be able to access special benefits within the FoodE ZeroMiles programme (which allows for discount on goods and services provided by CRFS case studies present in the FoodE App).

As per T4.4, "Participatory pilot monitoring", the performance indicators of each pilot will be made public on the FoodE website at predefined time intervals and the predefined quality attributes of each pilot will be gathered and made available to the FoodE App.

As per T5.3 "Multi-user online survey tool", a multi-user online survey tool on the FoodE App will be made available (D5.3) for three target stakeholder groups:

- owners/members of CRFS;
- users of CRFSs;
- stakeholder groups (HEIs, PAs and NGOs).

By using the online survey tool, owners/members of CRFS receive a sustainability assessment by entering their business data into the protected online survey tool. Thereby, owners/members are able to check their performance in different sustainability dimensions.

As per T7.1.4, "The FoodE interactive website", the FoodE website will also integrate the FoodE App (developed in T3.2).

As per T7.3.1, "Exploitation plan", FoodE sustainability beyond the project end will be guaranteed through continued animation and management of the community, by physical activities but in particular through the FoodE App, that will integrate input from WP2, WP4, WP5 and WP6. Being designed and developed to meet the community's need, the FoodE App will likely continue to be used after the project's end, indeed FoodE will set activities for securing involvement, interest and continued participation of the FoodE App stakeholders. During the project implementation, the consortium will assess the possibility that one, or more, of the stakeholders takes over the management of the FoodE App. The FoodE App will be however kept online for at least 5 years after the project ends using own resources of the consortium. Furthermore, the consortium will consider applying for an EU-funded COST Action, that would allow further joint work of the whole FoodE App for several additional years and support not only its sustainability but also its further development.

As per T7.3.2, "Stakeholder network and EU project clustering", it is expected that the network enlargement will benefit from the "snowball effect" of the project's ongoing activities, its active online app, its systematic presence in social media and the realization of the MyLocalFoodE initiative. The FoodE App will also improve the cooperation and synergies between the different public authorities within a country and between different countries, allowing for expanded coverage area and intervention capacity in the different EU regions. The FoodE App may be a source of concrete and detailed field experiences for policy makers. It will help them to seize the meeting point between theory and practice and to adapt when possible their frameworks for a better response to CRFS sustainability (D7.20) as well as benefitting from accessing an extended network of CRFS stakeholders (D7.21).

4. Methodology

4.1 Methodological framework

The following conceptual map includes the data and information sources used to collect data for the preparation of this report (Figure 1).

These sources were deemed relevant to provide an exhaustive overview of the present studies on digital solutions in the agri-food sector which have been studied in the literature as well as those that are currently on the market and in use, with a specific focus on Apps.

The used sources are the following:

- Literature review of 57 scientific papers on how digital solutions have been used in the agri-food sector, especially for selling and purchasing food;
- Survey for project partners: an online questionnaire was circulated among the project partners as an exploratory search for Apps currently in use;
- Survey for CRFS: as part of WP2, an online questionnaire was circulated among CRFS initiatives around Europe and a question about the technology they use was included;
- App mapping: an inventory of the Apps currently available for download has been compiled.

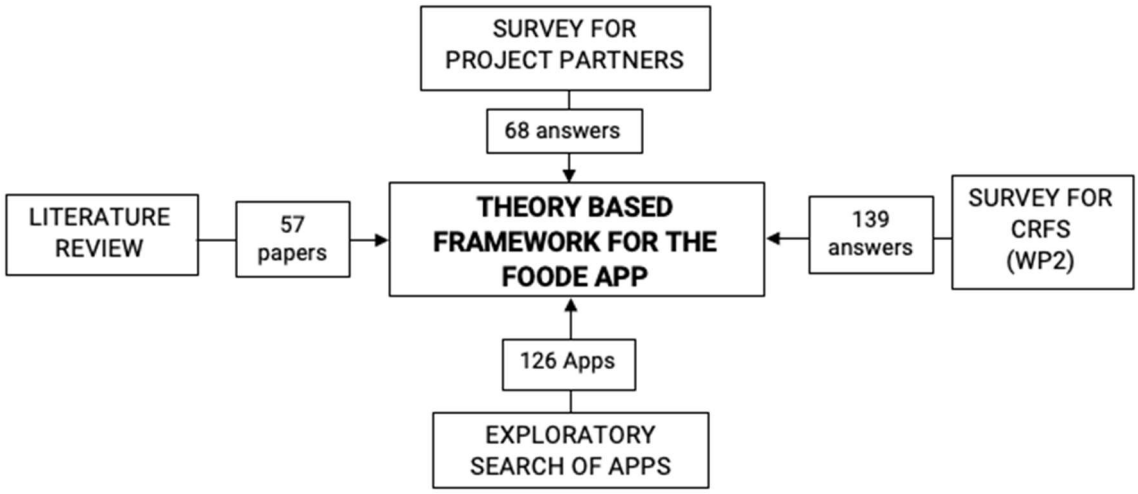

Figure 1. Conceptual map of relevant sources.

The preparation of this report consisted of the following methodological steps:

- Secondary data collection and elaboration: literature review and exploratory search of Applications
- Primary data collection and elaboration: questionnaire to the partners and questionnaire to CRFS

4.2 Data collection

4.2.1 Secondary data collection: literature review and exploratory search of Applications

4.2.1.1 Literature review

In order to design a theory-based framework for the development of a CRFS-oriented App as foreseen in the GA, the research aimed at understanding and analysing the current research panorama of ICT solutions in the agri-food sector. For this reason, in April 2020, a literature review of past studies on the aforementioned topic was conducted in a

structured and systematic manner. Studies included in the literature review were retrieved from two scientific search engines: Scopus and Web of Science. A search string with a combination of selected search terms was used in both databases to yield relevant results. The final string consisted of four groups of words, which are explained as follows.
Since a univocal word for *App* does not exist, the first group includes App synonyms, and similar words to convey that meaning such as *mobile*, *device*, *digital*, *"smartphone Application"* and *ICT* (short for Information and Communications Technology). Despite the latter being a broad term, it is often used in the literature to refer to the sort of digital solution this report is about. The word *Application* alone was excluded as it is used in a wide range of fields and created undefined results. The second group of words focused the results on the agro-food sector using three expressions: *food*, *agro-food* and *agri-food*. To align the database search to the project's focus on City Region Food Systems initiatives, the words *urban*, *local* and *regional* were added. The fourth group of words aimed at limiting the selection to those Apps that are favouring a direct relationship between producers and consumers: *consumer*, *consumption*, *marketing*, *commercialization*, *distribution*, *selling*, *delivery* and *trade*. Given the large number of papers from the field of medicine resulting from the string at this stage, it was added AND NOT *medic** to exclude them. *medic** was not relevant for the scope of the present research. As technology is a fast-changing field, a temporal limitation was put in place to include only works published between 2010 and 2020.

The search with the string on Scopus yielded 370 results, of which three were duplicates, so the identified papers were 367. Of these, 79 were selected for further screening based on title, abstract and journal of publication. The same string was used on Web of Science, where it resulted in 398 studies: of these, 164 were different from the results in Scopus and their title, abstract and journal of publication were screened to select 25 studies. The resulting 104 papers were read in full and 47 were eliminated as out of scope for this research as they were not focused on agri-food products or on ICT tools. 57 studies were therefore included in the final body of literature to be analysed.
The selected papers were analysed by three different researchers, in order to limit the possible bias. All the papers were read in full and classified according to the following categories.

- Country
- Year of publication
- Journal of publication
- Theoretical framework of the paper
- Aim of the paper
- Theoretical framework of the digital solution
- Rural or urban context
- Methodological approach
- Data collection method
- Data elaboration method
- Type of digital solution
- Digital solution aims
- Digital solution target
- Digital solution management
- Section of the agro food chain

— Digital solution successful features or interesting findings

4.2.1.2 Exploratory search of Applications

Starting from December 2019, an exploratory search of smartphone Apps on Google Play Store was performed. Google Play, which is the official App store for the Android operating system, was chosen as it is the largest App store, with 2.57 million Apps accessible for users (Statista, 2020b). 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.

The exploratory search of Apps was further implemented by adding the following relevant sources identified in cooperation with Arctur FoodE partner, expert in this field and in charge of the App development:

- App store, the digital distribution platform developed by Apple, where mobile Apps running on iOS & 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;
- Advice from experts among FoodE project partners;
- Google search engine, where sources mentioning agro-food Apps were searched.

These keywords were also added: Farmers market, Local farmers market, Local food farmers and the App category "Food & Drink" was selected.

As these searches yielded a consistent number of results, several inclusion and exclusion criteria were identified to fine tune the results. The following inclusion criteria were used:

- Title and description of the Apps related to:
    - Presence of urban and regional food markets and farms
    - Mapping of restaurants offering urban and regional food
    - Availability of urban and regional food delivery (farm to door delivery service)
    - Availability of information regarding seasonal food, urban and regional food, news in the world of urban agriculture, nutritional facts etc.
    - Tackling of the food waste in urban area
    - Reward systems for sustainable lifestyle in urban areas
    - Nutrition-information and diet-tracking

The following exclusion criteria were used:

- Mobile Apps that have not been updated or reviewed for more than four years

From all these sources, a total of 126 Apps were found (see Annex B).
In order to acquire data for Apps analysis, the identified Apps were subsequently searched in Google Play Store, which offers consistent parameters for analysis, such as the number of downloads and reviews.
The Apps were analysed according to the following categories:

— Mobile App distribution platform in which they are available
— Category as reported in Google Play
— Number of downloads
— Latest update
— Country of origin

— User rating
— Number of reviews
— App objective

In addition, the Apps were analysed through the hierarchical taxonomy of Behaviour Change Techniques (BCTs) developed by Michie et al. (2013). This approach together with other studies set a framework for nutritional studies and consumer behaviour adopted in App impact analysis (Gilliland et al., 2015; Coughlin et al., 2015; Schoeppe et al., 2016; Zhao et al., 2016; Samoggia et al., 2020). The limited theoretical foundation of the digital solutions identified in the literature review studies supported the analytical approach adopted. Michie model identified 93 different techniques used in the Apps clustered in 16 groups: Goals and planning; Feedback and monitoring; Social support; Shaping knowledge; Natural consequences; Comparison of behaviour; Associations; Repetition and substitution; Comparison of outcomes; Reward and threat; Regulation; Antecedents; Identity; Scheduled consequences; Self-belief; Covert learning. Out of these, the following four items were drawn as the most fitting for the present research: community creation, knowledge enhancement, self-monitoring/goal setting, reward/performance feedback.

4.2.2 Primary data collection: survey for project partners and survey for CRFS

4.2.2.1 Survey for experts: FoodE project partners

In order to explore experts' and stakeholders' experiences and opinions on Apps within the agro-food system, an online questionnaire was created through the Qualtrics platform and carried out in cooperation with Arctur partner. The questionnaire items were developed based on a first analysis of the digital solutions described in the literature review. The user survey was an additional activity not included in the GA, and it was focused on FoodE partners. It was a preliminary assessment of users needs which provided a wider and more comprehensive picture on food-related Apps.

In addition, other users feedback was collected in the project beyond T3.2.1 scope. First, in the context of T3.2.2, FoodE partners feedback was requested on several occasions (GA meetings, partner workshops, bilateral meetings, etc.) during the development of the App prototype to receive comments on the layout and the contents of the App. Second, in T2.1 the research group agreed to include specific questions on the use of digital technology in the questionnaire circulated among the CRFS initiatives. Both these interactions can be considered a follow up on the initial survey included in D3.8, albeit for different time scheduling results will be included in the other relevant tasks.

The survey presented was made up of 12 close-ended questions (factual questions, checklist type, rating Likert scale questions), grouped in four major areas (see Annex C).

First, respondents were asked if they have been using any App related to the agro food system in the past two years and, if yes, to indicate its name, its objective and whether they started using it during COVID-19 pandemic or not. Second, a list of possible objectives drawn from the literature was made available for the respondents to choose from. Moreover, they were asked what purpose would motivate them to use an agro-food related App by rating a list of possible motivations on scale from 1 (not at all important) to 5 (very important). The third area of the questionnaire asked the respondents if they knew an App with the characteristics suggested in the previous questions already exists

and how likely they were to use such an App abroad. The last part of the questionnaire included a few socio-demographic questions, such as indicating name, gender and age (in compliance with the ethics requirements explained in D8.1 and D8.2).

4.2.2.2 Survey for CRFS initiatives

As part of the WP2 (T2.1), an online survey was developed to gather data on innovative CRFS in Europe. In order to ensure the broadest amount of respondents possible, both from a sectoral and a geographical point of view, its dissemination was planned taking advantage of the T2.1 inventory and of the partnership networks. For the same reason, the survey was translated in eight languages: English, French, Italian, Spanish, Dutch, German, Romanian and Slovenian.

The survey consisted of 25 questions, both open-ended and close-ended (factual questions, multiple answers, checklist type, rating questions), grouped in 9 sections. Two questions were designed to inform the App:

1. "Do you use digital solutions/online channels for the dissemination of your activities?"
2. "If yes, please indicate what do you use"

The first question was close-ended (Yes/No answer) and the second one allowed multiple choices, with the following possible answers:

- Platform/Website
- Social Networks
- App
- Others (please explain)

5. Results

5.1 Literature review

5.1.1 Results

The following are the results of the content analysis of the 57 selected papers.

5.1.1.1 Temporal and geographical distribution of the papers

First of all, a preliminary analysis of time and place of the studies was conducted (see Figure 2, 3 and 4).

Research works were overall well distributed around the world, but two continents stood out for the highest number of papers on digital solutions in the agri-food sector, with 21 papers each:

- Europe (Rossi et al., 2010; Vallauri, 2014; Davies, 2014; Joosse and Hracs, 2015; Bacarella et al., 2015; Arapovic and Karkin, 2015; Tadei et al., 2016; Pienak et al., 2016; Gupta, 2016; Eli et al., 2016; Quaranta and Salvia, 2017; Della Gala and Reed, 2017; Marchetti et al., 2018; Duignan et al., 2018; Davies and Garrett, 2018;

Ievoli et al., 2019; De Bernardi, 2019; Bassano et al., 2019; Poelman et al. 2020; Lee et al. 2020; De Bernardi et al., 2020);

- Asia (Anib et al., 2019; Hossain et al., 2019; Murthy et al., 2019; Nikmawati et al., 2019; Oborin, 2019; Pyanikova et al., 2019; Syaglova, 2019; Thamaraiselvan et al., 2019; Wang et al., 2019; Davies and Garrett, 2018; Gupta et al., 2018; Kaur et al, 2018; Fauzi et al., 2017; Shanita et al., 2017; Wicha et al., 2017; Ahmed et al., 2016; Eli et al., 2016; Gupta, 2016; Srividya, 2016; Yen and Zaaba, 2016; Moon et al., 2012).

