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Micro Knowledge as a Driver for Systemic Emergencies Management: The Case of *Xylella* in Italy

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Abstract

During emergency production systems, supply chain stakeholders' interactions, media activities, government actions, community behaviors are stressed bringing, all, to a high-risk perception about safety. For agri-food products, it became in a variation of consumers' purchasing behaviors, guided by uncertainty and influenced by trust. The extant knowledge about consumers' willingness to buy for agri-food products in emergency condition does not provide evidences during a phytosanitary warning. The proposed study, considering the *Xylella fastidiosa* phytosanitary emergency as case study, aims to fulfill this gap analyzing the possible variations of consumers' perception and willingness to buy of Apulian olive oil in the era of *Xylella* emergence by adopting a multi-perspective and systemic approach. For achieving this scope, the study follows a Process-Person-Context-Time perspective for conceiving a systemic psychological model based on the Bronfenbrenner ecological model. Seven hypotheses were tested through Structural Equation Modeling thanks to a survey in a representative sample of 779 Italian consumers. Results showed that Italian consumer's willingness to buy the post-*Xylella* olive oil can fluctuate due to the hypothesized system vulnerability: family, friends, and colleague such as trust in farmers and the credibility of Italian food market are impactful; trust in processors, transporters, and government and media is not. The findings, from theoretical and sectorial perspectives, provide new knowledge on the topic, empirical evidences, and a multi-systemic model able to analyze consumers' behaviors, understand and stimulate the search for new (or more appropriate) marketing and communication strategies to face *Xylella* serious economic shortages, and to act a requalification of territory at all.

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Introduction

Nowadays, the world is interested by numerous events, which are mining the survival of the entire Earth ecosystems. The impact of climate change, the salience of the COVID-19 pandemic, and the recent conflict insisting on Russian and Ukraine territories made it clear how a catastrophic event, from unpredictable or natural causes, had a relevant impact on every industry, market, and society, from several viewpoints (e.g., economic, social, political, or environmental). In emergency scenarios, the agri-food sector is highly impacted, since it is responsible, worldwide, of food production and availability (Testa et al., 2022). By 2050, the food production must double to fulfill the global population demand; therefore, if the sector is under stressing conditions, caused by predictable or unpredictable events, the livelihood of the humanity could be compromised (FAO, 2018). For example, rising temperatures, with the associated droughts of entire territories, have led to an obvious recourse to safeguarding water consumption, which is indispensable for cultivation and agricultural production (X. Wang, 2022). The proliferation of plant pathogens (e.g., *Dryocosmus kuriphilus*, for the chestnut gall wasp; *Rhynchophorus ferrugineus*, the red palm weevil), caused by the increasing global warming, has damaged crops and farmers, with relevant consequences such as loss of jobs, closure of farms and production, and territorial degradation (Malhi et al., 2021). The military conflicts limit the performance of food supply chains, given the interruption of import-export and production activities (Liu et al., 2023). Industrial disasters, such as food hazards or chemical accidents, can suddenly change the destiny of global market and, therefore, of the society and economy (Thompson & Darwish, 2019). The events able to trigger emergency conditions can lead to the arising of more and, often unexpected, evidences such as disruptions in the supply chain, perceptions of scarcity, price sensitivity, health concerns, and perceived sustainability. Each of them can impact on the consumers' willingness to buy agri-food products, determining its variability (Ichim, 2023). The extant knowledge about this topic revealed (more details in "Exploring the Angle of Investigation: How Emergency Conditions Can Impact Consumers' Willingness to Buy Agri-Food Products?") that all those evidences were aggravated by the severity of emergencies, with risk perception playing a mediating role (X. Jin et al., 2021). Therefore, more impactful is the emergency, on the territories in which insists more variability is associated to consumers' willingness to buy (Li & Qian, 2022). As attested by Benali (2022), Benali et al. (2019), Brown et al. (2002), and Calvitti et al. (2020), the economic damage caused every year by the insisting of invasive biological species on agricultural landscape is about ten times higher than that due to natural disasters. This number will increase because of global climate change which registers an exponential evolution (Messono & Mermoz Homère, 2023). Since October 2013, a phytosanitary emergency insists on Mediterranean scrub tree species, especially the olive trees in the south of Italy: *Xylella fastidiosa* (Xf) infection. It was and, unfortunately, is already the most impactful phenomenon which is insisting on Italian territory; and it is the reason

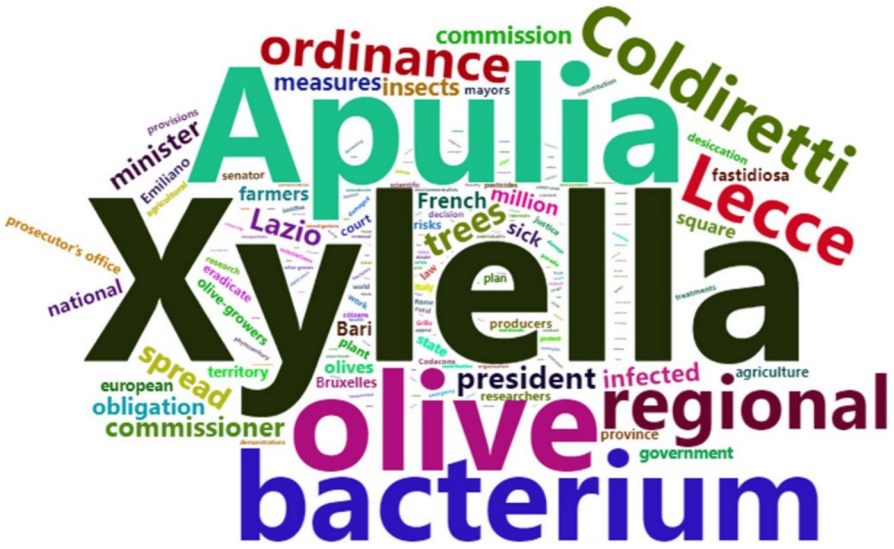

Fig. 1 Word cloud of the most frequent words *Xylella*'s articles in newspapers from 2014 to 2019

why in a short time this phenomenon attracted the major media outlets of the nation, moving great interest around the issue not only at a local level. Figure 1 reveals some of the most recurrent terms used by the national media for approaching and divulgating news on the disease from 2014 to 2019. The Xf disease on the olive tree begins showing some marginal or apical necrosis of the leaves, then the development of the entire plant slows down, negatively impacting on its productivity, and, finally, the olive trees wither rapidly and die (more details in "The Case of Xylella fastidiosa Phytosanitary Emergency and Related Severity of Impact").

Although Xf phenomenon harmed only the quantity of the olive trees products, in terms of production volume determining a decrement of about the 35% in quintals of olive only in the first year after the Xf detection in Apulia (Istat, 2014), and not the quality of them, several factors could sensitize consumers impacting on food behavior or purchasing choices, such as the mediatic cloud, kin opinion, and government measures. The history of the food industry, unfortunately, shown as hazards (e.g., Bovine Spongiform Encephalopathy (H. J. Jin, 2003), pesticide) was capable of impacting on the food public perception and on the consumers' consumption and purchasing behaviors, mining their trust in product, producers, and related stakeholders (Miles & Frewer, 2001; Roosen et al., 2015; Schlenker & Villas-Boas, 2009). Although Xf infection does not directly impact on consumers' health and safety, as instead food hazards done, it insists on the quality and quantity of crops (Di Vita et al., 2021) leading to a drop of Apulian olive oil supply within local, national, and international markets. The less supply of olive oil fallout on import and export practices. The drop down of the production volume was compensated by an increasing, of about the 45%, in importation practice and, inevitably, impacted on the price of the product, leading it to an increase of the 50% per quintals in respect to the years ante Xf (Bagnariol et al., 2014). Therefore, after the first detection of

Xf in Apulia, the panorama of olive and olive oil products changed drastically: the nature of the production system became inelastic; the reductions in supply led to pricing strategies redistributing economic impacts to consumers; a low communication of pest risk assessments to the public could not foster a better understanding of mitigation strategies leading toward a societal challenge (Schneider et al., 2021).

The extant literature about Xf phenomenon is fed by a huge number of contributions in subject area of Agricultural and Biological Sciences. This kind of studies investigated about Xf through biological and chemical lens in order to supply knowledge and practices useful to face the disease, supporting farmers, biologist, policy in their actions. No one study addressed the impact of the Xf phenomenon on consumers' perception of olive oil during own purchasing process (more details in "Research Gap"). In this panorama, the authors chose to investigate about the possible variations of consumers' perception and willingness to buy Apulian olive oil in the era of Xf emergences, identifying it as post-*Xylella* Apulian olive oil. Specifically, this study aims to evaluate what factors impact on Italian consumers post-*Xylella* Apulian olive oil purchase intention from Process-Person-Context-Time perspective, leveraging on Bronfenbrenner ecological model (Bronfenbrenner, 1992, 2005). Thus, a set of 7 hypotheses (H) is born: each of them aimed to validate the relation of microsystem (family, friends, colleagues), mesosystem (farmers, processors, transporters), and exosystem (media, Italian food market, government) in a specific chronosystem (the era of *Xylella* emergence) through Structural Equation Modeling. Hence, the study of these determinants could foster a new interconnected way of sustainability, by including a regional, agricultural, social, and an economic one. Thanks to the results of this study, we can demonstrate that the family, friends, and colleague such as trust in farmers and the credibility of Italian food market (microsystem, mesosystem, and exosystem) influence the purchasing behavior of post-*Xylella* Apulian olive oil. However, trust in processors, transporters, and government and media (mesosystem and exosystem) did not. These results can be interpreted in a second multi-level perspective: starting from the focus on the micro context (the *Xylella* emergency in Italy), a macro-order (social and economic aspect) is proposed as a way of managing the problem. Moreover, the identified modes of action (the role of trust) may be interpreted as a function of possible technologies implemented to foster these processes. The proposed model enlarges the knowledge base of findings coming from other more adopted theoretical model (e.g., TPB) and represents a well-established element for food choice assessment during phytosanitary emergencies or more generally consumer behavior assessment during critical events (e.g., pandemics, economic or political crises). Finally, thanks to our insights, agri-food sector operators can establish an effective mechanism for food safety communication trying to enhance trust in farmers and elevate the credibility of the Italian market. At the same time, government bodies and public health sector policymakers can understand and stimulate the search for new (or more appropriate) marketing strategies to compensate for the serious economic shortages caused by *Xylella* and to act a requalification of territory at all. The manuscript was structured as follows: "Introduction" introduces the work's, briefly outlining the case study of Xf phenomenon and its impact on territory, media, government, olive oil production stakeholders, community behaviors, and market, highlighting

the literature gap which we referred to and the purpose of the work; "Exploring the Angle of Investigation: How Emergency Conditions Can Impact Consumers' Willingness to Buy Agri-Food Products?" presents evidences about the work's angle of investigation, justifying the choice about the case study and the relevance of it in terms of impact on national (Italy) and regional (Apulia) economy; "Theoretical Framework" presents the theoretical framework of the study describing the research gap, the theory on which it is rooted, and the hypothesis development; "Material and Methods" shows the materials and methods used in the study with particular reference to procedure, participants, and measure description; "Results" presents the results of the study from empirical viewpoint; "Discussion: The Link to the Meso Level" discusses our insights correlating them with the extant literature of reference; " Implications" encompasses its implications both from methodological and sectorial perspectives; "Conclusions, Limits, and Follow-Up" closes the study presenting its main insights, limitations, and follow-ups.

Exploring the Angle of Investigation: How Emergency Conditions Can Impact Consumers' Willingness to Buy Agri-Food Products?

The emergency conditions can create a complex interplay of factors that influence consumers' willingness to buy agri-food products, including supply chain disruptions, perceptions of scarcity, price sensitivity, health and safety concerns (Mancuso et al., 2023). During emergencies, as what happens for natural disasters or pandemics, agri-food industry and markets may be assists to disruptions in the supply chain (transportation, distribution, and logistics networks can affect the availability of certain products), leading to perceived scarcity of agri-food products (Ali et al., 2023). This perception can trigger panic buying behavior as consumers rush to stock up on essential items (E. Wang et al., 2020). Moreover, due to changes in supply and demand dynamics, agri-food products suffer fluctuations in prices leading consumers to become more price-sensitive and opt for cheaper alternatives or bulk-buying strategies to save money. In times of crisis, consumers may prioritize the safety and health aspects of the food they purchase (Gordon-Wilson, 2022). They may prefer locally sourced or organic products, and they may be more cautious about consuming foods that have been imported or handled by multiple parties along the supply chain. Specifically, as attested by Wallnoefer and Riefler (2022), during emergency conditions, such as the pandemic one, consumer perceptions were affected about the relevance of local food production and consumption, with some showing strong beliefs in the reliability and resilience of local agriculture during the crisis. The sustainability perception about agri-food products seems, therefore, to be a driver for the consumers' behavior in emergency time (Stone & Rahimifard, 2018). Studies have focused on consumers' willingness to buy agri-food products with environmentally sustainable attributes, showing that factors such as environmental attitudes, knowledge, and social norms influence consumers' willingness to pay for such products (Galati et al., 2023; Yang et al., 2023). All these evidences were amplified by the severity of emergencies, which positively influences the population's willingness to pay, with risk perception playing a mediating role (X. Jin et al., 2021). Therefore,

Table 1 Quintals of oil production in Italy from 2012 to 2022, before and after the *Xylella* appearance. In bold years between the last year before *Xylella* and after. From Istat, 2022

Years	Quintals of olive oil produced
2012	28,456,130
2013	**28,526,962**
2014	**18,536,638**
2015	29,953,777
2016	19,602,136
2017	25,444,601
2018	18,890,480
2019	21,181,301
2020	21,261,563
2021	21,813,450
2022	20,737,965
Grand total	**254,405,003**

more impactful is the emergency, on the territories in which insists, more variability is associated to consumers' willingness to pay (Li & Qian, 2022). Downline these evidences, investigating about consumers' willingness to pay for agri-food products in emergency conditions is relevant because it provides valuable insights for both academics and industry practitioners, helping them better understand and respond to consumer preferences and market dynamics during crises.

The Case of Xylella fastidiosa Phytosanitary Emergency and Related Severity of Impact

Since October 2013, Xf phytosanitary emergency insists on Mediterranean scrub tree species. The disease on the olive tree begins showing some marginal or apical necrosis of the leaves, then the development of the entire plant slows down, negatively impacting on its productivity, and, finally, the olive trees wither rapidly and die. Since the discovery of Xf on olive trees in Apulia region, southern Italy, its presence was attested in other Italian regions (e.g., Toscana) leading to a quick diffusion of the infection toward the north soon reaching France, Spain, and Portugal (EFSA, 2022). For Europe, the consequences of the Xf disease spread were devastating; only in Italy a 60% drop in crops was estimated after the first discovery. The bacterium damaged about 12% of the Italian cultivable surface determining a loss in olive crops with consequent reduction of Italian olive oil production, especially in the first year after the phytopathogenic emergency detection (Camera dei Deputati Italia, Servizio Studi, XVIII Legislatura, 2022). Between 2013 and 2014, the Italian production of olive oil suffered a decrement of about 35% (Table 1) (Istat, 2022). In spite of all the farmers' strategic measures implemented to face the emergency (such as eradication, plant care, planting of resistant pathogen species), ISTAT data shows that this decline continued until 2022 (decrease of 27% from 2013 to 2022); therefore, the production still shows a rate of suffering due to the bacterium.

In the past, Italy was one of the main exporters of oil in the world (second only to Spain and followed by Greece, Turkey, and Tunisia)—and about 70% of Italian olive oil production came from the southern regions such as Apulia, Calabria, and Sicily (Unaprol, Consorzio olivicolo Italiano, s.d.). Specifically, before the advent of *Xylella*, Apulia region had a production of around 10,765,600 quintals of olive oil for 2012 and 11,705,450 quintals of olive oil for 2013 (Istat, 2022). In 2014, there was a drastic drop in Apulian olive oil production, to around 7,844,600 quintals, confirming the decline in the national trend (Istat, 2022). Moreover, Apulia boasts the highest concentrations in the world of millenary olives, historical-cultural, architectural, landscape, and naturalistic evidence of immeasurable value: the damage to olives caused a depreciation of the land value and of the region tourist attraction (Denuzzo, 2017).