12 papers are focused on African countries (Koufie and Kesa, 2020; Mwalupaso et al., 2020; Zina and Sun, 2020; Isler et al., 2019; Davies and Garrett, 2018; Byomire et al., 2016; Eli et al., 2016; Gupta, 2016; Vallauri, 2014; Henriques and Kock, 2012; Odiaka, 2012; Chang et al., 2010) while nine referred to Oceania (Pond et al., 2019; Davies and Garrett, 2018; Tonkin et al., 2017; Eli et al., 2016; Gupta, 2016; Kurnia et al., 2015; Bali et al., 2014; Hearn et al., 2014) and eight to America (Bakırcı-Taylor et al., 2019; Dellinger et al., 2019; Davies and Garrett, 2018; Eli et al., 2 016; Gupta, 2016; Gilliland et al., 2015; Hearn et al., 2014; Rahman et al., 2011).

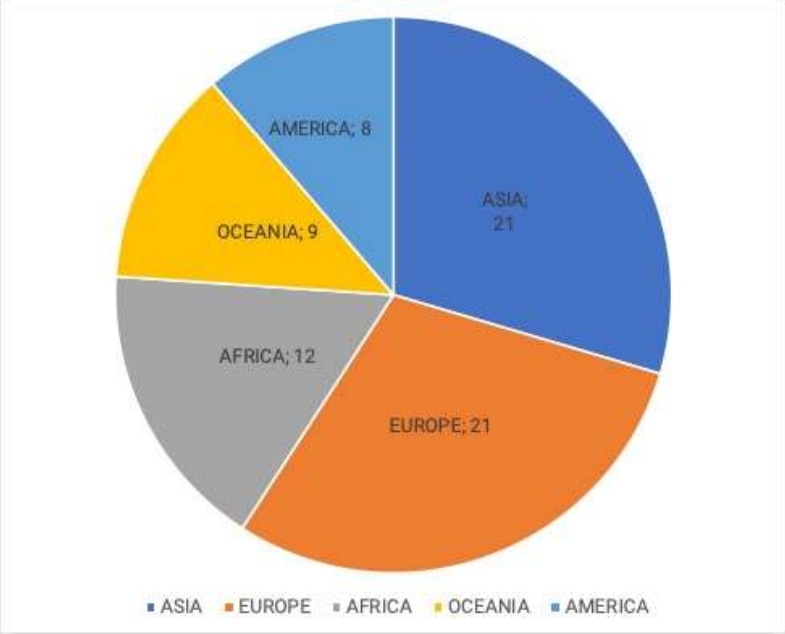

Figure 2. Geographical distribution of analysed papers.

The choice of selecting papers in the time frame of 2010-2020 was confirmed as valid from the years of publication of the resulting papers. As Figure 3 shows, from 2015 onwards the body of research on digital solutions in the agri-food sector has grown consistently. It particularly peaked in 2019 when 16 papers on the topic have been published, a trend that will likely continue in the years ahead – considering that the database search for 2020 only included papers out before April. None of the papers published in 2013 was considered eligible for the final analysis.

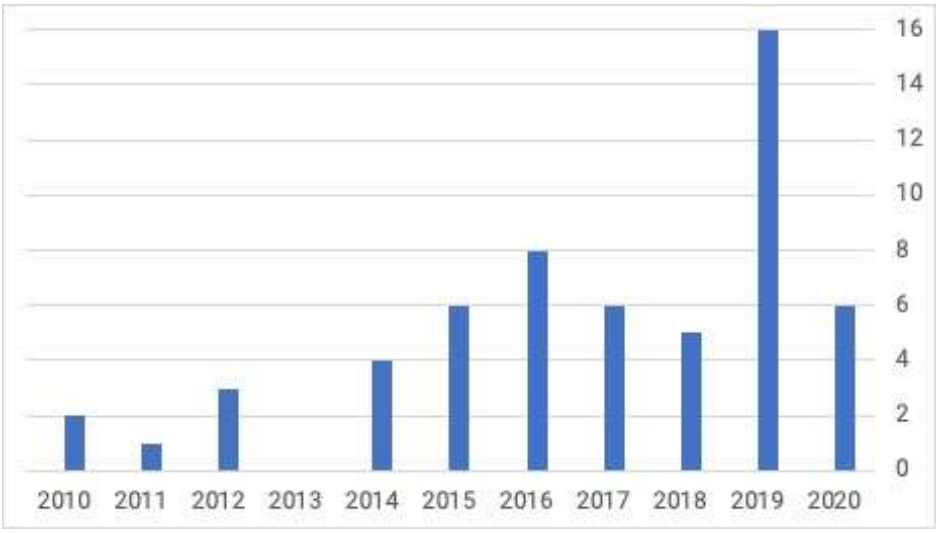

Figure 3. Years of publication of the selected papers.

Combining geographic and time distribution, an interesting picture emerges (see Figure 4). All five continents reflect the general time pattern mentioned above, where after 2015 the body of research increased consistently. However, while for some continents (namely Europe and Asia) this meant a steady growth, for others (namely America and Oceania) it was only a small increase. Africa classified in the middle, with a few peaks (in 2016 and in 2020) and a general increase in the remaining years.

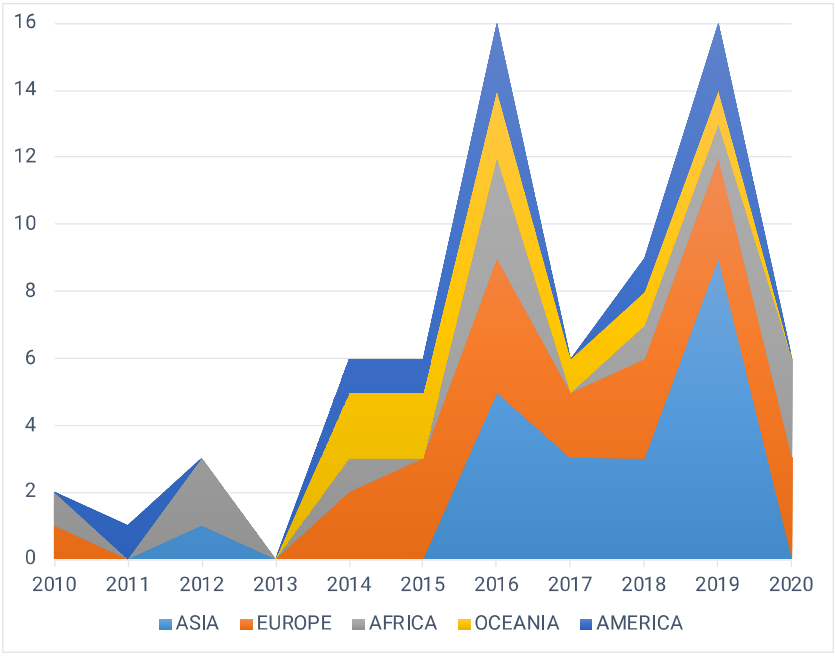

Figure 4. Historical evolution of published studies.

5.1.1.2 Papers' fields of research and aims

The selected body of research was well distributed in different disciplines, with IT being the most present with 21% of papers falling within the subject followed by the medical-nutrition field (see Figure 5). Both were consistent with the aims of the FoodE project: the great number of papers in the field of technology reflected the focus of the present research on digital solutions, while the high number of nutrition-related papers reflected a strong presence of nutrition ICT solutions, in particular Apps, in the market which was confirmed by later stages of research.

However, it is interesting to note that only 10% of papers were in the field of agriculture, which was predictable given the limited development of the primary sector in terms of technological innovation.

3% of papers are instead published in a tourism-focused journal, which shows a new tendency of such field towards technology.

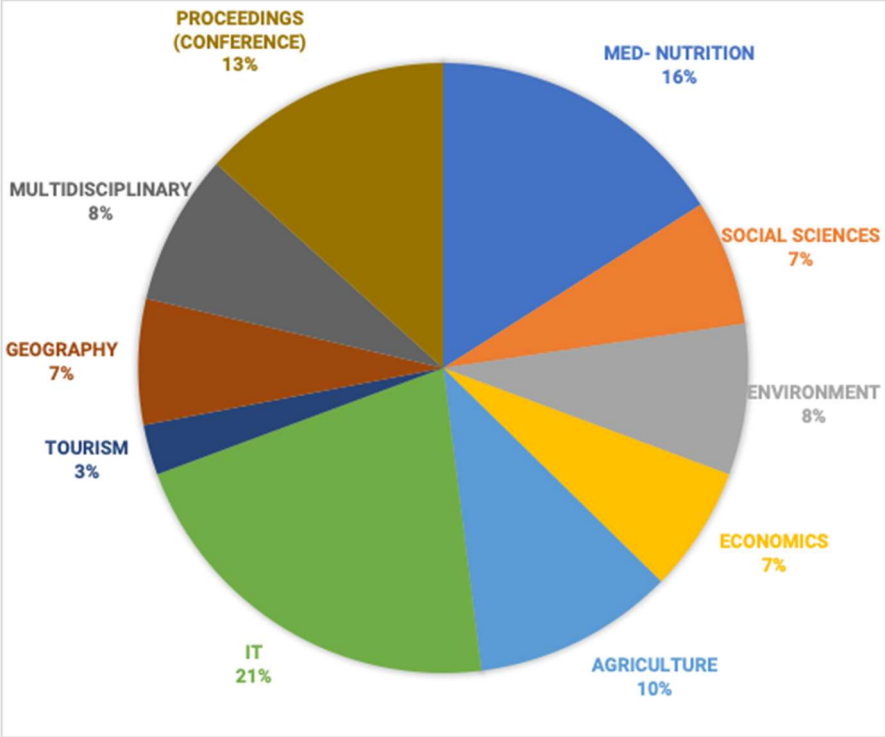

Figure 5. Journals of publication in percentage.

Regardless of the journal of publication discipline, the vast majority of papers were aimed at studying three topics (see Figure 6):

- the effects of digital solutions on local and sustainable consumption – 20 papers (Vallauri, 2014; Hearn et al., 2014; Davies, 2014; Kurnia et al., 2015a; Kurnia et al., 2015b; Joosse and Hracs, 2015; Bacarella et al., 2015; Yen and Zaaba, 2016; Srividya, 2016; Pieniak et al., 2016; Eli et al., 2016; Wicha et al., 2017; Quaranta and Salvia, 2017; Della Gala and Reed, 2017; Duignan et al., 2018; Wang et al., 2019; Nikmawati et al., 2019; De Bernardi et al., 2019; Anib et al., 2019; De Bernardi et al., 2020);

- the effects of digital solutions on healthy eating – 15 papers (Rossi et al., 2010; Ball et al., 2014; Gilliland et al., 2015; Pieniak et al., 2016; Gupta, 2016; Tonkin et al., 2017; Shanita et al., 2017; Marchetti et al., 2018; Kaur et al., 2018; Pond et al., 2019; Murthy et al., 2019; Isler et al., 2019; Dellinger et al., 2019; Bakırcı-Taylor et al., 2019; Mwalupaso et al., 2020);
- the effects of digital solutions on farm marketing – 11 papers (Kurnia et al., 2015a; Kurnia et al., 2015b; Joosse and Hracs, 2015; Arapovic and Karkin, 2015; Tadei et al., 2016; Byomire et al., 2016; Wicha et al., 2017; Quaranta and Salvia, 2017; Della Gala and Reed, 2017; Ievoli et al., 2019; Hossain et al.2019).

These three major topics are strongly in line with the objectives of the FoodE App, in particular with easing citizen awareness on CRFS sustainability by mapping and describing sustainable CRFS initiatives, and therefore increasing household's sustainable and healthy consumption as well as CRFS sales of sustainable food.
Interestingly, the least studied topic was the role of digital in retail, which was the focus of two papers only (Rahman et al., 2011; Syaglova, 2019). This result could be due to the difficulties in collecting information and data on retailers' approach towards digital solutions, as it may disclose information on retailers' marketing strategies. However, it should be noted that retailers are conducting their researches on the topic independently and it is difficult to access their data. One of the three case studies analysed by Syaglova (2019) was a mobile Application of the Russian retail network "X5 Retail Group", including 13,000 trading companies, operating as hypermarket and supermarket: such Application allowed buyers to use a loyalty card in electronic form, to receive special offers and recommendations on products and prices.

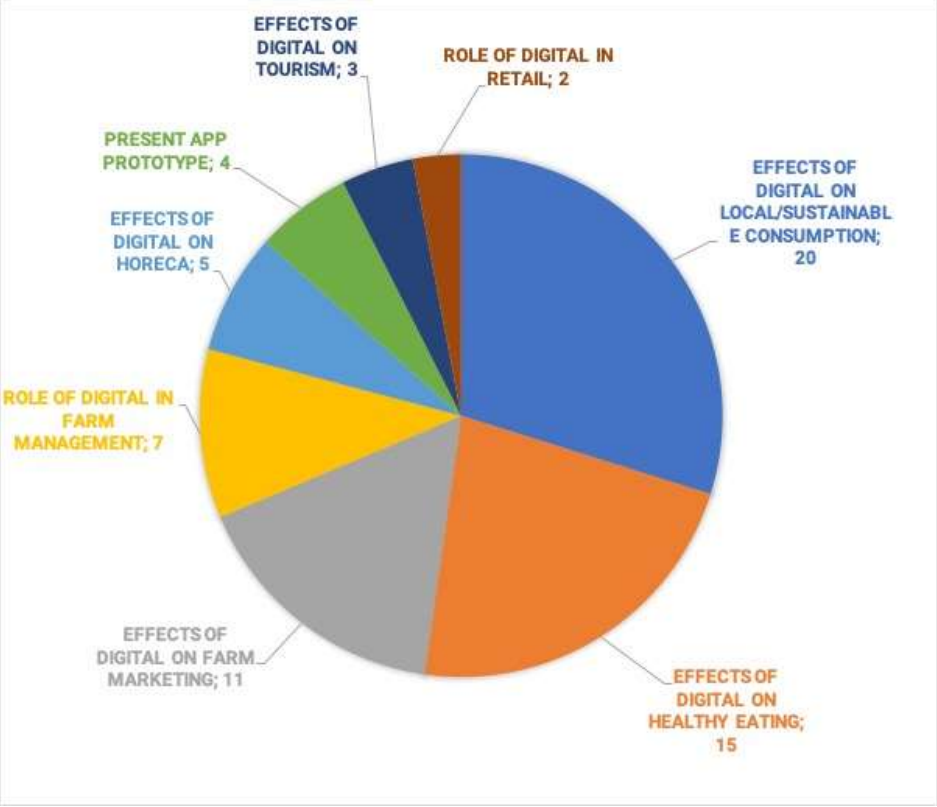

Figure 6. Aims of the papers (n° of studies).

5.1.1.3 Urban or rural focus and methodological approaches of the papers

Given the FoodE research focus on City Region Food System, it was deemed relevant to classify the papers according to their focus on rural or urban agri-food activities. 44% of the selected papers had a focus on rural areas while 47% on an urban setting: the latter reflects a general trend in the literature of exploring ICT solutions in urban agri-food systems. One paper in particular compared an urban and a rural experience: a London-based veg box scheme (Transition Belsize Veg Bag scheme) and an e-agriculture pilot project with Kenyan farmers (Vallauri, 2014). In both cases, it was found that the use of digital tools to document and share food projects allows the collaboration and engagement of stakeholders otherwise distant or unrelated: this represents an original way of looking at technology, which is usually relegated – especially in the farming sector – to techniques improvement (Vallauri, 2014).

As far as methodological approaches were concerned, qualitative and quantitative methodologies were equally used (47% of papers each).

5.1.1.4 Types of digital solutions studied in the papers

The selected papers varied in several ways, but the types of digital solutions studied in the literature were the most homogeneous result. Mobile Apps were the most studied digital solutions, followed by websites and platforms, phones and tablets and social and classic media (Figure 7). Apps were the focus of 25 papers, a result in line with the aim of the current research which is targeted specifically at Apps (see section 5.1.2 for specific results about Apps-focused papers).

20 papers studied websites and platforms: the focus here was on e-commerce, namely the buying and selling of food products using online platforms (Moon et al., 2012; Henriques and Kock, 2012; Vallauri, 2014; Hearn et al., 2014; Kurnia et al., 2015a; Kurnia et al., 2015b; Arapovic and Karkin, 2015; Tadei et al., 2016; Srividya, 2016; Ahmed et al., 2016; Quaranta and Salvia, 2017; Della Gala and Reed, 2017; Davies and Garrett, 2018; Wang et al., 2019; Ievoli et al., 2019; Hossain et al., 2019; De Bernardi et al., 2019; Bassano et al., 2019; Bakırcı-Taylor et al., 2019; De Bernardi et al., 2020). Most of the papers were about small-scale producers being able to enter the market through e-commerce, but a few were focusing on retailers as well. Interestingly, half of the papers analysed online selling platforms in Europe, followed by Asia and Oceania. The two most studied online platforms were the Food Assembly and the Open Food Network: the former was the focus of two Italian researches on customers behaviour (De Bernardi et al., 2019; De Bernardi et al., 2020), while the latter was studied in two Australian papers (Kurnia et al., 2015a; Kurnia et al., 2015b) and one UK paper (Della Gala and Reed, 2017). On one hand, it was found that the success of the Food Assembly business model laid in the mix between knowledge sharing on their website and on-site interactions, especially in terms of customers' purchase frequency (De Bernardi et al., 2020). On the other hand, Kurnia et al. (2015a) studied the platform from the point of view of producers, examining how ICT solutions like the Open Food Network can support sustainable practices among Australian food hubs. Moreover, they inquired whether the whole regional supply chains could benefit from the use of the platform (Kurnia et al., 2015a): despite a few challenges, such as products distribution and difficulty in cooperation with local farmers, both hypotheses were confirmed (Kurnia et al., 2015a; Kurnia et al.,

2015b). Della Gala and Reed (2017) found that for both case studies (Stroudco Food Hub and the Dean Forest Food Hub, in the South of England) selling through the Open Food Network meant more efficiency for the producers and easy access to affordable local food for consumers.

While most other papers were focusing on single specific e-commerce platforms, there were two exceptions: Bakırcı-Taylor et al. (2019) researching the nutrition-advice website "Jump2Health" and Bassano et al. (2019) comparing two tourism-related websites "Umbria on the blog" and "Il Mangiastorie". "Umbria on the blog" was considered more effective in attracting tourists as it reported the experiences of ten bloggers invited to visit the region for a weekend, while "Il Mangiastorie" simply told stories of traditional products (Bassano et al., 2019).

Nine papers were on mobile phone use, focusing on the use of SMS, voice messages or WhatsApp messages for agri-food sales or health advice (Rossi et al., 2010; Chang et al., 2010; Odiaka, 2012; Bacarella et al., 2015; Kaur et al., 2018; Murthy et al., 2019; Isler et al., 2019; Bakırcı-Taylor et al., 2019; Mwalupaso et al., 2020). Most of these researches (4) took place in African countries (Chang et al., 2010; Odiaka, 2012; Isler et al., 2019; Mwalupaso et al., 2020).

Eight papers studied social and classic media (six and two, respectively) (Chang et al., 2010; Rahman et al., 2011; Hearn et al., 2014; Byomire et al., 2016; Duignan et al., 2018; Pyanikova et al., 2019; Bakırcı-Taylor et al., 2019; Koufie and Kesa; 2020). Among the first group, the most mentioned social media was Facebook, which was used at different stages of the food supply chain: urban farmers in Uganda used it to exchange agricultural information and to sell their products (Byomire et al., 2016), the EATCambridge Festival used it to facilitate customer–producer, customer–festival and producer–festival interactions (Duignan et al., 2018), researchers used it to improve healthy eating among children in the USA (Bakırcı-Taylor et al., 2019), and millennials in South Africa posted about their meals helping local restaurants business with e-Word of Mouth (Koufie and Kesa, 2020).

Some of the papers in the body of literature studied several types of digital solutions: for example, Hearn et al. (2014) included 21 of them. The ICT tools covered in their study belonged to the three categories of "App", "Website/Platform" and "Social Media" and they were compared to describe emerging innovations in urban food systems according to their technical, discursive and social components. The digital solutions they described were all aimed at increasing local and sustainable consumption, but in particular they focused on providing information on food provenance, on foraging, on food waste reduction, on cooking as well as reinforcing networks of growers and eaters. In the field of nutrition, Bakırcı-Taylor et al. (2019) compared three types of nutritional interventions (phone text messages, Facebook page and the Jump2Health website) to test with a randomised control trial which intervention resulted in a higher intake of fruits and vegetables in young children.

While the above covered three types of digital solutions each, the following studies covered two. Davies and Garrett (2018) listed several technologies helpful at farm level, such as "CocoaLink" which connects stakeholders in the Ghanaian cocoa supply chain using text and voice messages; "Digital Green", which shares good agricultural practices among smallholder farmers through videos in their own language and dialects; "MFarm", a mobile App connecting Kenyan farmers with urban markets. Ahmed et al. (2016)

described digital solutions belonging to the SENSE project: for example, "E-agriculture", a platform where farmers can ask questions about farming issues to receive possible solutions from agricultural experts; "Agri-eyes", a farm environment monitoring system which can support farmers decision–making. "FarmDroid" a web Application studied by Henriques and Kock (2012) enables smallholders to interact with traders, retailers, consumers, and each other; it also included a dashboard of local prices, planting and harvesting risk indices, weather conditions and access to a virtual marketplace. Chang et al. (2010) paper evaluated the existing ICT contribution in connecting farmers to the market in Senegal: the most widely available ICTs were mobile phones but it was found that they were still not majorly used as a marketing tool by producers.

While describing digital solutions, some authors also addressed the related barriers to their use (Joosse and Hracs, 2015; Tadei et al., 2016; Hossain et al., 2019; Ievoli et al., 2019). Hossain et al. (2019) mentioned farmers' perception of high technological barriers when trying to sell their products in online buying groups in Bangladesh and Ievoli et al. (2019) seconded that by adding the lack of broadband in rural areas is a challenge for many. Another issue peculiar of the agri-food sector is the perishability of agro-food products, which demands quick and accurate supply chain operations (Tadei et al., 2016). On consumer side, the challenge is trust: not being able to see the products first-hand, consumers are unsure of what they are buying, and remain critical of Apps usefulness (Joosse and Hracs (2015).

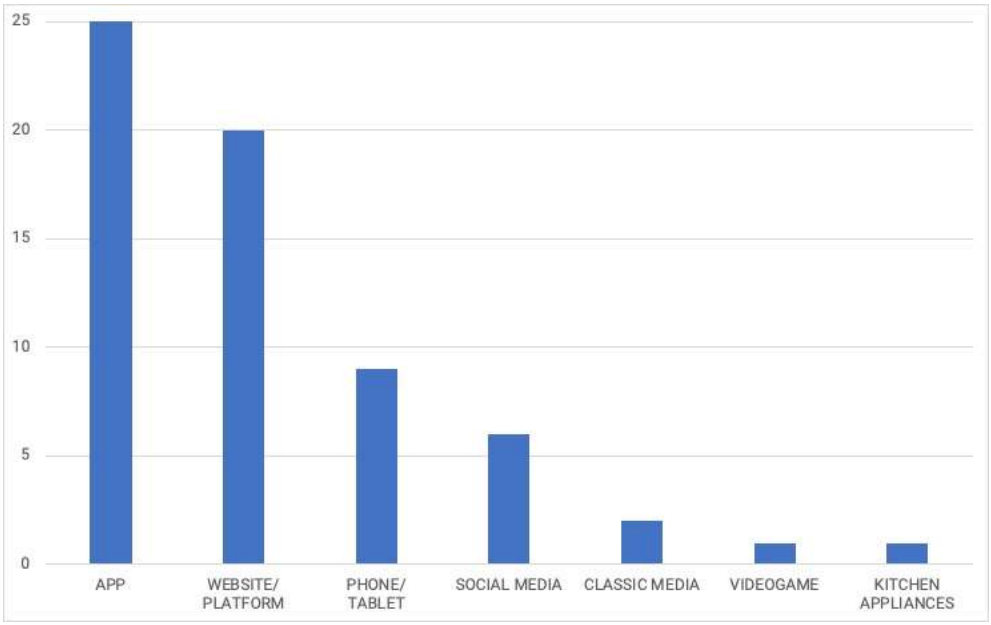

Figure 7. Types of digital solutions studied in the literature (n° of papers).

5.1.1.5 Aims of digital solutions

Most of the digital solutions analysed in the literature have two main objectives (figure 8):

- selling agri-food products - 23 papers (Moon et al., 2012; Vallauri, 2014; Hearn et al., 2014; Kurnia et al., 2015a; Kurnia et al., 2015b; Tadei et al., 2016; Srividya, 2016; Byomire et al., 2016; Ahmed et al., 2016; Wicha et al., 2017; Quaranta and

Salvia, 2017; Della Gala and Reed, 2017; Gupta et al., 2018; Davies and Garrett, 2018; Wang et al., 2019; Thamaraiselvan et al., 2019; Syaglova, 2019; Oborin, 2019; Ievoli et al., 2019; Hossain et al., 2019; De Bernardi et al., 2019; Anib et al., 2019; De Bernardi et al., 2020);

- buying agri-food products - 20 papers (Vallauri, 2014; Hearn et al., 2014; Kurnia et al., 2015a; Kurnia et al., 2015b; Joosse and Hracs, 2015; Tadei et al., 2016; Srividya, 2016; Byomire et al., 2016; Ahmed et al., 2016; Wicha et al., 2017; Quaranta and Salvia, 2017; Della Gala and Reed, 2017; Wang et al., 2019; Thamaraiselvanet al., 2019; Syaglova, 2019; Oborino, 2019; Ievoli et al., 2019; De Bernardi et al., 2019; Anib et al., 2019; De Bernardi et al., 2020).

The three papers present in the first group and not in the second are solely focused on the producers' side, therefore only describing the use of the digital solution from their point of view, while the remaining 20 studied how the digital solution helped the exchange between producers and consumers.

Similarly, 16 papers addressed the topic of food delivery, which is the fifth aim for number of digital solutions addressing it and it is strongly linked to the first two (Vallauri, 2014; Hearn et al., 2014; Kurnia et al., 2015a; Kurnia et al., 2015b; Tadei et al., 2016; Srividya, 2016; Ahmed et al., 2016; Wicha et al., 2017; Quaranta and Salvia, 2017; Della Gala and Reed, 2017; Wang et al., 2019; Thamaraiselvan et al., 2019; Syaglova, 2019; Oborin, 2019; Ievoli et al., 2019; Anib et al., 2019). This result reflects a similar finding of the exploratory Apps search, where Apps used for buying and delivering food products were the two most common (see 6.3).

The third most popular aim for digital solutions was networking with consumers, which was addressed by 18 papers (Chang et al., 2010; Rahman et al., 2011; Moon et al., 2012; Henriques and Kock, 2012; Vallauri, 2014; Hearn et al., 2014; Kurnia et al., 2015a; Kurnia et al., 2015b; Bacarella et al., 2015; Eli et al., 2016; Byomire et al., 2016; Della Gala and Reed, 2017; Duignan et al., 2018; Pyanikova et al., 2019; Ievoli et al., 2019; De Bernardi et al., 2019; Koufie and Kesa, 2020; De Bernardi et al., 2020). The concept of networking with consumers here addressed is definitely linked with marketing and the sense of belonging that marketing strategies aim at creating in consumers. In light of this, it is interesting to note that the item "food promotion" was not the aim for any of the digital solutions described in the literature: the networking action appears to be limited to users sharing food information and reviews of food places. Other aims unrepresented in the literature were information about urban agriculture and job search/labour management. The former is interesting as other forms of food information (on seasonal or organic food for example) were present in the literature, albeit in limited amounts. The latter instead was in contrast with a general trend of growing popularity for job search Applications, linked with the need of a more fluent exchange between jobseekers and employers, especially in the agricultural sector.

The fourth most popular digital solution aim, with 17 papers dedicated to it, is health advice, a concept in line with the analysis of the section of the agro-food chain, where healthy consumption was the third most popular (Rossi et al., 2010; Ball et al., 2014; Gilliland et al., 2015; Pieniak et al., 2016; Gupta, 2016; Tonkin et al., 2017; Shanita et al., 2017; Marchetti et al., 2018; Kaur et al., 2018; Pond et al., 2019; Nikmawati et al., 2019; Murthy et al., 2019; Isler et al., 2019; Dellinger et al., 2019; Bakırcı-Taylor et al., 2019; Poelman et al., 2020; Mwalupaso et al., 2020).

Other frequent goals were the connection among farmers, as well as spreading knowledge about food. No papers were found on digital solutions aimed at providing urban agriculture information, giving food promotion or helping with job seeking or labour management.

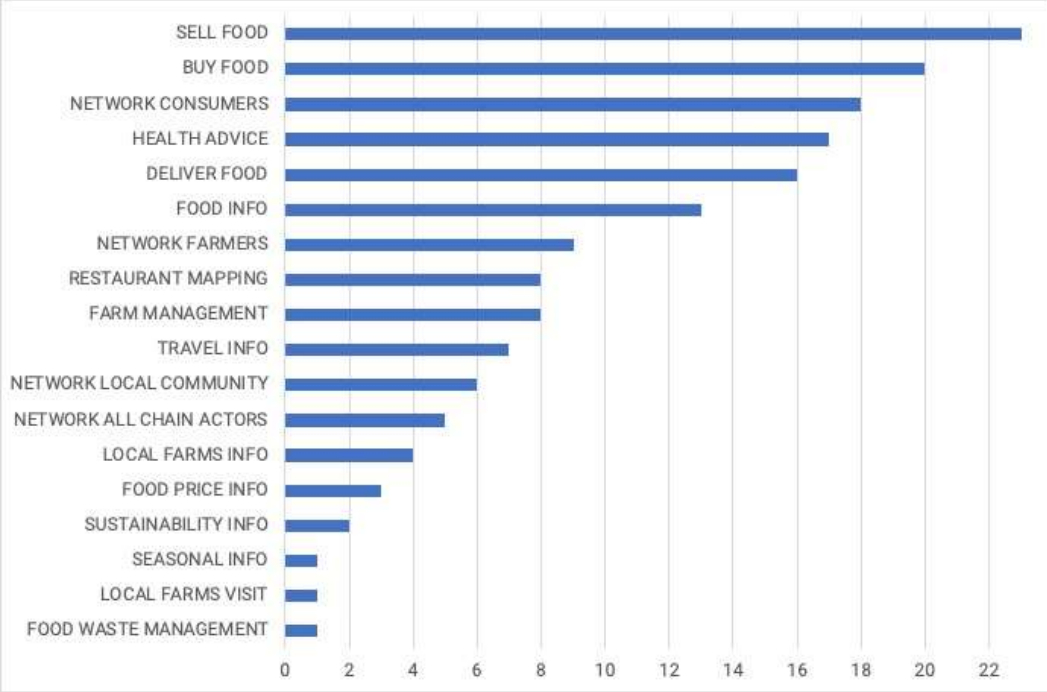

Figure 8. Digital solutions aims (n° of papers).