Currently, infectious disease caused by XF is refractory to treatment. The available management options rely on the removal of infected hosts to eliminate or limit the source of inoculum to limit or eradicate the virus through eradication and containment procedures. In the past, eradication programs have caused controversy and considerable public opposition, which has forced interventions to be delayed or prevented (Vicent & Blasco, 2017). Consequently, it is a coordination issue in both crops and livestock, like many other viral pathogens.

Therefore, it is evident that the advent of *Xylella* caused a significant impact on the economic situation of Italy and Apulia. At the national level, the olive oil production was partially compensated thanks to a strong increase in olive oil production from northern Italian regions, while those in the south registered a negative variation, equal to −45% (from 2019 to 2020) for the Apulia region (Fig. 2) (ISMEA, Istituto di Servizi per il Mercato Agricolo Alimentare, 2021).

The consequent impact on the Italian and Apulian economic structure has been significant. In this regard, according to several resolutions approved by the Apulian regional body for the disbursement of non-repayable subsidies for damaged farms, the loss of production for Apulian farms caused by *Xylella* in 2018 was about 137 million euros, corresponding to 70% of the gross saleable production of olive trees in the delimited area. For the year 2019, on the other hand, the damaged production was about 86.4 million euros, corresponding to 66%: the total, therefore, is about 223 million in losses over 2 years.

This condition risks to get worst in the future if nothing changes. In their study, Schneider et al. (2020) simulated the geographical distribution of the infection in the most affected Italian areas, from 5 to 50 years in the future (see Fig. 3): the scenario is projected as catastrophic since that, with the infection spread, the costs for Italy could reach over 5 billion euros over the next 50 years.

Summarizing, the great impact of the Xf phytosanitary emergency condition in terms of availability about olive oil product, loss in crops and land availability, and related decrement of agri-food sector economic value led to a strong variability about consumers' willingness to pay for olive oil products.

Considering the Xf phytosanitary phenomenon as case study for investigating about the factors able to impact on consumers' willingness to buy in emergency conditions, the following section supplies an overview about the contributions on the Xf phytosanitary emergency phenomenon in order to highlight the gap.

Italian region	Variation 19/20
Apulia	-45%
Calabria	-36%
Sicily	-5%
Tuscany	103%
Latium	58%
Campania	-20%
Abruzzo	-11%
Umbria	82%
Liguria	223%
Basilicata	-38%
Sardinia	-9%
Marche	50%
Veneto	858%
Molise	-2%
Emilia Romagna	94%
Lombardy	911%
Trentino Alto Adige	560%
Friuli Venezia Giulia	110%
Piedmont	835%

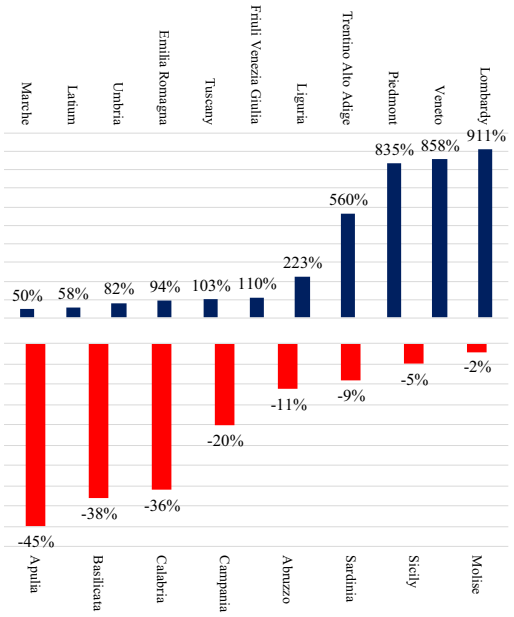

Fig.2 Variation 2019/2020 in Italy olive oil production (from ISMEA, Istituto di Servizi per il Mercato Agricolo Alimentare, 2021)

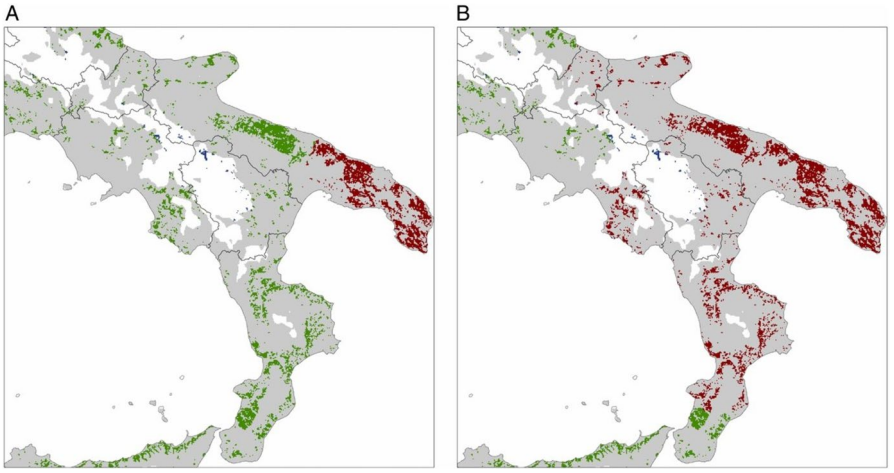

Fig. 3 Simulated Italian geographical distribution of Xf in years 5 (**A**) and 50 (**B**) (from Schneider et al., 2020) (gray: suitable territory; blue: non-suitable olives; green: suitable olives; red: infected olives)

Theoretical Framework

This section discusses the positioning of the study in reference to the existing literature, both in terms of fields of study and theoretical models relating to willingness to

buy in emergency condition, specifically during Xf emergency condition. Therefore, the research gap and the purpose of the study are hereafter described. Additionally, the theoretical lens through which the study was conducted is explained, with reference to the structure of the multi-systemic model proposed in terms of hypothesis development.

Research Gap

As it was stated in "Exploring the Angle of Investigation: How Emergency Conditions Can Impact Consumers' Willingness to Buy Agri-Food Products?," investigating about consumers' willingness to buy agri-food products in emergency conditions is relevant because it provides valuable insights for both academics and industry practitioners, helping them better understand and respond to consumer preferences and market dynamics during crises. The main evidence that arose from the previous studies about the consumers' willingness to buy agri-food products in emergency condition is the sense of reliability that moved the communities during the choosing and purchasing actions. For example, Bardin et al. (2017) and McFadden and Lusk (2015) testified that "trust" was one of the most influencing factors. This evidence is justified since trust is strictly linked to the food safety risk perception, which is maximized during an emergency status (Ha et al., 2020; Siegrist, 2021). According to Wang et al. (2023), Chinese consumers, during the "market explosion" of genetic modified food, become more sensitive to buy food, demonstrating to be influenced by trust in sellers. According to Roosen et al. (2015), trust plays a crucial role in consumers' perception of food safety helping to influence purchasing behaviors: trust leads consumers themselves to exert lower self-protection effort. During the COVID pandemic emergence, Polenzani and Marchini (2022) analyzed the willingness to pay for food through e-commerce finding that consumers can be uncertain about both the product and the producer and that this evidence can be translated in a conditioning variation of trust. Downline these evidence the first research statement was identified:

The main insight coming from the analyzed extant knowledge was that "trust" is able to influence consumers' willingness to pay during emergency conditions.

Analyzing from methodological viewpoint the research field of consumers' willingness to pay, various studies relate consumer behavior as grounded on the active and predominant role of the individual focused theory (Melnyk et al., 2021). Human being is seen as an actor performing choices rationally in function of oneself, thus with no influence by the external environment (Melnyk et al., 2021). Therefore, the predominance of theoretical frameworks related to changing people's behavior relies on the individual level (Collins et al., 2010; Helmig & Thaler, 2010). Mankind is seen as possessing a fundamental characteristic that guides its choices, namely, rationality. Despite the presence of elements of this perspective, proved to be strategic in subsequent theoretical developments (Mathis & Steffen, 2015; Chen et al., 2019), the main emphasis on the individual was widely criticized in the literature for failing to anticipate the impact of wider environmental influences on personal choice. Nowadays, there is little implementation of models for explaining consumer behavior in a systemic and multi-level perspective, which systematically

incorporates micro, meso, and macro level factors and argues that food consumption behavior emerges from these interactions (Maertens, 2017; Boulet et al., 2021). Downline these evidence the second research statement was identified:

The willingness to pay for agri-food products in emergency conditions was extant analyzed only through the individual focused theorical lens and not following a systemic and multi-level perspective.