5.1.1.6 Section of the agri-food chain where the digital solutions operate

Further analysis was included to understand in which section of the agri-food supply chain the digital solution was operating, and the findings were in line with the results above. In Figure 9, the first two columns are:

- production, which accounts for 21 papers (Rahman et al., 2011; Odiaka, 2012; Moon et al., 2012; Henriques and Kock, 2012; Vallauri, 2014; Hearn et al., 2014; Davies et al., 2014; Arapovic and Karkin, 2015; Byomire et al., 2016; Ahmed et al., 2016; Wicha et al., 2017; Quaranta and Salvia, 2017; Della Gala and Reed, 2017; Gupta et al., 2018; Duignan et al., 2018; Davies and Garrett, 2018; Ievoli et al., 2019; Hossain et al., 2019; De Bernardi et al., 2019; Zina and Sun, 2020; De Bernardi et al, 2020);
- distribution, with 18 papers (Chang et al., 2010; Rahman et al., 2011; Moon et al., 2012; Vallauri, 2014; Hearn et al., 2014; Davies, 2014; Kurnia et al., 2015a; Kurnai et al., 2015b; Tadei et al., 2016; Byomire et al., 2016; Ahmed et al., 2016; Wicha et al., 2017; Quaranta and Salvia, 2017; Della Gala and Reed, 2017; Davies and Garrett, 2018; Ievoli et al., 2019; Hossain et al., 2019; De Bernardi et al., 2020).

Similarly, Figure 8 showed how “Sell food”, “Buy food” and “Deliver food” were prominent among digital solutions aims.

When counting all the papers on the topic of "Consumption" (both healthy consumption and consumption in general), this becomes the first category, with 29 papers. For the purpose of this analysis, it was deemed more adequate to split the studies into the two groups of "Healthy consumption" and "Consumption", as shown in Figure 10, and the following analysis will adhere to this classification. Thus, the third most studied section of the agri-food chain is healthy consumption, researched in 16 papers (Rossi et al., 2010; Ball et al., 2014; Gilliland et al., 2016; Pieniak et al., 2016; Gupta, 2016; Tonkin et al., 2017; Shanita et al., 2017; Marchetti et al., 2018; Kaur et al., 2018; Pond et al., 2019; Murthy et al., 2019; Isler et al., 2019; Dellinger et al., 2019; Bakırcı-Taylor et al., 2019; Poelman et al., 2020; Mwalupaso et al., 2020). This section included all the studies on digital solutions used in the nutritional field to stimulate healthy consumption among specific populations or segments of the population. For example, Ball et al. (2014) studied an App supporting healthy food habits among socioeconomically disadvantaged women in Australia while Murthy et al. (2019) used voice messages to reach the same goal in India. Indigenous communities were the target of two studies aimed at creating culturally appropriate nutrition interventions in Australia (Tonkin et al., 2017) and in Canada (Dellinger et al., 2019). Pieniak et al. (2016) analysed how to increase healthy food consumption among young adults in Poland, while Bakırcı-Taylor et al. (2019) focused on fruits and vegetables consumption among young children in the USA.
Since the "Consumption" category is the fourth, with 13 papers written on the topic (Vallauri, 2014; Hearn et al., 2014; Davies, 2014; Kurnia et al., 2015a; Kurnia et al., 2015b; Joosse and Hracs, 2015; Eli et al., 2016; Quaranta and Salvia, 2017; Della Gala and Reed, 2017; Davies and Garrett, 2018; De Bernardi et al., 2019; Anib et al., 2019; De Bernardi et al., 2020) the issue of consumption in general (nutrition-oriented or not) can be considered the first most studied section of the agri-food chain in the literature.

These last findings confirmed a previously highlighted trend: the digital solutions analysed were heavily concentrated on shortening the chain favouring a direct contact between producers and consumers as well as favouring a healthier consumption.

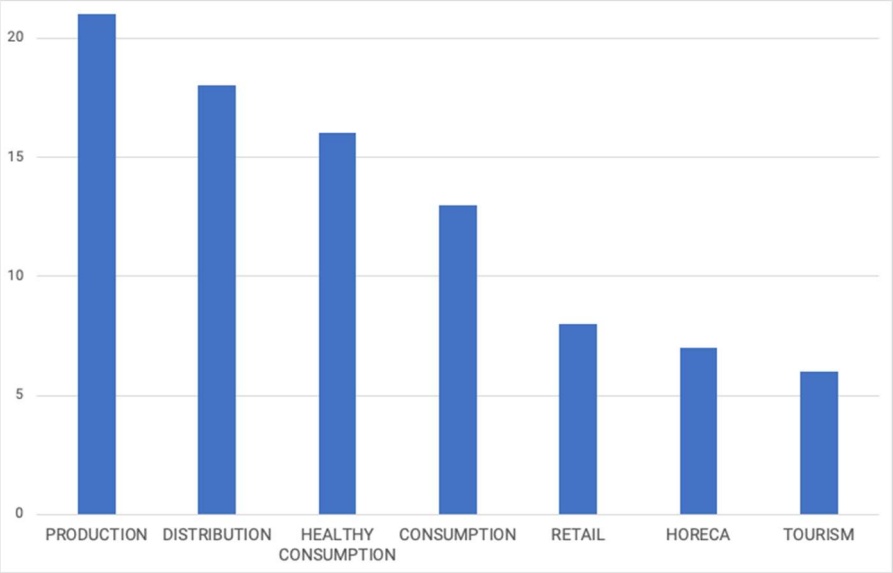

Figure 9. Section of the agri-food chain (n° of papers).

5.1.1.7 Digital solutions effective features

The analysis of effective features of the digital solutions supported that the main advantage in using technology was the improvement in communications and marketing as well as the easy access to information granted.

As shown in Figure 10, "Food information" was the most common feature of digital solutions described in the literature, as it was present in 50 papers out of 57. Its popularity was due to the interests in information of several stakeholders in the food supply chain. On one hand, thanks to websites, Apps and other ICT tools, agri-food producers, restaurants and nutrition experts could share content with clients (or potential ones) in a fast and low-cost manner (Rahman et al., 2011; Byomire et al, 2016; Duignan et al., 2018; Bassano et al., 2019; Koufie and Kesa, 2020). On the other hand, digital solutions allowed interested customers to easily access food information and share their knowledge with other people, building a good or bad reputation through electronic word of mouth.
Some papers also reported that such use of digital solutions can positively impact profits of agri-food enterprises (Henriques and Kock, 2012; Kurnia et al., 2015b; Srividya, 2016; Ahmed et al., 2016; Wicha et al, 2017; Quaranta and Salvia, 2017; Fauzi et al., 2017; Della Gala and Reed, 2017; Gupta et al., 2018; Wang et al., 2019; Thamaraiselvan et al., 2019; Syaglova, 2019; Pyanikova et al., 2019; Oborin, 2019; Ievoli et al., 2019; Hossain et al., 2019; De Bernardi et al., 2019; De Bernardi et al., 2020). Digital solutions granted an increase in profits by expanding the customer and consumer base as well as by allowing a higher bargain power to farmers in setting the price (due to the elimination of middlemen). Some authors, however, argued that establishing a pricing model for online transactions which allows good profit margins for producers while being appealing for consumers has proven difficult (Kurnia et al., 2015a; Tadei et al., 2016).

Networking and user interaction were also found to be playing an important part, being discussed in 32 papers. As reported in 6.1.1.5., networking was guaranteed across the food supply chain: for example, in the study about the Food Assembly in Italy, De Bernardi et al. (2019) claimed that "socially and environmentally driven community-oriented platforms can benefit from online interactions" as they facilitate the development of trust towards the network. Kurnia et al (2015a) seconded this finding by arguing that "community engagement and empowerment" were benefits often cited by participants in the Open Food Network in Australia.

Albeit not being a prevalent feature, "Mapping" is worth mentioning as it is increasing in popularity recently and as location tags (also present in social media) were deemed a crucial marketing tool.

Other interesting features for successful digital solutions which increase customers' satisfaction and engagement were:

- security of payments;
- punctuality of food delivery;
- the use of video and photo material.

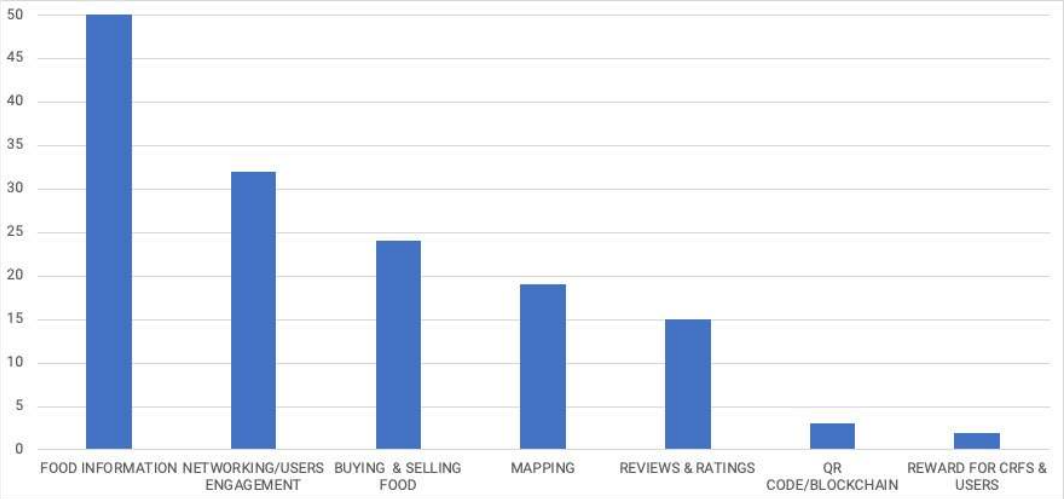

Figure 10. Digital solutions effective features (n° of papers).

5.1.2 Results of literature focused on Apps

Given the aim of the present subtask, it was deemed relevant to aggregate results to focus specifically on the 25 papers studying mobile phone Applications.

5.1.2.1 Temporal and geographical distribution of papers focused on Apps

Starting from geographical distribution of papers, as Figure 11 shows, interesting results emerged: when selecting only studies about Apps, Asia was strongly dominating the literature, with 13 papers on the topic (Yen and Zaaba, 2016; Eli et al., 2016; Ahmend et al., 2016; Wicha et al., 2017; Shanita et al., 2017; Fauzi et al., 2017; Gupta et al., 2018; Davies and Garrett, 2018; Thamaraiselvan et al., 2019; Syaglova, 2019; Oborin, 2019; Nikmawati et al., 2019; Anib et al., 2019), followed by Europe (Joosse and Hracs, 2015; Pieniak et al., 2016; Eli et al., 2016; Davies and Garrett, 2018; Poelman et al., 2020; Lee et al., 2020) and Oceania (Hearn et al., 2014; Bali et al., 2014; Eli et al., 2016; Tonkin et al., 2017; Davies and Garrett, 2018; Pond et al., 2019) with six papers each.
It is important to note that some papers focused on more than one geographic area.
The most popular countries among the Asian papers are India (Gupta et al., 2018; Thamaraiselvan et al, 2019; Anib et al., 2019) and Malaysia (Yen and Zaaba, 2016; Shanita et al., 2017; Fauzi et al., 2017), with three papers each, followed by Russia with two (Syaglova, 2019; Oborin, 2019).

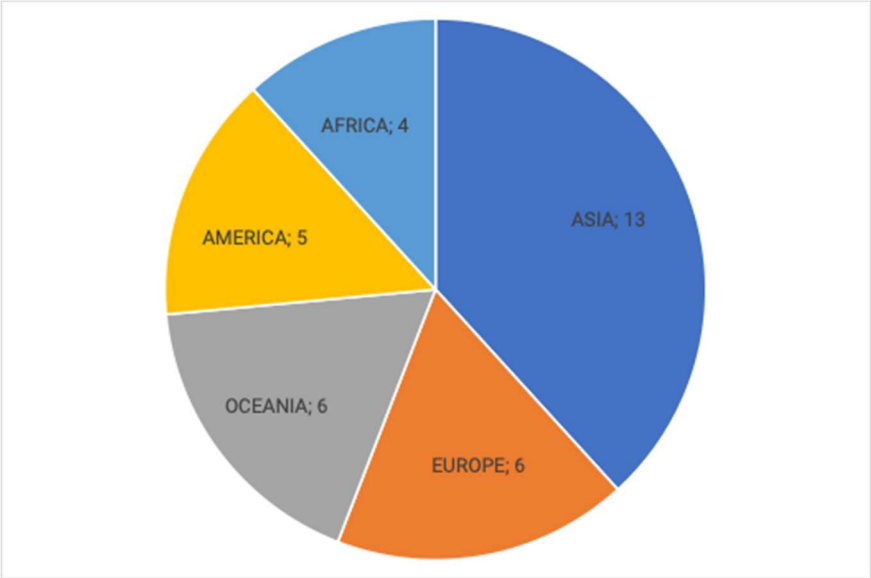

Figure 11. Geographical distribution of papers focused on Apps.

In terms of timeframe, the results focused on Apps reflect the tendency of the full literature analysis: as shown in Figure 12, a strong upward trend is present after year 2016 (with the exception of year 2018). Moreover, no papers on Apps were published in the early years of the decade (2010 and 2011).

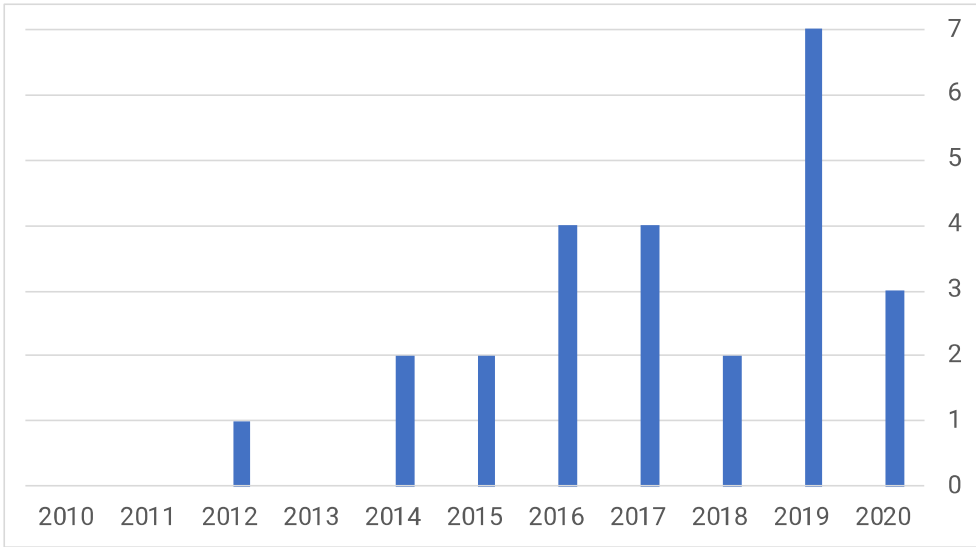

Figure 12. Time distribution of papers focused on Apps.

5.1.2.2 Journals of publication and aims of the papers focused on Apps

As far as journals of publication are concerned, IT was confirmed to be at the forefront with 29% of papers published in this field – an 8% increase compared to general results (Figure 13). A similar increase was recorded in the nutritional field, which was again at the second place, with 23% of papers: the focus on nutrition was 7% higher on Apps than in all the digital solutions.

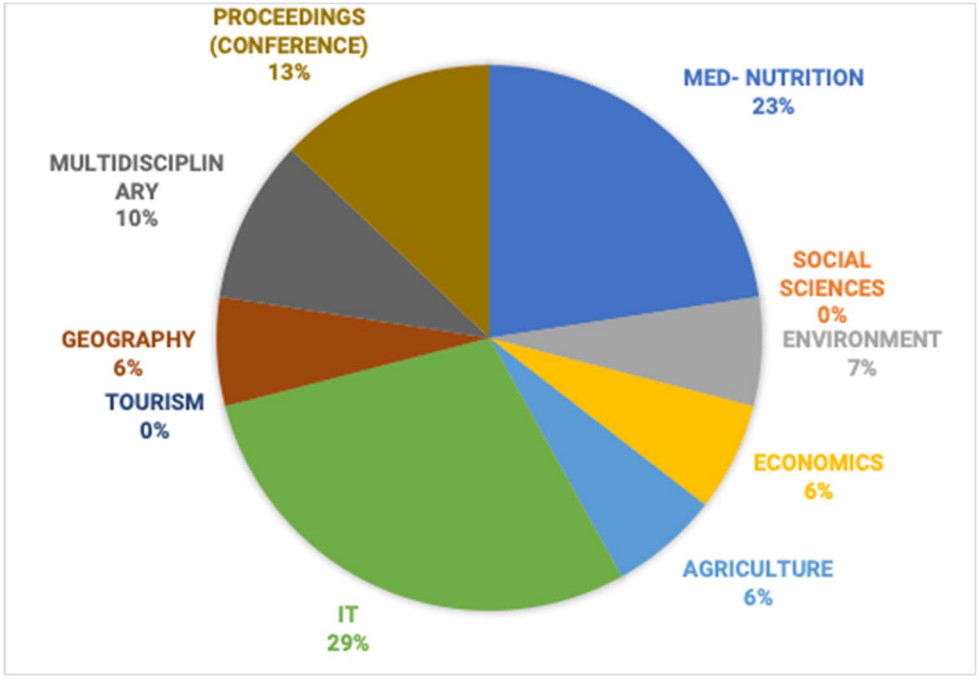

Figure 13. Journals of publication of papers focused on Apps in percentage.

As Figure 14 shows, the first two aims of papers focused on Apps were the same as in the results on all the digital solutions: effects of digital innovations on local and sustainable consumption and effects on healthy eating. The third biggest slice included the four papers presenting an App prototype (Gilliland et al., 2015; Fauzi et al., 2017; Gupta et al., 2018; Poelman et al., 2020). The four prototypes were quite different from each other: for example, Gilliand et al. (2015) designed an App to encourage healthy eating by reducing educational, behavioural and economic barriers to accessing healthy and local food, while "FoodieRoute", the App described by Fauzi et al. (2017) guides tourists to discover eating places in the region of Sarawak in Malaysia. Gupta et al. (2018) developed a mobile phone Application which allows famers in India to sell their livestock more easily, while the FoodTrack study presented by Poelman et al. (2020) allowed the researchers to examine the participants' food environment to assess their food choices and to examine the moderating role of individual and contextual determinants (such as mood, companion, time of the day) of food purchases and consumption.

Effects of digital solutions on tourism and retail were the least studied in this case as well.

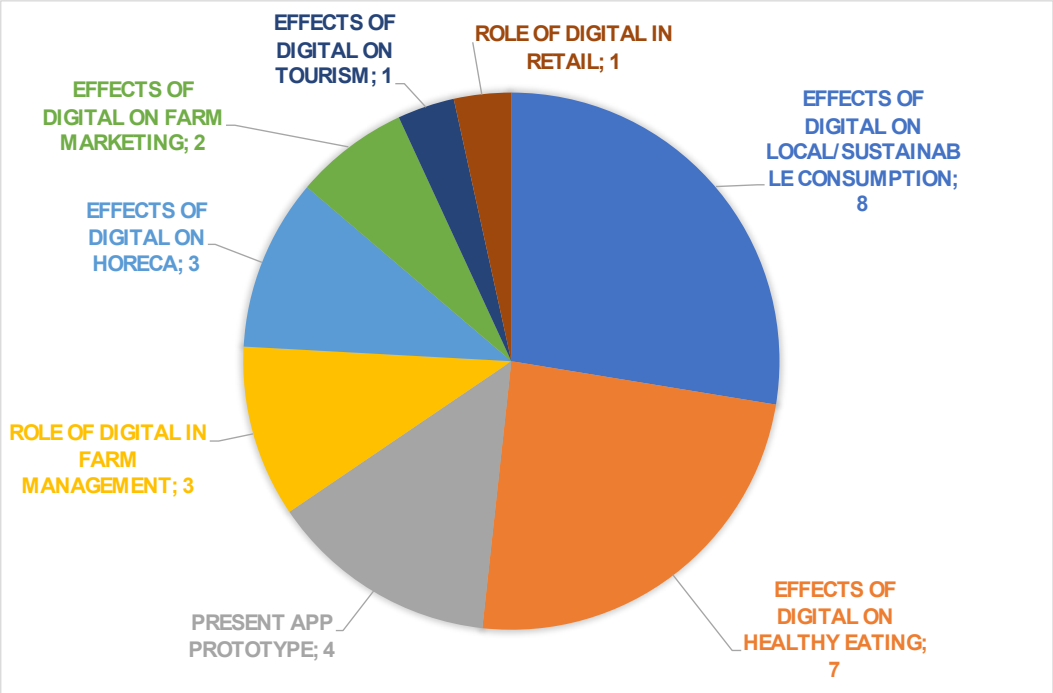

Figure 14. Aims of the papers focused on Apps (n° of studies).

The percentages of papers with rural and urban setting are again equally distributed with 45% and 42%, respectively. Similarly, methodological approaches are homogeneous: both qualitative and quantitative are 43%.

5.1.2.3 Aims of the Apps and stage of the agri-food chain

Both Figure 15 and Figure 16 show an interesting variation compared to the analysis of all the digital solutions: the focus on healthy consumption appeared consistently stronger. Nine out of 25 papers on Apps aimed at providing health advice (Ball et al., 2014; Gilliland et al., 2015; Pieniak et al., 2016; Tonkin et al., 2017; Shanita et al., 2017; Pond et al., 2019; Nikmawati et al., 2019; Dellinger et al., 2019; Poelman et al., 2020), and healthy consumption was the most present section of the agri-food chain.

Popular aims among Apps were respectively:

- Selling (nine papers, Hearn et al., 2014; Ahmed et al., 2016; Wicha et al., 2017; Gupta et al., 2018; Davies and Garrett, 2018; Thamaraiselvan et al., 2019; Syaglova, 2019; Oborin, 2019; Anib et al., 2019),
- Buying (eight papers, Hearn et al., 2014; Joosse and Hracs, 2015; Ahmed et al., 2016; Wicha et al., 2017; Thamaraiselvan et al., 2019; Syaglova, 2019; Oborin, 2019; Anib et al.2019)
- Delivery (seven papers, Hearn et al., 2014; Ahmed et al., 2016; Wicha et al., 2017; Thamaraiselvan et al., 2019; Syaglova, 2019; Oborin, 2019; Anib et al., 2019).

In some papers, the Apps aim of selling food was paired with the aim of networking with other stakeholders in the food supply chain and of mapping local restaurants. As for the former, see section in 6.1.1.4 for insights on the digital solutions studied by Ahmed et al.

(2016), Gupta et al. (2018), Davies and Garrett (2018). As for the latter, three papers focused on both selling, buying and delivering food and on restaurant mapping: Hearn et al. (2014), Thamaraiselvan et al. (2019), Anib et al. (2019). For example, in the US and Canada the App "Eat St." provides an interactive map where users can find food trucks in many cities and the website "Eat Well Guide" includes an interactive map ("Eat Well Everywhere") with the localisation of stores, restaurants, bakers, CSAs and butchers selling local produce in the US (Hearn et al., 2014). In the other two papers, food delivery Applications and their perception among Indian consumers were studied (Thamaraiselvan et al., 2019; Anib et al., 2019). While Thamaraiselvan et al. (2019) aimed at identifying and explaining the drivers for the acceptability the future trends of food delivery platforms in Indian food marketing scenario, Anib et al. (2019) focused on the consumer perception and level of satisfaction of a single App, "Swiggy", developed by an Indian company. No papers were found on Apps aimed at:

- providing urban agriculture information
- promoting food
- helping with job seeking or labour management
- organising local farm visits
- networking with the local community.

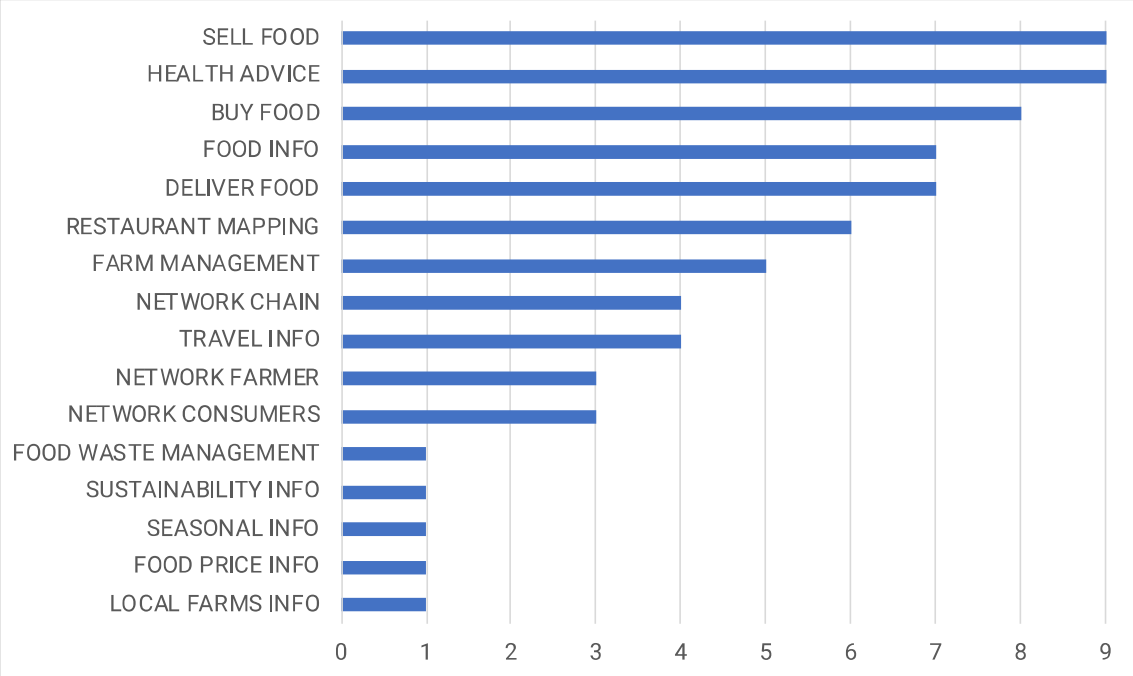

Figure 15. Aims of the Apps described in the papers (n° of studies).

As far as the section of the agri-food chain is concerned, Figure 16 shows that the most interesting change was that of HORECA: while in the analysis of all the digital solutions only seven papers out of 57 (12%) were focusing on this sector, five out of 25 (20%) of the papers on Apps concentrated on HORECA (Hearn et al., 2014; Thamaraiselvan et al., 2019; Oborin, 2019; Nikmawati et al., 2019; Anib et al., 2019). In particular, Oborin (2019) studied how the adoption of new technology could increase the restaurant management efficiency and provide better service quality to clients. For example, local automation systems were recommended for their potential to manage more accurately

both the order of service and the supply of ingredients in the kitchen (Oborin, 2019). The digital solution studied by Nikmawati et al. (2019) is an offline educational Application delivering content about traditional foods of the region of Cireundeu in Indonesia. Albeit being a food information App, it was listed in the HORECA category as it is specifically targeted to students of culinary arts, which makes a difference both in how the information is delivered and in how the students will work.

As for the disaggregated results, tourism was the least studied category (see Figure 16). However, half of the papers in this field (three out of six) were App-related (Yen and Zaaba, 2016; Fauzi et al., 2017; Lee et al., 2020). Yen and Zaaba (2016) developed an Android App called "Malaycious" whose main function was to map local restaurants in Malaysia. Their App consisted of six main modules: augmented reality for food location, a photographic food diary made by users, a Smart Budget option to select restaurants based on price, a list of top ten Malaysian foods to try, the promotion of Malaysia Food Festival and geographical filtering. The App developed by the study of Fauzi et al. (2017) was also focused on restaurant location but in a specific region of Malaysia, Sarawak. More recently, Lee et al. (2020) also developed an App prototype called "Local Foodie" using mobile augmented reality (MAR) to encourage local food consumption among tourists in Finland.

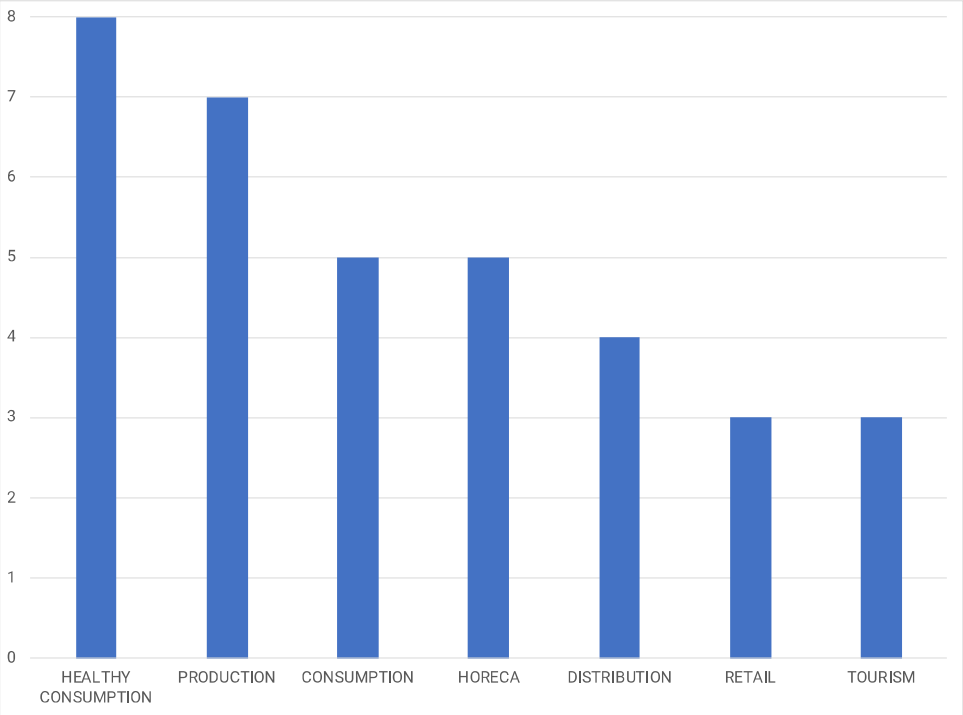

Figure 16. Section of the agri-food chain (n° of papers).