The extant body of knowledge about Xf phenomenon is fed by a huge number of contributions from Agricultural and Biological Sciences focused to investigate several characteristics of the Xf infection such as pathogen, vectors, host plants, infection process, infection causes, epidemic model. Only a smaller portion of literature analyzed the social impact of Xf addressing several topics, such as the following:

i) Activism, referring to the analysis of the role political discourses and community actions oriented toward the cure, preservation, and the protection of olive trees (Parmigiani, 2023)
ii) Policy, referring to the political repercussions and initiatives that occurred during and post phytosanitary emergency (Giovani et al., 2019; Luvisi et al., 2016; Monica, 2020; Pagano, 2017)
iii) Story, referring to the study of the historical infection evolution in and outside Italy (Martella, 2023; Morey & Fornés, 2021)
iv) Territory geographic value, referring to the analysis of the geographic and cultural value of the plants which are potential host for the bacterium (Ciervo, 2023; Gatti, 2022; Pavlović & Đorđević, 2022)
v) Urban planning, referring to the study of requalification plan for urban territory in the damaged territories (Maggiore et al., 2019; Semeraro et al., 2021, 2022)

Downline these evidence the second research statement was identified:

No study was focused on analyzing the consumer preference or purchasing behavior during emergency condition of Xf infection.

It is relevant to investigate on this topic, because understanding consumer willingness to pay can contribute to decoupling economic growth from environmental and social degradation of the affected territories, which is also one of the tasks set by the United Nations' Sustainable Development (Goal #8[1]) (Frontiers science communications, 2023). Downline these evidence the third research statement arose:

Understanding consumer willingness to pay can contribute to decoupling economic growth from environmental and social degradation of the Xf affected territories.

Leveraging on the three research statements, the proposed study aims to overcome these gaps analyzing the possible variations of consumers' perception and willingness to pay for Apulian olive oil in the era of Xf emergences by adopting a multi-perspective and systemic approach founded on the ecological models of Bronfenbrenner (Bronfenbrenner, 1992, 2005). Considering its relevance emerged from

[1] https://sdgs.un.org/goals/goal8

the literature, trust factor was considered as a driver to stimulate processes related to the purchase, and therefore, the willingness to buy was designed as a function of trust in the various stakeholders.

Theory and Hypothesis Development

The theory of ecological contexts of Bronfenbrenner leverage on the concept of "*Process, Person, Context and Time*," according to which the behavior of an individual is connected not just to the context (Brennan et al., 2016). Bronfenbrenner conceived the social environment as a set of five structures nested around the individual, represented by concentric and interconnected circles (Bronfenbrenner, 2005). The innermost level, the microsystem, consists of activities, social roles, and interpersonal relationships that the individual experiences in a particular environment through face-to-face interactions, such as family, friends, peers, and colleagues. The second level, the mesosystem, is the set of links and processes that occur between the environments that contain people, such as the workplace or neighborhood. The third level, the exosystem, consists of those systems that indirectly influence processes within the individual's immediate environments, such as the media, local government policy, transport facilities, and wider social networks. The fourth level, the macrosystem, is the overall configuration of a given culture incorporating belief systems, bodies of knowledge, or lifestyles that form the cultural template for structures and activities at other levels. Finally, the fifth level, the chronosystem, considers the impact of time and a spatiotemporal circumstance on the rest of the structures. Although the Bronfenbrenner's theory born as bio-ecological theory (Jensen & Olsen, 2019) to explaining child development in the social environment (Smith et al., 2018), it was widely used in other disciplines (e.g., marketing, health, or sport) (Brennan et al., 2016; Young, 2018; Cox et al., 2021; Steger et al., 2021), becoming the foundation for studies in consumer psychology (Collins et al., 2010; Young, 2018) and in social marketing (Hastings & Donovan, 2002; Lefebvre, 2012).

With a perspective aimed at promoting the aware post-*Xylella* Apulian olive oil buy intention and supplying indicative suggestions at a marketing standpoint to foster suitable communication strategies, the Process-Person-Context-Time approach will be helpful in identifying which environmental settings had most influence on the olive oil willingness to buy in relation to the several levels of Bronfenbrenner's model.

Specifically, in this study, Xf emergency represents the chronosystem. For the definition of the other levels (microsystem, mesosystem, exosystem, and macrosystem), we considered, under the lens of ecological contexts (Xia et al., 2020), the different actors of the agri-food supply chain (AFSC) (Tsolakis et al., 2014).

Indeed, several studies have empirically documented how trust in the various stakeholders of the agri-food supply chain plays an important role in determining the purchase of the ensuing end products (de Jonge et al., 2008; Buck & Alwang, 2011; Eccles et al., 2014; Lee et al., 2019; Carfora et al., 2019; Ji et al., 2020).

The AFSC is composed of a series of activities in a sequence that involves different processes and stakeholders, starting with farming and progressing with

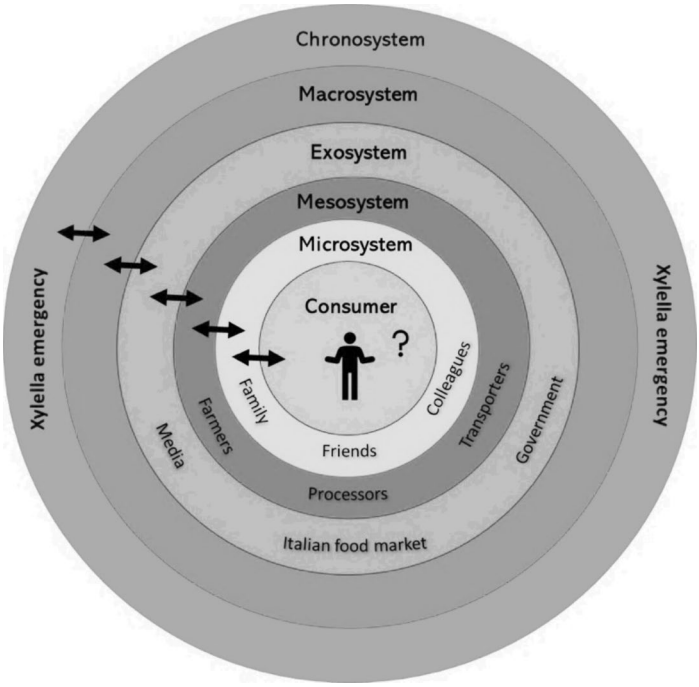

Fig. 4 Bronfenbrenner's model adapted to the study investigation

processing/production, packaging, storage, transport, distribution, and marketing (Saitone & Sexton, 2017). The stakeholders engaged in the AFSC can generally be divided into two categories: public authorities and private stakeholders (Tsolakis et al., 2014). The first one includes actors such as national governments and regulatory and administrative authorities (e.g., Italian food market regulatory system). The second one includes farmers/growers, processors, and transporters (Jaffee et al., 2010). Therefore, our exosystem was composed of the media, the Italian food market, and government policies (Xu et al., 2014) and our mesosystem composed of farmers, processors, and transporters.

Finally, according to Bronfenbrenner's definitions, family, friends, or work colleagues were deemed to belong to our microsystem. Figure 4 describes the adaptation of Bronfenbrenner's model for our study.

From the conceptualization of this model, the following hypotheses (Hs) are born:

H_1: Family, friends, and colleagues (microsystem) influence the purchase choice of post-*Xylella* Apulian olive oil.
H_2: Trust in farmers (mesosystem) influences the purchase choice of post-*Xylella* Apulian olive oil.
H_3: Trust in processors (mesosystem) influences the purchase choice of post-*Xylella* Apulian olive oil.

H_4: Trust in transporters (mesosystem) influences the purchase choice of post-*Xylella* Apulian olive oil.
H_5: Media information (exosystem) influences the purchase choice of post-*Xylella* Apulian olive oil.
H_6: The credibility of the Italian food market (exosystem) influences the purchase choice of post-*Xylella* Apulian olive oil.
H_7: Trust in the government (exosystem) influences the purchase choice of post-*Xylella* Apulian olive oil.

As it will be explained in detail in the "Procedure" section, the analysis was carried out through Structural Equation Models (SEM), following the investigation of the main psychometric characteristics of the sample, reliability, and validity represented in Fig. 5.