5.1.2.4 Effective features of Apps present in the literature review

As far as successful features are concerned (see Figure 17), results are consistent with the disaggregated results (see 6.1.1.7).

Information on food is the most common feature, present in almost all the papers focused on Apps (22 out of 25). Apps granted an even more immediate access to information as shown by Joosse and Hracs (2015) who described a Swedish App which allowed consumers to scan a product with their smartphone to know if it was produced in Sweden or not.

Networking was the second most common feature, as it was present in 12 papers focused on Apps. Also in this case, networking was guaranteed across the food supply chain: for example, the App developed by Henriques and Kock (2012) enabled smallholders to interact with traders, retailers, consumers, and each other thus encouraging the emergence of sustainable and fair regional markets.

Interestingly, two of three of the papers on blockchain and QR code use were about Apps. Hearn et al. (2014) described the "Harvest Mark" App, which provided a food traceability system allowing consumers to scan a QR code with their smartphones and receive information about the participating fruit, vegetable and poultry brands, including where the food was grown and what kinds of seeds were used. Syaglova (2019) described the case of a Russian food company using blockchain technology to certify the quality of the food they sell.

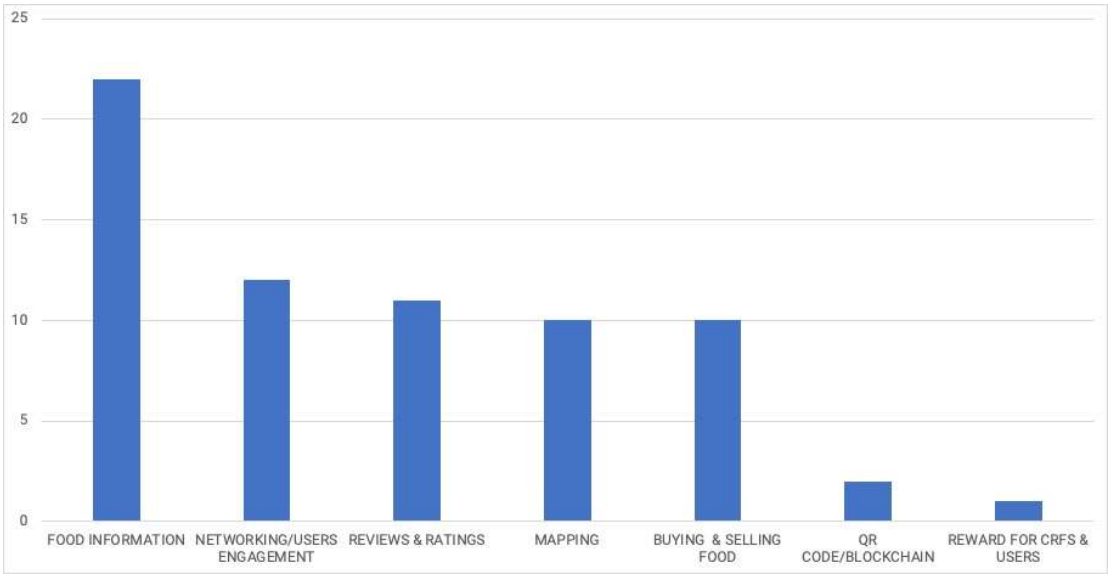

Figure 17. Successful features of the selected Apps (n° of papers).

5.2 FoodE experts: partners' survey results

After circulating the questionnaire within FoodE consortium and, through snowball sampling, to their extended network, 68 valid answers were received.

Female respondents were the majority, while 29% were male.

The average age of the respondents was 36 years old and almost half of them were from Italy (49%). Other countries of origin were Spain (20%), followed by Germany (8%), France (7%), Netherlands (5%). This result reflects the partnership composition, where many of the researchers involved work for Italian institutions.

Only 13% of respondents have been using Apps related to the agro-food system in the past two years, while the remaining 87% have not. The formers were asked to indicate the main objective of the App they used. The results are fairly consistent with the literature review (see Figure 18).

None of the respondents indicated Apps aimed at networking with other stakeholders in the food supply chain, or at providing information on sustainability, or on organic food, or at giving health advice or information on food prices.

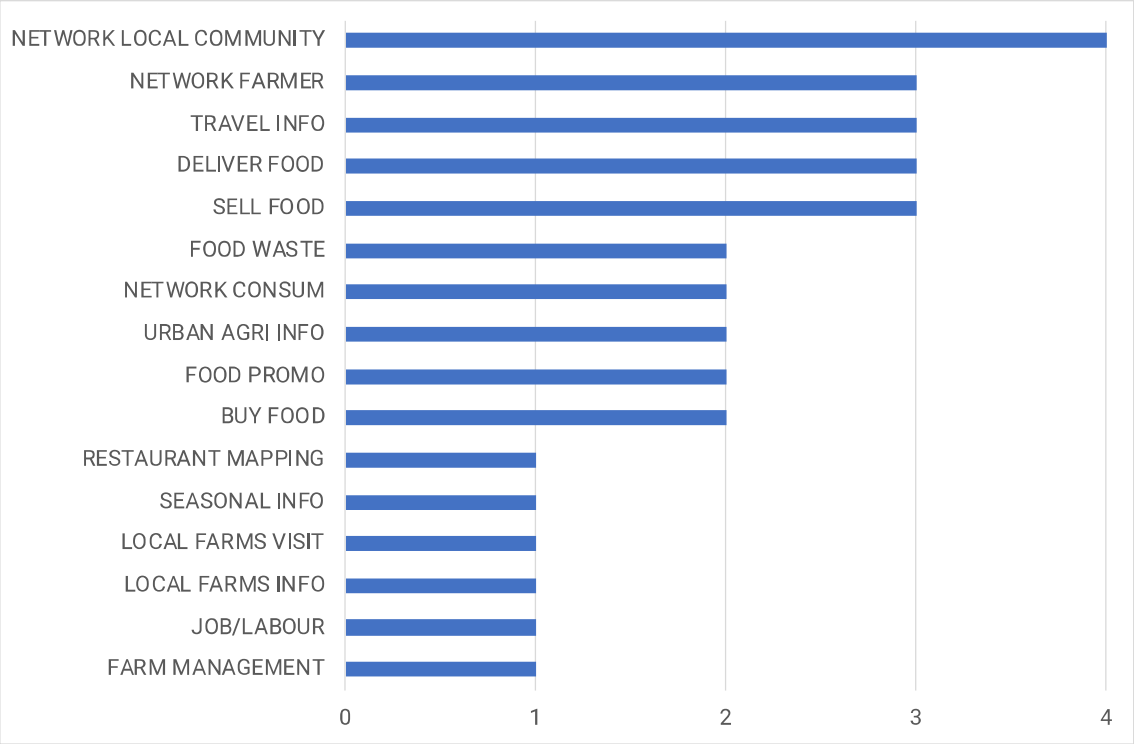

Figure 18. Aims of the Apps indicated by partners in the survey (n° of answers).

5.3 Applications analysis results

The 126 Apps resulted from the search were analysed through content analysis and through the hierarchical taxonomy of Behaviour Change Techniques (BCTs) developed by Michie et al. (2013).

The results of the analysis are the following.

Most Apps (113) were available in Google Play Store, while 96 were downloadable from the App Store.

The most common category is Food & Drink, where the vast majority of Apps (63 out of 126) fell. Examples in this category were quite diverse, from Apps ensuring direct contact between producers and consumers (i.e. "L'alveare che dice sì - La ruche qui dit oui") to more common food delivery Apps (i.e. "Zomato") and Apps fighting food waste ("Too Good To Go"). The second most popular category was "Shopping", with 17 Apps, where for example both "Esselunga", a leading Italian supermarket, and "Cortilia", an online agricultural market, could be found. All the other Apps fell in the categories of Lifestyle,

Travel & Local, Education, Health and Fitness, Business, Productivity, Social, Tools, News & Magazines.

In terms of number of downloads, the most popular Apps were "UberEats", "Zomato" and "TripAdvisor", all three with more than 100.000.000 downloads, while "MyFitnessPal" and "Swiggy" followed with 50.000.000+ downloads. The third group of the most widespread Apps includes Apps with more than 10.000.000 downloads, e.g. "Too Good To Go", "FoodPanda", "Deliveroo", "Yazio", "Glovo", "Vivino", "The Fork", "McDonald's Deutschland" and "Platinx -Your crop doctor". Results supported that food delivery Apps were prominent. This was especially true during Covid-19 pandemic, when delivery platforms have helped agri-food business to remain active while minimising the risks (IFPRI, 2020). Some food delivery companies, such as "Swiggy" have gone a further step providing funding to restaurants to resume operations with hygiene and distancing upgrades (IFPRI, 2020).

Considering the countries where the Apps were developed, the results showed considerable differences from the literature review: while Asia prevailed in the papers, in the Apps inventory Europe was the leading continent, standing out from the others by a large number (see Figure 19). In particular, 61 Apps were developed in Europe, while 30 in America, 19 in Asia and 7 and 5 in Africa and Oceania respectively. Such asymmetry could be partly due to language: on one hand, English is nowadays the most common language of academic writing, therefore allowing homogeneity of results; on the other hand, Apps are often developed in the local language, thus limiting the results to the researchers' literacy in foreign languages.
In the context of this research, the country indicated referred to the country of origin of the company developing the App, but it is important to note that various Apps were used in other states: for example, "Maano" was created in the US to be used by Zambian farmers.

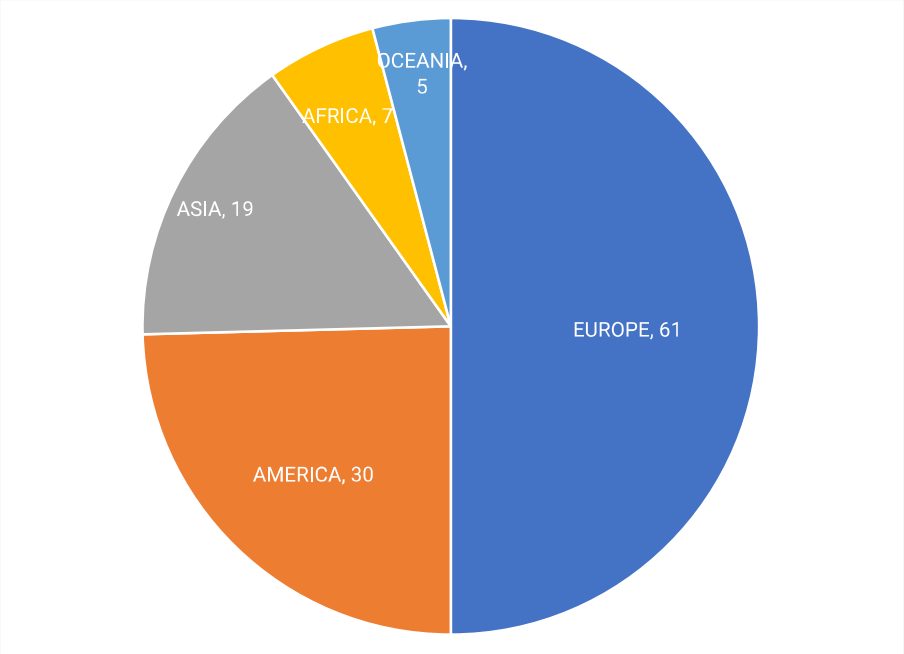

Figure 19. Geographical distribution of analysed Apps (n° of Apps).

The six Apps with the highest possible user rating (5/5) were: "A casa tua", "Fresh&Local", "Chyve - Local Food Network", "Natoora", "Croft - Urban Farms" and "happyplace". Users particularly appreciated the chance to have easy access to fresh and local food on their tables. Only two Apps had the lowest possible rating (1/5): "Central Mass Locavore" and "Foodcourt", mainly due to negative feedback on the registration process.

5.3.1 Apps features

Most of the selected Apps focused on food delivery, from small ones such as "NeatEat" and "Localtoyou", to the most popular ones like "JustEat" and "Deliveroo". The delivery was mainly of restaurant dishes but also of fresh agri-food products. Some Apps selling small producers' goods did not include delivery in their services. This type of Apps included information on food products and a few included discounts for loyal customers. Apps were present in smaller numbers were those targeted at tourists with travel information, those providing nutritional advice and specific sustainability information.

The most common feature among the 126 Apps was "Food information", present in 98 of them (Figure 20). This item included a wide range of food-related content such as recipes, stories of producers and details on products sold through the App. Information on seasonal food was included in a separate category, and it was featured in 15 Apps. Nine of these were developed in Europe and in particular in Italy and France, reflecting the importance given by both countries to gastronomic culture. Interestingly, seasonality was not mentioned in any of the analysed papers. A few Apps were specifically focused on information on alcoholic beverages, such as "Vivino" and "Wine-searcher" for wine and "Pint Please" for beer.

The second most common feature was "Mapping", present in 68 Apps. It often included the users' geolocalisation and a list of filters to select restaurants, grocery shops and/or farms according to the characteristics searched by the users.
Interestingly, four Apps were very specific in the information provided and only included restaurants cooking with local ingredients: "ULocal" "Osterie d'Italia 2020", "Etiquettable" and "Buy Fresh Buy Local Hampton Roads".
A similar concept was addressed in the literature review by Lee et al. (2020) who mentioned "Sourcemap", an online tool used by restaurants to show the miles travelled by the food they serve.

The third and fourth most common features were in line with the body of literature. As mentioned in 6.1.1.5, buying and selling food were popular items, both present in 63 Apps, while only 50 of these included a food delivery service. In all the other cases, a collection point was indicated by the seller.

"Travel info" consisted of 16 Apps with restaurants recommendations for tourists (i.e. "Going local" and "Il Golosario Ristoranti") as well as cooking classes and market visits with local people (i.e. "TravelingSpoon" and "Cesarine").

11 Apps reported information on the sustainability of agro-food products. In particular:

- "SeafoodWatch" included data on sustainable fishing methods, marine ecosystems conservation and on sustainable fish species;

- "AnaliSAFs" allowed the socio-environmental analysis of agroforestry systems;
- "Fresh & Local" embedded a *green-o-meter* to calculate the food miles of agro-food products bought by users.

Among the three Apps providing "Urban agriculture information" were included "Croft – Urban farms" and "Farmizen". They were Indian Apps with a similar feature: both were allowing users to rent a small piece of land and to monitor it and grow fruit and vegetable under the supervision of a farmer. A similar model was identified in the literature by Ievoli et al. (2019) whose case study was "Natura Vicina" farm which allowed the active involvement of customers through the possibility of having their own organic vegetable garden to watch growing through webcams located in the greenhouses, and to have them delivered throughout the year.