Starting from the micro context, we investigated trust as a driver to stimulate the consumer willingness to buy olive oil in post-*Xylella* condition, which are essential for the country's economy (macro). Therefore, the willingness to buy was analyzed as a function of trust in the several stakeholders, to understand and stimulate the search for new (or more appropriate) marketing strategies to compensate for the serious economic shortages caused by Xf.

Material and Methods

Leveraging on the evidences collected in the previous sections, the analysis followed a clear procedure, which was described in the following subsections.

Procedure

The analysis was performed by means of a structured questionnaire, including quantitative (measured using a Likert scale) and qualitative variables, with the latter aimed at investigating the main sociodemographic characteristics of the sample. Probability sampling was guaranteed by using a qualified company and reached 779 Italian subjects, who filled in the questionnaire from March to June 2020. The subjects who participated in the study were informed of the objectives and methods of the research project. Participation was voluntary and there was no compensation for partaking. Subjects had the opportunity to withdraw from the study at any time. Anonymity was guaranteed and the data were analyzed in an aggregated manner, following Helsinki Declaration's guidelines.

After an initial descriptive and frequency elaboration of the sample, the indices of normality of the distribution (asymmetry and kurtosis) were investigated. The quantitative measures included in the questionnaire were tested in terms of reliability (Cronbach's alpha and McDonald's omega) and validity (average variance extracted). Due to the sample characteristics and its probabilistic nature, once assessing that the investigated measures fit a reasonably normal distribution, analyses were performed using SEM and maximum likelihood algorithm, by testing the

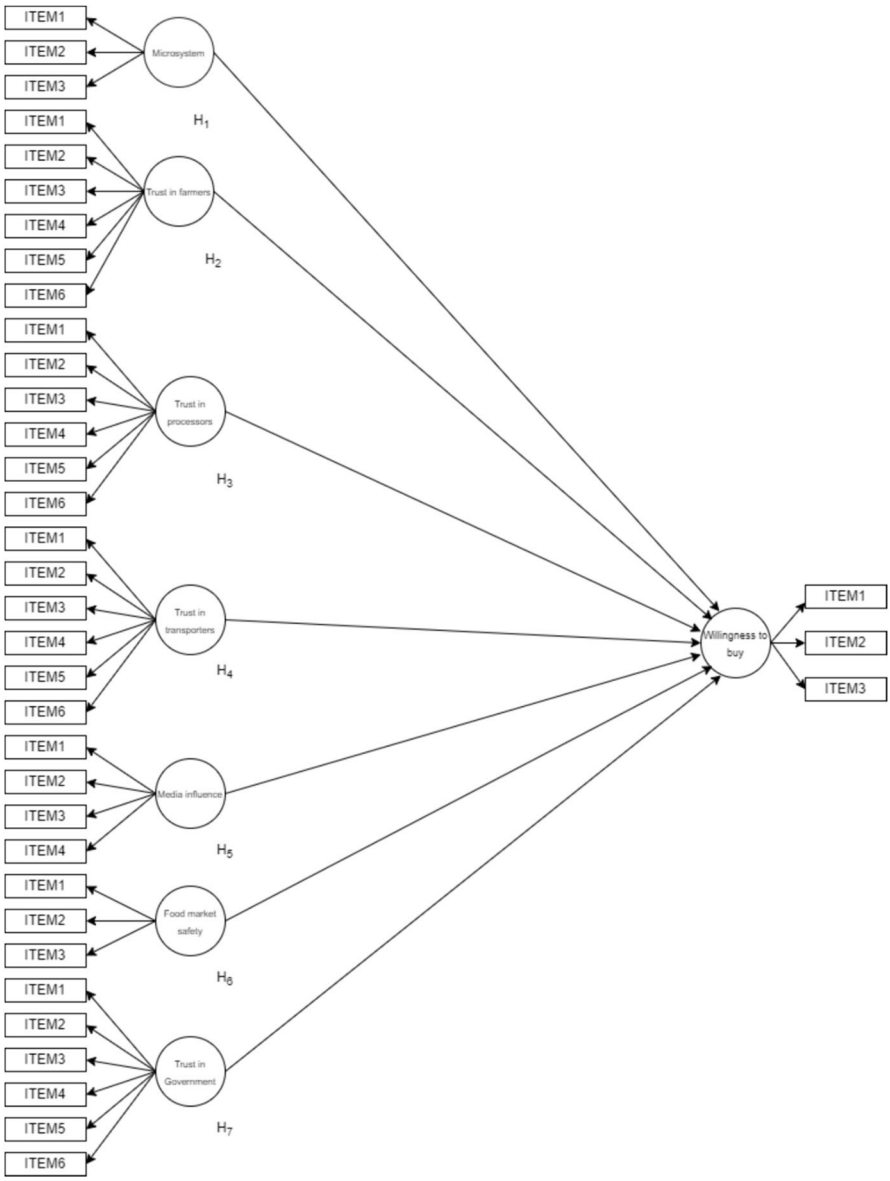

Fig. 5 The hypothesized SEM

goodness of measurement and structural models. SEM allows the mutual impact of certain latent, not directly measurable variables within the structural model to be detected. These variables, in turn, can be measured by means of manifest indicators, i.e., questionnaire items. Depending on the specificity of the study, which used questionnaire scales that directly refer to latent variables, the methodological choice therefore fell on SEMs. Finally, the Comparative Fit Index (CFI), Tucker–Lewis

index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) indices were used to measure the overall quality of the model (Iacobucci, 2010). The following were considered as appropriate indices: TLI $\geq$ 0.90, CFI $\geq$ 0.90, RMSEA $\leq$ 0.08, and SRMR $\leq$ 0.10 as threshold values (Kline, 2016). All statistical elaborations were performed through Jamovi software (Jamovi Project, 2021) and SEMLj module (Gallucci & Jentschke, 2021).

Participants

The study was carried out on 779 Italian consumers who were perfectly balanced from gender (50.4% female, 49.6% male), with an average age of 46 years. In relation to age, the predominant consumer group belonged to the 35–44 (22.0%) and 45–54 (21.3%) age groups. The 55–64 (17.6%), 25–34 (15.4%), and 65–75 (14.1%) age groups were basically equally distributed, while the prevalence of the 18–24 age group was slightly lower (9.6%). The Italian regions with the most respondents were Lombardy (15.7%) and Lazio (12.3%), in proportion to their populations. In terms of geographical area, 29.1% of the respondents came from Southern Italy, 27.5% from the North-West, 26.1% from the Center, and 17.3% from the North-East. Finally, the whole sample (100%) stated to be consumers of olive oil.

Measures

The hypotheses were explored through the implementation of latent variables, measured reflectively by means of manifest indicators, extracted from questionnaire dimensions already existing in the literature. Specifically, the used latent dimensions were as follows:

1. Microsystem, measured through 3 items adapted from Armitage and Conner (1999). In particular, the reliability of the construct was respected since both Cronbach's α and McDonald's ω were equal to 0.94, as well as the validity, being the AVE greater than the recommended cut-off of 0.50 (AVE = 0.80, Hair Jr et al., 2021).
2. Trust in farmers, dimension identified by 6 items from the adaptation of (de Jonge et al., 2008) scale. Reliability was confirmed as Cronbach's α=0.92 and McDonald's ω=0.90, as well as convergent and discriminant validity (AVE=0.66).
3. Trust in processors, factor identified by 6 items from the adaptation of (de Jonge et al., 2008) scale. Reliability was confirmed as Cronbach's α=0.94 and McDonald's ω=0.91, as well as validity (AVE=0.69).
4. Trust in transporters, construct identified by 6 items from the adaptation of (de Jonge et al., 2008) scale. Reliability was confirmed as Cronbach's α and McDonald's ω=0.95, as well as validity (AVE=0.87).
5. Media influence, measured by 4 items adapted from (Chen, 2017), which provided excellent reliability (Cronbach's α=0.86 and McDonald's ω=0.87) and validity (AVE=0.68) indices.