As opposed to the literature review, no Apps providing information on agri-food prices were found, while the absence of Apps helping with labour management and job search was in line with the literature results.

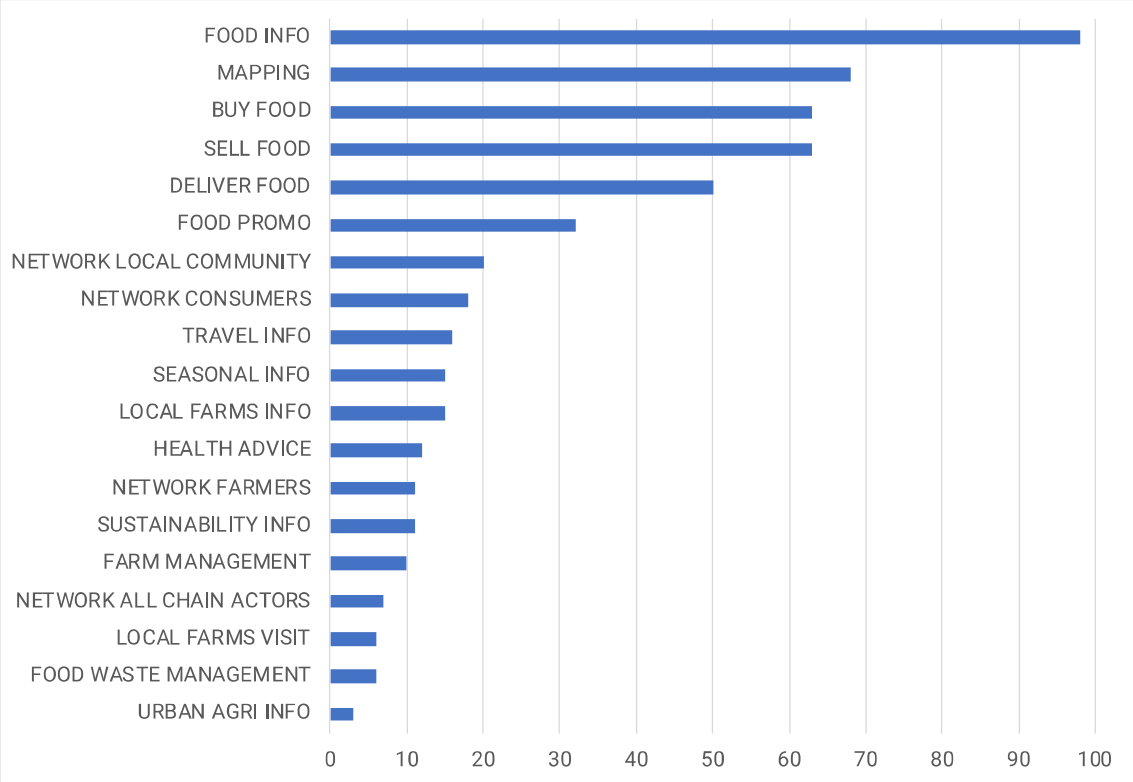

Figure 20. Apps features (n° of Apps).

The research focused on four specific features: community creation, knowledge enhancement, self-monitoring/goal setting, reward/performance feedback (Figure 21).

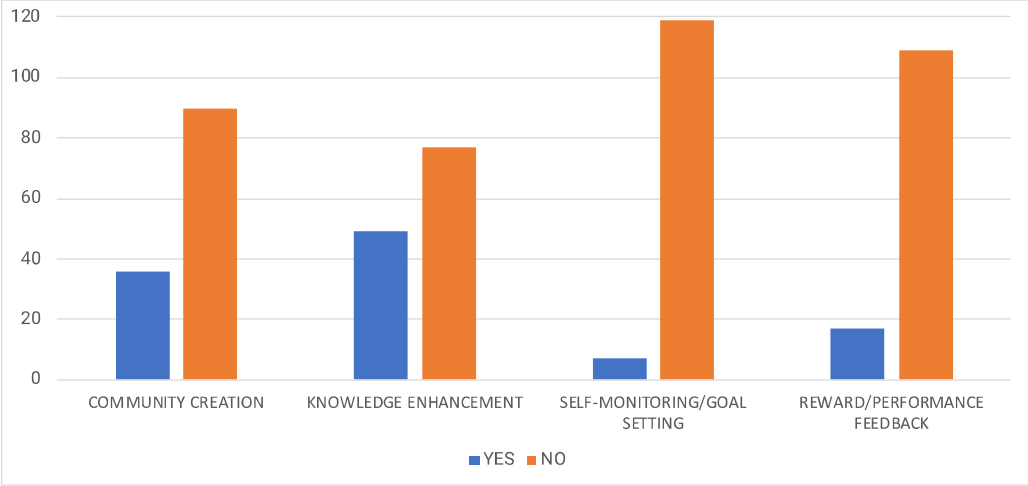

Figure 21. Presence (yes) or absence (no) of four indicators in the selected Apps (n° of Apps).

The most popular of them was "Knowledge enhancement", featured in 49 Apps and targeted to both farmers and consumers, often by combining a community to share contents. "Open Food Facts" allowed the exchange of information on food carbon footprint, nutrients content, traceability and additives to build a sharable online database. "Natoora" included Information targeted to chefs on farmers and their products.

The creation of a community was the second most popular indicator and a feature of 36 Apps, where the network among consumers aimed at sharing personal experiences within the online community. For example, "My Fitness Pal", was among the most downloaded Apps creating a webspace where it was possible to share healthy lifestyle advice and personal results. "OLIO – Share more. Waste less" brought the community from online to offline, allowing the sharing of food which would otherwise be wasted among neighbours.

Under the "Reward/performance feedback" indicator fell 17 Apps mainly providing discounts to frequent customers, such as "Local Food Champion" and "Sayurbox".

"Self-monitoring and goal setting" were the least present indicators (in only 7 Apps), especially nutrition focused ones (i.e. "Yazio" and "FitMenCook") but also educational (Fooducate – D").

The concept of sustainability was mostly addressed by Apps developed in Europe, and a few American ones. Sustainability was declined in two main ways. First of all, the concept of local food is often addressed by Apps targeted to tourists with the idea of involving them in the gastronomic culture of a place by promoting local food traditions. Secondly, the issue of food waste was addressed by European Apps only (six Apps) while only one paper in the literature (Hearn et al., 2014) mentioned it.

A remarkable difference between the literature and the Apps inventory was the interest for farm management: Asian and African papers were more focused on this topic throughout the last decade (Odiaka, 2012; Moon et al., 2012; Henriques and Kock, 2012;

Ahmed et al. 2016; Wicha et al., 2017; Davies and Garrett, 2018; Hossain et al., 2019; Zina and Sun, 2020), but among the Apps in the inventory four were American, two European and only two African.

5.4. CRFS use of ICT solutions

The survey was still open at the time of responses accessibility. As of mid-September (14th September 2020), after data cleaning, 139 answers from CRFS initiatives across Europe were received. Figure 22 shows an overview of the geographical distribution of the respondents: almost half of them were from France (55), followed by Spain (31), Germany (20) and Italy (14).

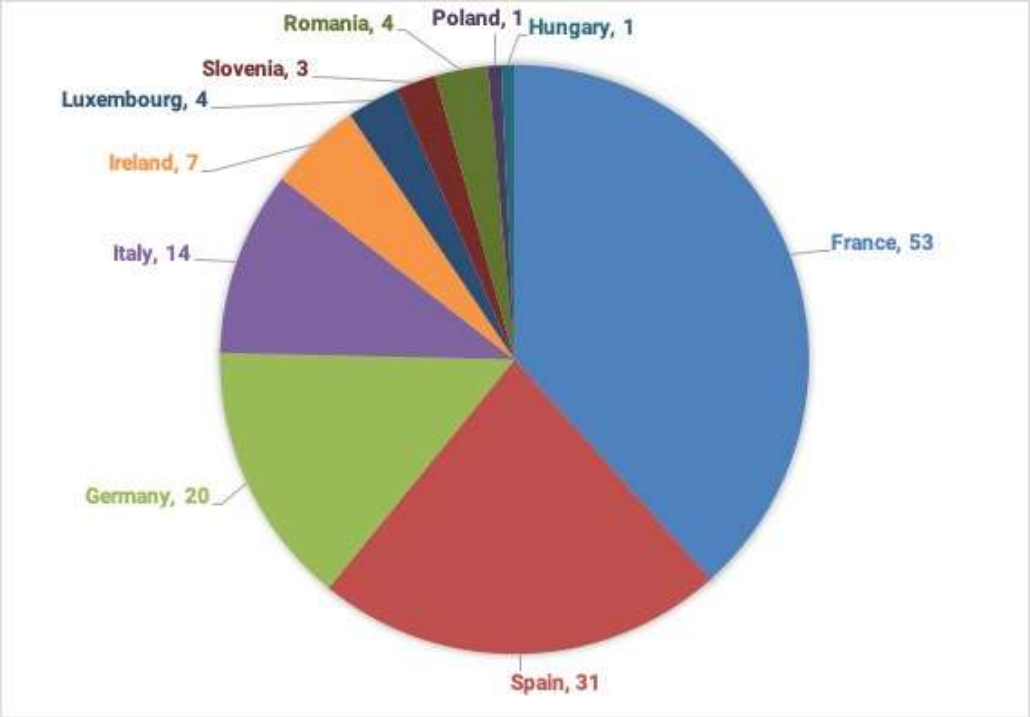

Figure 22. Geographical distribution of CRFS initiatives that responded the survey.

The results showed that CRFS initiatives in Europe participating in the survey proliferated in particular after 2010, as it can be seen from the steady growth shown in Figure 23.

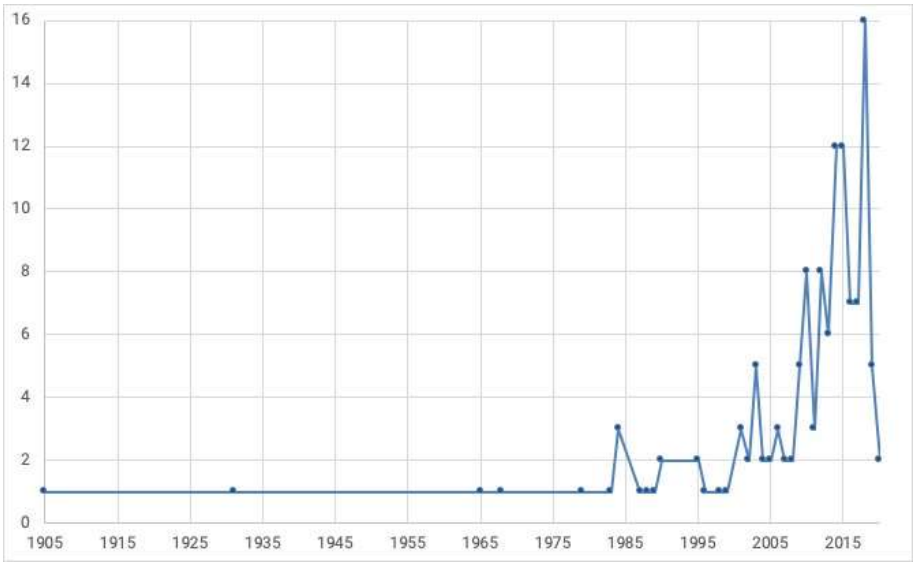

Figure 23. Start year of CRFS initiatives.

Most of the initiatives were located in urban and peri-urban areas (69 and 43, respectively), while only 48 in rural areas (see Figure 24).

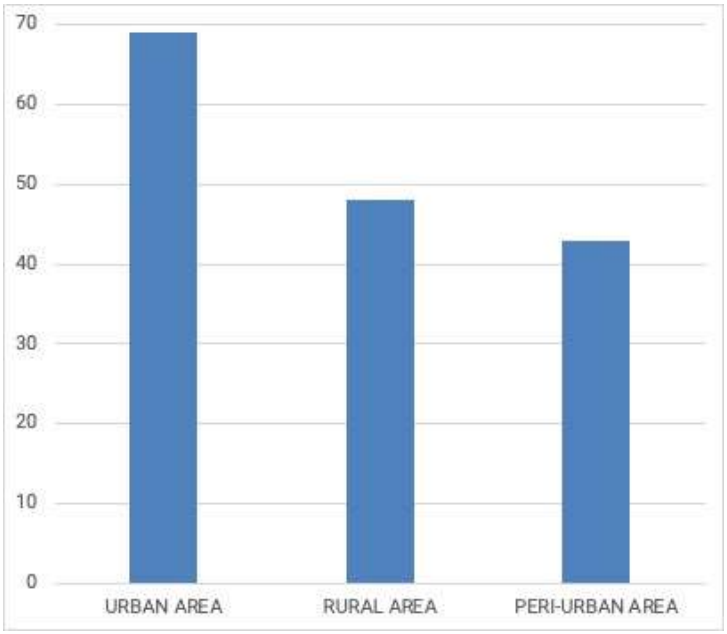

Figure 24. CRFS initiatives location.

The amount of for-profit and not-for-profit initiatives was balanced, as they were present in nearly equal numbers: 78 and 61 respectively.
Agriculture and Fishing was the predominant sector (73) among the CRFS initiatives, followed by Education and services (47) and Food distribution (46). Waste management was the least present, as only 13 respondents focus on this aspect (see Figure 25).

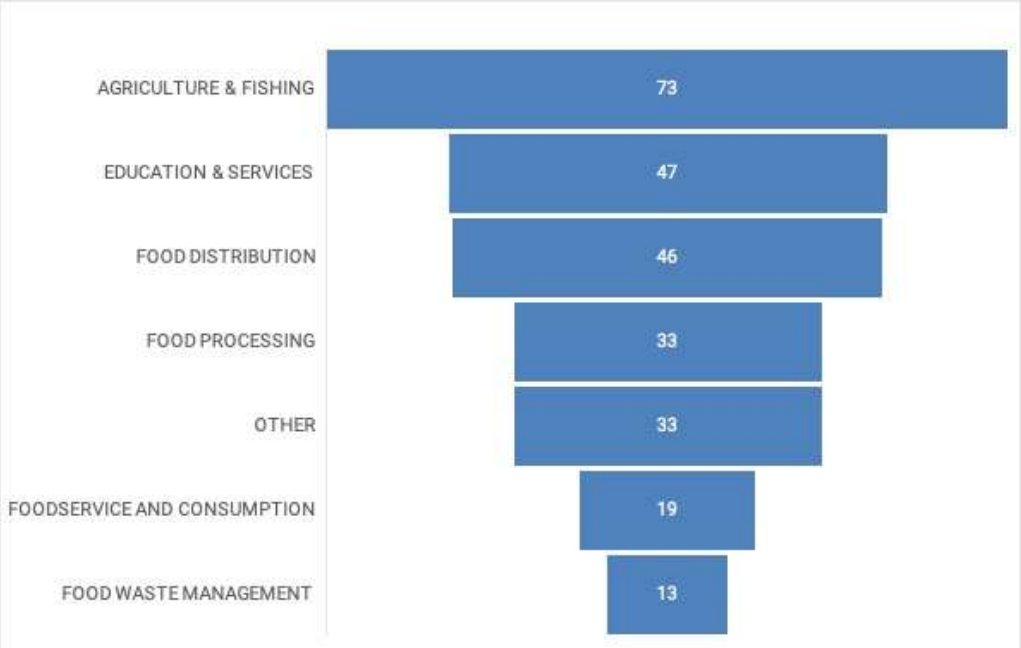

Figure 25. Main task of the CRFS initiatives.