Table 2 Principal descriptive analyses of the sample

	Mean	Standard deviation	Skewness	Std. error skewness	Kurtosis	Std. error kurtosis
Microsystem	5.47	1.65	−0.72	0.10	−0.53	0.20
Farmers	5.31	1.50	−0.86	0.09	0.31	0.18
Processors	4.80	1.58	−0.55	0.09	−0.31	0.18
Transporters	4.30	1.75	−0.28	0.09	−0.78	0.18
Media influence	4.69	1.38	−0.61	0.10	0.22	0.20
Food market safety	4.60	1.63	−0.09	0.10	−0.90	0.20
Government	5.00	1.77	−0.72	0.09	−0.35	0.18
Willingness to buy	5.08	1.73	−0.49	0.10	−0.83	0.20

6. Italian food market safety, identified by 3 items adapted from Chen (2017), with reliability (Cronbach's α=0.93, McDonald's ω=0.91) and validity of the measures (AVE=0.67) respected.
7. Trust in government, a dimension identified by 6 items from the adaptation of (de Jonge et al., 2008) scale. Reliability was confirmed as Cronbach's α=0.91 and McDonald's ω=0.87, as well as validity (AVE=0.61).
8. Willingness to buy post-*Xylella* Apulian olive oil, measured through 3 items adapted from Armitage and Conner (1999). Even in this case, the reliability was verified as both Cronbach's α and McDonald's ω were equal to 0.96, while the validity explored through the AVE was equal to 0.89.

The items were measured using a 7-polarity Likert scale, with a response range from 1 = completely disagree to 7 = completely agree. Example of items are "*My family thinks I should consume Apulian oil produced after the spread of Xylella*"; "*Farmers are reliable about the safety of agri-food products*"; "*Processors take great care of the safety of agri-food products*"; "*Transporters are very concerned about the safety of food products*"; "*The news about the spread of Xylella in Apulian olive groves broadcast on TV is credible*"; "*I have confidence in the food safety of the Italian food market*"; "*Governments have the competence to control that agri-food products are safe*"; "*I will inform myself to buy Apulian oil produced after the spread of Xylella*".

Results

Having ensured that the measures resulting from the scales fulfilled appropriate reliability and validity criteria, analyses were performed to probe the distribution of the data in preparation for the correct statistical procedure. Table 2 shows that all the suggested measures were included in the range of ± 1.96 both in terms of skewness and kurtosis (George, 2011; Gravetter & Wallnau, 2014). Therefore, in order to generalize the findings to population and the assured representativeness of the sample,

Table 3 Correlation analyses between latent variables

	1	2	3	4	5	6	7	8
1. Microsystem	–							
2. Farmers	0.17***	–						
3. Processors	0.08	0.84***	–					
4. Transporters	0.05	0.61**	0.82***	–				
5. Media influence	−0.06	0.12**	0.19***	0.15**	–			
6. Food market safety	0.52***	0.33***	0.23***	0.21***	−0.03	–		
7. Government	0.16***	0.57***	0.27***	0.54***	0.26***	0.27***	–	
8. Willingness to buy	0.67***	0.21***	0.09**	0.07	−0.07	0.63***	0.12**	–

***< 0.001, **< 0.05, *< 0.01

data were elaborated by means of SEM with maximum likelihood estimation, as the proper requirements were satisfied (Hair Jr et al., 2017).

Correlation analyses (Table 3) discloses that microsystem does not show a significant association either with media influence (r=−0.06, *not significant*, hereafter *ns*), trust in processors (r=0.08, *ns*), and transporters (r=0.05, *ns*), while it highlights a significant two-way relationship with Italian food market safety (r=0.52, p value<0.001), trust in farmers (r=0.17, p value<0.001), and government (r=0.16, p value<0.001). Consumer trust in farmers is positively and significantly correlated with trust in processors (r=0.84, p value<0.001), transporters (r=0.61, p value<0.001), media influence (r=0.12, p value<0.05), food market safety (r=0.33, p value<0.001), and trust in government (r=0.57, p value<0.001). Trust in processors is also positively associated with trust in transporters (r=0.82, p value<0.001), media influence (r=0.19, p value<0.001), food market safety (r=0.23, p value<0.001), and trust in government (r=0.27, p value<0.001), as well as trust in transporters and government (r=0.54, p value<0.001) and food market safety (r=0.21, p value<0.001). Media influence is positively correlated with trust in government (r=0.26, p value<0.001), while it is not associated with food market safety (r=−0.03, *ns*). Additionally, food market safety is positively linked to trust in government (r=0.27, p value<0.001). Finally, the willingness to buy related to Apulian oil is positively and significantly connected with microsystem (r=0.67, p value<0.001), trust in farmers (r=0.22, p value<0.001), processors (r=0.09, p value<0.05), and government (r=0.12, p value<0.05) and food market safety (r=0.64, p value<0.001), while it reveals no bilateral relationships with media influence (r=−0.06, *ns*) and trust in transporters (r=0.07, *ns*).

In terms of measurement model, the items appear to be strong indicators of latent constructs, with significant loadings exceeding 0.60, as suggested in Hair Jr et al. (2017). About microsystem dimension, the range of loadings is [0.89, 0.98], for trust in farmers [0.61, 0.87], in processors [0.66, 0.90], in transporters [0.70, 0.92], in government [0.67, 0.88], for media influence [0.77, 0.95], for food market safety [0.78, 0.98], and for willingness to buy [0.89, 0.96] (Table 4).

The model showed good fit indices, with TLI=0.92, CFI=0.92, RMSEA=0.069, SRMR=0.043. The structural model (Table 5) enabled to highlight which are the

Table 4 Measurement model

Latent variable	Observed indicators	λ	p
Microsystem	Microsystem1	0.89	< 0.001
	Microsystem2	0.96	< 0.001
	Microsystem3	0.98	< 0.001
Farmers	Farmers1	0.61	< 0.001
	Farmers2	0.64	< 0.001
	Farmers3	0.82	< 0.001
	Farmers4	0.85	< 0.001
	Farmers5	0.87	< 0.001
	Farmers6	0.86	< 0.001
Processors	Processors1	0.66	< 0.001
	Processors2	0.70	< 0.001
	Processors3	0.86	< 0.001
	Processors4	0.85	< 0.001
	Processors5	0.90	< 0.001
	Processors6	0.90	< 0.001
Transporters	Transporters1	0.70	< 0.001
	Transporters2	0.76	< 0.001
	Transporters3	0.84	< 0.001
	Transporters4	0.87	< 0.001
	Transporters5	0.92	< 0.001
	Transporters6	0.91	< 0.001
Media influence	Media influence1	0.93	< 0.001
	Media influence2	0.95	< 0.001
	Media influence3	0.92	< 0.001
	Media influence4	0.77	< 0.001
Food market safety	Food market safety1	0.86	< 0.001
	Food market safety2	0.78	< 0.001
	Food market safety4	0.98	< 0.001
Government	Government1	0.67	< 0.001
	Government2	0.76	< 0.001
	Government3	0.84	< 0.001
	Government4	0.88	< 0.001
	Government5	0.88	< 0.001
	Government6	0.88	< 0.001
Willingness to buy	Willingness to buy1	0.95	< 0.001
	Willingness to buy2	0.96	< 0.001
	Willingness to buy3	0.89	< 0.001

most influential ecological contexts in relation to the post-*Xylella* Apulian olive oil purchase intention, which conveyed a R^2=0.58 (Fig. 6).

The adoption of a model that accounted for joint influences of several different contexts thus explained a non-negligible amount of variance in the dependent

Table 5 Structural model assessment

			95% confidence intervals		
	β	SE	Lower	Upper	p
H_1: microsystem → willingness to buy	0.47	0.05	0.41	0.61	< 0.001
H_2: farmers → willingness to buy	0.16	0.13	0.04	0.55	0.034
H_3: processors → willingness to buy	−0.16	0.18	−0.60	0.09	0.184
H_4: transporters → willingness to buy	0.04	0.09	−0.14	0.23	0.603
H_5: media influence → willingness to buy	−0.00	0.04	−0.09	0.08	0.892
H_6: food market safety → willingness to buy	0.39	0.06	0.32	0.56	< 0.001
H_7: government → willingness to buy	−0.08	0.05	−0.21	−0.01	0.036

variable. In particular, the microsystem, meant as the set of the consumer's nearest connections, such as family, friends, colleagues, resulted in having a strong, positive, and significant influence (β_1=0.47, <0.001, CI [0.41, 0.61]) as well as the Italian food market (β_6=0.39, <0.001, CI [0.32, 0.56]), when deemed safe and with adequate security (Kneafsey et al., 2013; Silva et al., 2016). The other influential component in the purchase behavior was trust in farmers (β_2=0.16, p=0.034, CI [0.04, 0.55]), while trust in the government, although significant, was basically equal to 0 (β_7=−0.08, p=0.036, CI [−0.21, −0.01]). Finally, according to the analysis, the influence of the media (β_5=−0.00, *ns*, CI [−0.09, 0.08]), trust in processors (β_3=−0.16, *ns*, CI [−0.60, 0.09]), and trust in transporters (β_4=0.04, *ns*, CI [−0.14, 0.23]) did not appear to have an impact in fostering the consumers' buying patterns. All structural coefficients were validated through bootstrap resampling equal to 5000.

Discussion: The Link to the Meso Level

As what emerged from the introductory sections, *Xylella* can be counted among the natural emergencies triggered by bacteria as one of the strongest in terms of production impact and income (Ciervo, 2023; Gatti, 2022; Giovani et al., 2019; Luvisi et al., 2016; Maggiore et al., 2019; Martella, 2023; Monica, 2020; Morey & Fornés, 2021; Pagano, 2017; Pavlović & Đorđević, 2022; Semeraro et al., 2021; Signes-Pont et al., 2021). According to Vicent and Blasco (2017), the impact of the emergency, turned into significant political and social repercussions, as a compromise could hardly be found that agreed upon by all the stakeholders included. This emergency situation still persists on the Italian economy, as attested by Istat data. As observed from the analyzed data, in fact, the greater production of the northern regions has not been able to compensate for the much lower rates of the southern ones, so the problem, although the first glimmers of recovery can be seen, is still far from being completely resolved. For this reason, this study attempts to interpret the phenomenon from a constructive viewpoint, identifying cues based on a systemic perspective, able to highlight elements that

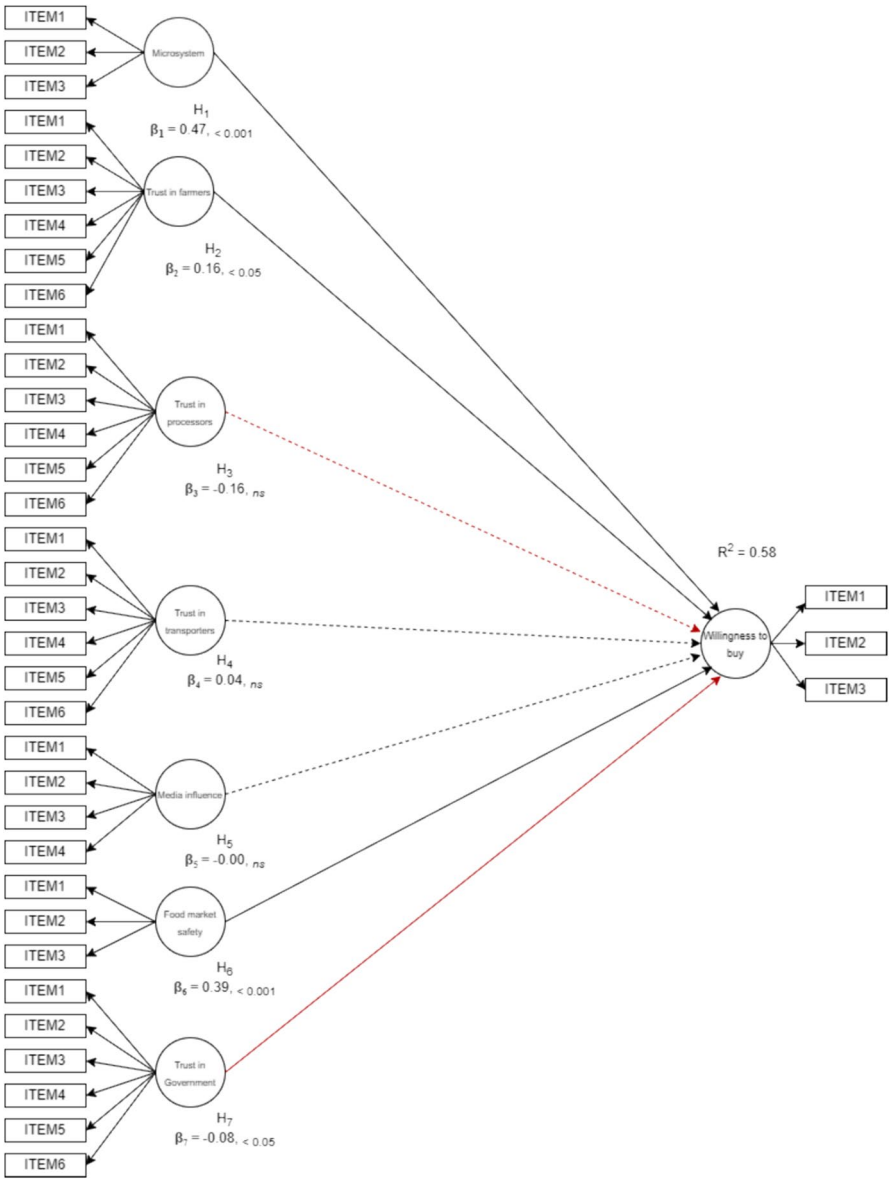

Fig. 6 The final model with estimated coefficients (dotted arrows: non-significant paths; black arrows: positive relationships; red lines: negative relationships)

can render functional the current olive oil production, which is still strongly compromised. Understanding on which level to act, in fact, could, for example, allow the creation of suitable marketing strategies and contextual decision-making models (Park et al., 2014).

The emerging results confirmed the importance of some specific ecological contexts in determining the post-*Xylella* Apulian olive oil willingness to buy. Specifically, given that the theory of ecological contexts is well adaptable to absorb the AFVC stakeholders and the social actors that have been considered in this analysis, as stated several times by different research in social marketing (Lefebvre, 2012; Brennan et al., 2016), we supposed that each context can be influential in determining the purchase behavior of post-*Xylella* Apulian olive oil. The notion that the social actors in each individual's daily life can be represented as belonging to concentric circles of different complexities called contexts, and that such ecological contexts are able to influence day-to-day actions and development (Xia et al., 2020), proved to be effective, as mentioned above, in various fields such as sport (Cox et al., 2021) or product purchasing (Young, 2018), among others.

Our findings suggest that the role of the microsystem, meant as the interconnection of dyadic relations with the most proximal actors (e.g., family, friends, work colleagues), plays a strategic role. This result, which confirms H_1, is in line with the studies of (Ahmed et al., 2018; Evans et al., 2021; Roberts et al., 2004), which attribute a crucial function to the influence of close contacts in food and non-food purchase choices. Companies involved in the promotion of post-*Xylella* Apulian olive oil could consider these results to implement strategies capable of fostering the quality perception around the Apulian olive oil, explaining what has been done to stem the infection (e.g., organic procedure) and how the current Apulian olive oil production has been diversified by introducing *Xylella*-resistant olive species. Passing the right message in media and social media, the positive opinion toward the social actors of the microsystem could increase, generating benefits for the economic sustainability of the olive oil companies, as also suggested by Nguyen and Claus (2013). On the contrary, not all the social actors belonging to the mesosystem context seem to influence the purchase choices of Apulian olive oil during and after the Xf emergency period. Although the farmers' trust and quality (Gao & Schroeder, 2009) play a significant function, confirming H_2, the same does not happen for processors and transporters (Carfora et al., 2019). Therefore, H_3 and H_4 are not confirmed. This intuition becomes very important when interpreted in a definite context and historical-temporal framework or chronosystem (Scholz et al., 2019), because, especially in terms of applicative effects, it provides extremely important food for thought in conveying suitable and strategic information that has important consequences on the choice of purchase. Therefore, from this study emerges that the several actors of the olive oil supply chain are not perceived as equally important by the consumer during the Xf emergency. This is probably related to the strategic role of farmers in olive oil production since the quality of this food strongly depends on the quality of the olive and the related cultivation processes. Moreover, *Xylella* affects the olive trees, representing a problem for farmers and not for the other actors.