The vast majority of the respondents (129 out of 139) stated that they use digital solutions for the dissemination of their activities. As shown in Figure 26, the most used ICT tools were websites and platforms (119), followed by social networks (113) and Apps (26). Apps were always used in combination with websites and social networks, except for one case: the French urban farm "Sous les fraises" indicated Apps as the only digital solution they use.

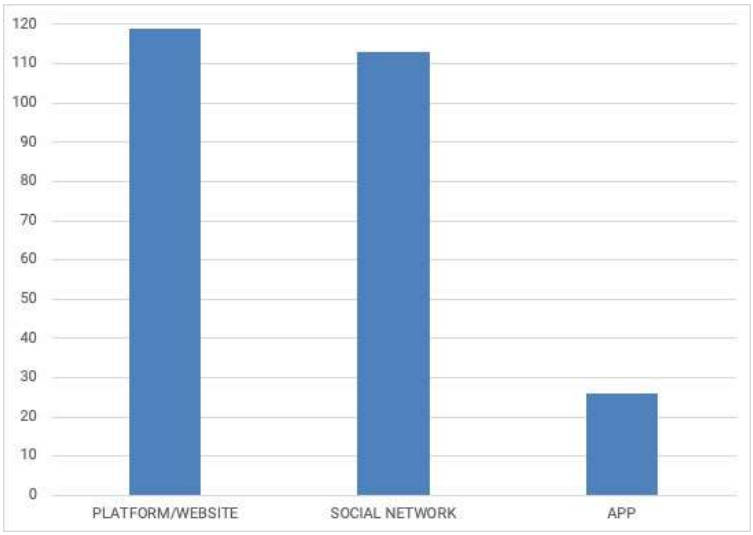

Figure 86. Digital solutions used by CRFS initiatives.

23 out of the 26 CRFS using Apps were founded after 2006. Reflecting the general trend of respondents, most initiatives using Apps were in the urban and peri-urban area (16 and 10, respectively), only seven were in rural areas. More striking is the difference between

for-profit and not-for-profit initiatives. Almost two thirds of those using Apps were for-profit initiatives (17), while only nine were not-for-profit.
Furthermore, the research investigated what were the main tasks of the initiatives using Apps. Out of the 26 CRFS using Apps, 11 were active in agriculture and fishing sector, and 8 in the food distribution sector. This result is supported by the other sources analysed. A new insight emerged from this survey: the education and services sector made wide use of Apps, especially for events promotion, and it was the second most popular with 10 initiatives. The use of Apps in the foodservice and consumption sector was less frequent (7) compared to results of the literature review and the Apps inventory. Lastly, only 4 initiatives in the food processing sector stated that they use Apps, while three were in the food waste management sector.
When comparing these results with the total of respondents some specificities can be highlighted (Figure 27). The highest percentage of App users was among those CRFS in the foodservice and consumption sector (36%), followed by CRFS focused on food waste management (23%), and on education and services (21%). All the other sectors presented lower percentages: agriculture and fishing 15%, food distribution 17% and food processing 12%. These results suggest that CRFS initiatives that are more in contact with consumers are more likely to use Apps.

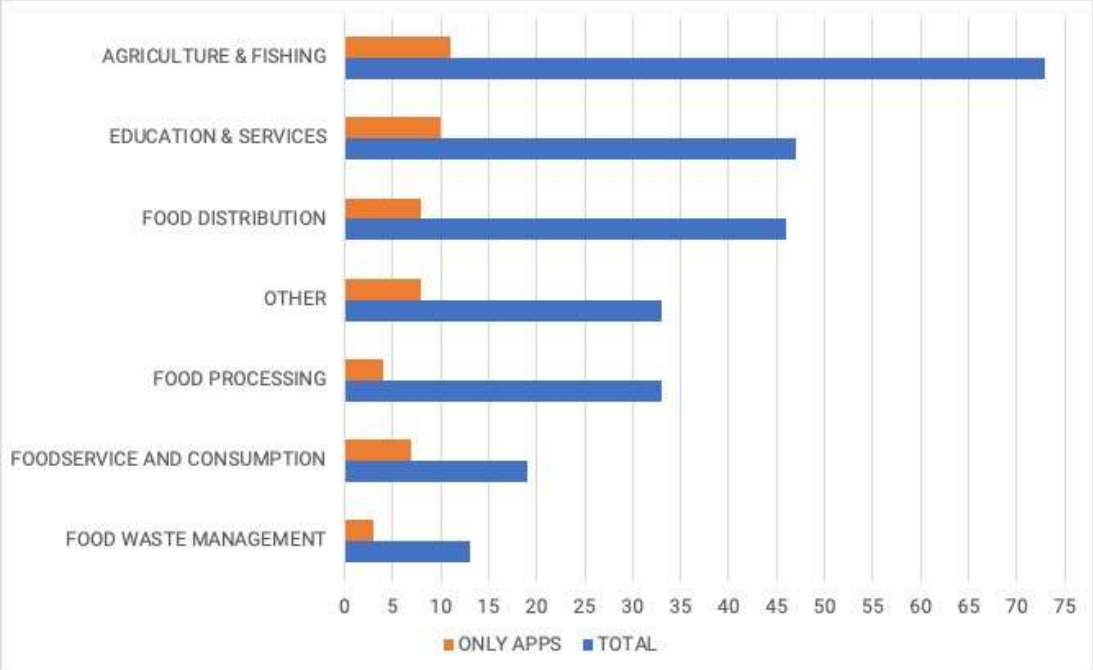

Figure 27. Main task of CRFS initiatives using Apps compared to the total of respondents.

5.5 Summary of key indicators

This section summarises the key literature and other sources' insights emerging from the analysis of the various different sources illustrated above. The contents of Table 1 will inform the suggestions for the FoodE App features included in Table 2.

Source	Key insights

Literature review	From the literature review, the following key highlights were considered the most popular in digital technologies for food purchasing and consumption. — Digital technologies grant easy access to food information, showing that all stakeholders in the food supply chain have an interest in sharing or receiving information. — Digital technologies allow for networking across the food chain and smooth user interaction. — Digital technologies can provide visibility and accessibility of local food initiatives — One third of the articles described Apps that include maps, a feature that showed a consistent growth in recent years. — Digital technologies allow for a stronger and more direct link between consumers, citizens, and local food initiatives. This may strengthen the power of local and smaller agro-food companies. For example, digital technologies allow a higher bargaining power to farmers thanks to channel differentiation and freedom in price setting. — There is little track record of digital technologies allowing for agro-food initiatives' consumer assessment in the literature. Existing consumers feedback is limited to product quality and economic attributes of food products, such as promotions. — Existing studies support that nutrition and fitness-oriented apps provide rewards features to motivate consumers in Apps use and achieve the set results. Rewards are limited in local food promotion Apps. — Apps contribute to community networking, whereas there is limited Apps implementations for liasing with public authorities. Studies support that there may be need to strengthen this aspect. This may provide a stronger extension of local and regional food initiatives. — Apps are widely used for food delivery. Past studies support that the food delivery involves foodservice, including restaurants, cafeterias, etc.. Thus, consumers are sensitive to this type of Apps aim. — Past studies tend to provide focus on single case studies or single countries. There were no studies with an EU-wide geographical coverage.

	— Past studies support that digital technologies can positively impact profits of agri-food enterprises, by expanding the customer and consumer base. — Apps for fighting food waste are limited in number but both very popular and successful in rising awareness on the topic among consumers.
FoodE partners survey	Networking within the local community and among farmers were the two most appreciated features indicated by respondents in the FoodE partnership.
Exploratory search of Apps features	From the Apps analysis, the following three features were considered the most popular in digital technologies aimed at food purchasing and consumption. 1. Providing food information on agro-food products, such as recipes, stories of producers and details on products sold through the App. 2. Including maps of food places, for an easier access to good food. 3. Allowing for food purchases on the App. Online food buying and selling (together with food delivery) have seen a recent growth in volume, especially after the Covid-19 pandemic, the consequent lockdowns, and lower capability to purchase food in person.
Survey for CRFS initiatives	While most of the respondents use digital technologies for the dissemination of their CRFS activities, Apps are the least used. However, the CRFS initiatives using Apps were the most recent, showing a growing trend in Apps use.

Table 1. Summary of key insights from different sources of analysis.

1. Conclusions and insights for FoodE App development

The present deliverable provides an analysis of agro-food digital solutions, by identifying and analysing the available literature on the topic, and the existing relevant agro-food Apps from various sources.

The number of studies on this topic has been steadily growing in the last decade and will probably continue to expand. As stated by the FAO, the opportunities created by digitalisation are manifold. The literature predominant focus on urban areas confirm the international agro-food institutions' claim according to which digital technologies could strengthen the urban-regional links, that is the main focus of the FoodE project. Digital technologies reinforce the connection between urban and regional food systems by eliminating the middlemen and allowing for a direct contact between producers and consumers.

Moreover, access to Apps, online platforms and websites enhanced the linkages among agro-food chain stakeholders: while the FAO focused on international connectivity, the present report found that the strongest links emerge at a local level. However, none of the articles in the literature addressed how authorities can check the quality and the safety of food sold directly to consumers, making it an interesting issue for further studies. The creation of an online community has proven crucial in enhancing networking among consumers and between them and farmers, radically changing the food shopping experience from both sides. While not being substitute for in person exchanges, online interactions help create a sense of community through sharing food choices and food shopping experiences. Digital technologies, through mapping and reviews, have made it easier for consumers to find local producers and restaurants. They also help maintain these new habits by providing further information and a service that is easy to use and fits with consumers′ busy lifestyles. Mobile phone Apps are particularly fitting for this as they are able to target consumers and farmers, helping the former with sustainable consumption and the latter with farm marketing.

Table 2 summarises the recommendations for the FoodE App development. All along the food supply chain, stakeholders' interest in innovative technological approaches to access and distribute food is increasing. ICT tools, and Apps in particular, can be a valuable instrument to strengthen food chain actor relationships, from farmers to consumers, and to distribute food information more effectively. The understanding of Apps' effectiveness and user appreciation reached through this research can increase accessibility, capacity and implementations of digital technologies, leading to ground-breaking transformations in the CRFS approach.

FOODE APP VISION	The FoodE App aims at improving the visibility and accessibility of CRFS initiatives and making them reachable to European consumers on one single platform. For agro-food producers, this will mean reaching a wider consumers base while consumers will have more control over their food choices and ecological impact. Local networks of agro-food stakeholders will proliferate, rebalancing the power in the food supply chain and enhancing the sustainability of CRFS and fostering mutual learning.
FOODE APP AIMS	The FoodE App will be aiming at enhancing direct contact between producers and consumers and strengthening the local community. In particular, it will: 1. Provide information about agro-food products Sharing agri-food information and enhancing food knowledge was found to be a prominent objective. In particular, in the partner survey, local food information when travelling abroad was the most popular, while in the Apps inventory the main information was about the food sold through delivery Apps. The

literature focused on the health advice on the kind of food information received by users.
In general, the ability of delivering or receiving an information quickly and at low cost (or free of cost) is a benefit of digital solutions unanimously recognised.
In particular, the FoodE App will provide information on where to find CRFS agro-food products (i.e. HORECA, local markets, etc).

2. Assess and provide feedback on CRFS initiatives performance

The review of agro-food initiatives is an appreciated feature by users. Exchanging opinions with peers is highly valued. Both in the literature and in the Apps inventory, the presence of databases of information on agro-food products created by users is an added value of Apps. Specific tools such as QR codes are used to establish a dialogue.
Only some Apps were found to be active in the assessment of agro-food initiatives sustainability. FoodE App will be at the forefront in this regard, thanks to the activities carried out within the overall project.

3. Provide rewards for consumers sustainable behaviours

Research results support that rewarding mainly comes in the form of discounts for loyal customers or to encourage new ones to start buying.
Reward for sustainable behaviour is still in its embryonal form, and it was mainly present in Apps about ecological means of transportation: extending it to agro-food purchases will be a very innovative stance for the FoodE App.

4. Mapping CRFS initiatives

Mapping was found to be a prominent feature, especially in the Apps inventory and in the partners' questionnaire. In the former, the map feature is linked to the localisation of the nearest restaurants for delivery, while in the latter geolocalisation helps tourists navigate a new place through travel Apps.

5. Provide opportunities for networking among stakeholders as well as engaging with authorities

Networking was a minor but constant objective of the analysed digital solutions. Features encouraging networking were present in about half of the ICT tools presented in the literature review and in one third of the Apps in the inventory. While not being the focus of most digital solutions, creating and reinforcing an online community of users helps the ICT tool reaching its main aim.

	With the exception of a few papers on public authorities delivering help to farmers or nutritional advice, no examples of cooperation with authorities were found in the literature to be used as a model. 6. Provide opportunities for extending CRFS initiatives and their customers Digital solutions capability of expanding CRFS client base was mainly claimed in the literature review. While presenting a few obstacles (i.e. lack of broadband, unfamiliarity with the use of technology), it was found that ICT solutions benefitted users all along the food supply chain. However, it was not mentioned in the studies whether the existence of digital tools could actually increase the number of active CRFS initiatives.
TARGET GROUPS	The App target is twofold: 1. CRFS initiatives 2. Consumers As described in FoodE Deliverable 2.1, CRFS initiatives of the following activity types will be targeted by the App: • Agriculture & Fishing • Food processing • Food distribution • Foodservice and consumption • Food Waste management • Education and services As for consumers, FoodE App will be targeted at urban dwellers interested in eating fresh local food for health and/or environmental reasons. These consumers will be tech-savvy and in need of a quick grocery shopping tool, which they might use both in their daily lives and when visiting foreign countries.
SUGGESTED FEATURES	The following suggested features are designed to enhance the direct contact between producers and consumers and to strengthen the local community: • E-commerce of CRFS agro-food products • Mapping of CRFS initiatives • Mapping HORECA using CRFS products • Review of CRFS initiatives • Information about CRFS initiatives and their approach to sustainability • Tracking of agro-food products sold by CRFS initiatives (using technologies such as QR codes), in line with the FoodE ZeroMiles programme • Web farming, allowing consumers to monitor CRFS initiatives through webcams, possibly in FoodE pilots.

GEOGRAPHICAL DIMENSION	EU-wide: it is important for the App to cover all European countries as to be used both by locals and tourists.
POSSIBLE MONETARY SOURCES	• Fee on transactions from consumers • Fee to access information on CRFS in all the countries (free to access in one country only) from consumers • Fee to be listed in the App for CRFS initiatives • Fee from HORECA to promote CRFS produce use
MAIN COMPETING EXISTING APPS	• Localtoyou • Local Food Champion • L'alveare che dice sì • Cortilia • Ulocal • Farmizen • FarmDrop See Annex B for specific Apps details.
Other	Allow a user-friendly and quick registration: being it the first step in the App use it must be quick and easy to perform.

Table 2. Insights for FoodE App development.

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Annexes