Finally, referring to the exosystem, from this study emerges that H_5 and H_7 are not met, while H_6 is supported. The study revealed that, among the social actors investigated in the exosystem (media, Italian food market, and government), media (Ismagilova et al., 2020) and government (Szmigin & Piacentini, 2018) do not have a relevant role in determining purchase choices for post-*Xylella* Apulian olive oil. Instead, our results confirm the strategical role of the Italian food market in

consumer choice in which consumer places exclusively own trust (Nagaraj, 2021). Although trust in the government is significant, it is almost nil in terms of quantitative effects in the structural relationship with the purchase of post-*Xylella* Apulian olive oil. On the one hand, this can be taken for granted since the food market is responsible for the food quality and safety adopting procedures aimed at witnessing quality and transparency (e.g., traceability, certification, labeling). In our opinion, the non-significant effect of government's trust on post-*Xylella* Apulian olive oil willingness to buy represents a lack of recognition of government's actions to protect food: thus, this outcome is surprising, albeit the extraordinary nature of the circumstance may have had a magnifying effect on consumer perceptions of regulatory policies (Ivanova et al., 1995; Welch, 2002). Indeed, toward regulations, government is the first actor of the food system to establish the rules to follow to guarantee food safety. There are different examples: regulations on agri-food traceability (e.g., EU 178/2002), food labeling (e.g., EU 1168/2011, EU 775/2018), food certification (e.g., UE 1151/2012, UE 652/2017). Probably the role assumed by the government within the *Xylella* case was not perceived as adequate by consumers. Considering the high involvement of the media in dealing with the topic, even the non-confirmation of H_5 opens points of reflection related to the effectiveness of these tools to reach the modern consumer who probably builds his opinion through different information paths than in the past.

Furthermore, the relationships identified in this study may provide implications straddling micro and macro logic by adopting meso-order strategies. In particular, the knowledge generated by the emergency situation regarding the spread of the *Xylella* bacterium in Italy, which is of a micro-order, can offer considerable food for thought in terms of economic management policy, thus acting on a macro-order. Bronfenbrenner's systemic model, already formulated from a systemic perspective of increasing complexity, considers trust as an essential element to favor the purchase of Apulian oil post-*Xylella*. There are different technologies capable of fostering a deeper knowledge of food products, to make the consumer more aware and more aligned with his or her purchase choice. As explored by Singh et al. (2022), some technological systems are able to increase the safety and perceived quality of food products, such as blockchain technology or RFID. Therefore, technology can represent the meso methodology capable of creating a point of contact between the micro situation and action in a macro context.

Implications

The findings of this study should be helpful to discuss implications from methodological and sectorial perspectives. From methodological perspective, to the best of the authors' knowledge, this study was one of the first to apply Bronfenbrenner's model in the evaluation of the consumers' food choices during a phytosanitary emergency, exploring the impact generated by several social actors of the microsystem, mesosystem, and exosystem. This allowed to confirm the importance of some specific ecological contexts in the social marketing study, confuting the theory of Melnyk et al. (2021). Therefore, academia could adopt this model to

better investigate the food purchase behavior enlarging the knowledge base of findings coming from other widely adopted theoretical model (e.g., Theory of Planned Behaviour). The importance of a systemic model postulating the influence of different contexts on human action, such as the intention to buy or the consumption of food, could therefore supplement the conception of humans as actors with rational logic in their decision-making with the influence played by different elements in their actions (Cárdenas, 2016). Indeed, the ecological contexts hypothesized can be conceptualized as multi-level impact factors with increasing complexity. In a society and in a historical-economic context marked by frequent emergencies and abrupt transformations, which lead to multivariate phenomena affected by many factors, a systemic approach to the rational choices of the individual should be addressed. Moreover, the conceived model could represent a well-established element for food choices' assessment during phytosanitary emergencies or more generally consumers' behaviors during critical events (e.g., pandemics, economic or political crises). In methodological terms, moreover, the SEM methodology proved effective in providing practical implications to the study, thus characterizing itself as a powerful tool useful in capturing specificities of a phenomenon that can potentially project into interventions at higher levels. The indices of reliability and goodness of fit, both in the appropriate ranges, reveal how even in the field of economics it is possible to study relationships between latent variables in order to gain a deeper understanding of phenomena that in the micro can provide empirical insights at macro levels.

From sectorial perspective, the retrieved findings should be helpful for marketers and companies in the agri-food industry, consortia, trade associations, government bodies, and public health sector policymakers to establish an effective mechanism for food safety communication (Silva et al., 2016). As discussed in the previous section, the relevance of microsystem in the post-*Xylella* Apulian olive oil choice could increment the awareness of food marketers and companies about the importance to better communicate during a phytosanitary emergency, to explain what impacts on the quality of the product and what does not generate a climate of favorable opinions around the phytosanitary emergency. This implicates the adoption of new communication strategies capable of increasing the product storytelling also toward the adoption of communication and media technologies. For example, social network theories could be strategical to change the opinion of the microsystem supporting companies in managing the effects of an emergency (Samson & Voyer, 2014). More actions are required to communicate better the responsibility along the agri-food supply chain (mesosystem). According to (Bardin et al., 2017; McFadden & Lusk, 2015; W. Wang et al., 2023), the trust in food sellers is capable of influencing the consumer purchasing behaviors but it is not clear what appended if the sellers coincide with the producers (such as the farmers in the case of low miles chain). Our findings suggest that acting on the consumers' perception of farmers can decrease the uncertain, as suggested also by (Polenzani & Marchini, 2022), increase the trust, and positively influence the buying choices. Although it emerges that the farmer is the actor in whom consumers place more trust during post-*Xylella* Apulian olive oil choice, it is necessary to underline the other agri-food supply chain actors' impact on the quality of the final product. Processors receive the olives from farmers and act on them realizing transformation processes that could impact on the olive oil

quality. Similarly, for distributors, managing the olive oil bottles during distribution could affect its quality, exposing the product to harmful temperature and brightness. Therefore, is not clear how much the consumer is aware of these aspects. With a view to correctly balance benefits and responsibilities among the olive oil agri-food supply chain actors, more informative campaigns could be realized, explaining better to the final consumers how the several actors can affect the product quality. If the consumer will distribute trust issues more evenly along the agri-food supply chain, farmers could benefit from a fair value distribution process. However, it must be recognized that this kind of actions cannot be carried out by a single company, but they require coordinated agri-food supply chain intervention by superstructures such as consortia, trade associations, or government bodies, in order to prevent the occurrence of the future scenario outlined by Schneider et al., (2021).

Conclusions, Limits, and Follow-Up

The study provided evidences about the factors able to influence the variability of consumers' willingness to buy of olive oil in phytosanitary emergency condition. Specifically, testing and analyzing seven hypotheses in a representative sample of 779 Italian consumers, through Structural Equation Modeling, the study showed that Italian consumer's willingness to buy the post-*Xylella* olive oil can fluctuate according to the influence coming from family, friends, and colleague such as trust in farmers and the credibility of Italian food market, trust in processors, transporters, and government and media does not. The findings, from theoretical perspective, enriched the extant knowledge on the topic, provided empirical evidences coming from the case study, and tested the applicability of a multi-systemic model able to analyze consumers' behaviors. Moreover, from sectorial perspective, leveraging on the study insights, agri-food sector stakeholders, government bodies, and public health sector policymakers can understand and stimulate new or more customized marketing and communication strategies to counterbalance the significant economic deficits resulting from *Xylella* and to undertake a comprehensive revitalization of the affected territory.

The present contribution, albeit in its originality, presents some limitations in the generalization of the results. Specifically, the criticisms concern two main aspects: the influence of the specific spatiotemporal period on the results and the numerosity of the sample. Therefore, although the study takes shape in a delimited and defined historical period for explanatory reasons, it is reasonable to expect that the results could vary if the measurements were carried out at different times. Moreover, the outputs obtained concern the entire Italian population, thus not differentiating by region of origin. Since the Xf emergency has mainly affected the southern regions, changing the stratification of the identified population could also vary the results. Finally, although the sample under analysis is representative of the reference population, its enlargement could provide support and greater robustness to the data. With the aim to overcome the envisaged limits and respond to the discussed implications, the following follow-ups were proposed: (1) realize a longitudinal study to evaluate the change of results overtime. *What will happen to the Italian consumer if Xylella*

emergency becomes a problem of national relevance? (2) Realize the study focusing on Apulian consumers to evaluate if the analyzed construct acts differently in a sample specifically involved in the phytosanitary emergency. *How do these results change considering the consumer's belonging to the territorial area in which the emergency is taking place?* This list of follow-ups is not to be considered complete and exhaustive, but it is intended to be a starting point of interest toward which to direct the efforts of researchers.

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Declarations

Conflict of Interest The authors declare no competing interests.

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