Creative Ecosystem Services: Valuing Benefits of Innovative Cultural Networks

Giuliano Poli[1](✉) and Gaia Daldanise[2]

[1] Department of Architecture, University of Naples Federico II, via Toledo 402, Naples, Italy
giuliano.poli@unina.com

[2] Institute of Research on Innovation and Services for Development (IRISS), National Research Council of Italy (CNR), Naples, Italy
g.daldanise@iriss.cnr.it

Abstract. The Ecosystem Services provided by food encompass a vast amount of material and immaterial benefits to human beings and shared values linked to creativity, self-fulfilment, recreation, sociality, culture, and mutual learning, which are at the basis of a modern and eco-instructed community. In Italy, agri-food no-profit sector or small-medium enterprises can empower a community to cope with resource depletion, waste production, biodiversity loss, and climate change by sparking sustainable urban and rural practices preserving the current ecosystem services and generating new ones. Within the ecological economics, the integrated assessments' contribution becomes relevant when the potentials of sustainable agri-food practices and values – which local communities assign to the related Ecosystem Services – have to be estimated to better inform Decision Makers in empowering policy and planning fostering maintenance and regulation of these services in rural and urban contexts. The contribution's purpose was to propose a methodological approach for assessing creative ecosystem services within an agri-food cultural value chain with the Fuzzy Analytic Hierarchy Process (F-AHP) multi-criteria method. The overall results have allowed obtaining a global ranking of the preferable scenarios linked to a Cultural Creative Enterprise (CCE) located in Foggia, Apulia (Italy). The research follow-up addresses the co-creation of creative ecosystem services in synergy with local stakeholders and beneficiaries, generating new job opportunities, awareness and innovation through an advanced form of shared responsibility.

Keywords: Ecosystem services · Creativity · Integrated evaluation · F-AHP

1 Introduction

The United Nations' Millennium Ecosystem Assessment (MA) framework [1] adopted the Ecosystem Services (ES) paradigm, which has emerged as a systematic methodology to define and categorize the relationship between ecosystems and society [2], and it is generally accepted within the international environmental science, policy communities [3] and academia [4]. Despite Cultural Ecosystem Services (CES) – as "the non-material benefits people derive from ecosystems through spiritual enrichment, cognitive growth,

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reflection, leisure, and aesthetic experience" [5] – have been recognised as crucial, they are not yet totally integrated into the MA's ES framework considering the difficulty of non-material services to be assessed.

As a specification of the MA definition, the Economics of Ecosystem and Biodiversity (TEEB) has defined ES as "the direct and indirect contributions of ecosystems to human well-being regenerating human, social, produced, and natural capitals" [6].

The initiative established by the European Environment Agency to create a Common International Classification of Ecosystem Services (CICES) has undertaken several consultation exercises to develop a more standard approach to describing ecosystem services (http://cices.eu). The 2012 revision work on CICES highlighted that cultural services encompass all non-material and typically non-consumptive outputs of ecosystems that affect people's physical and mental well-being [7].

Implementing the four ES capital stocks aids to investigate an agri-food cultural value chain in terms of material/immaterial flows, ranging from production to processing, distribution, consumption, and assessment. Therefore, linking the creative capital [8] to capital stocks means continuously innovating resources, expertise, knowledge and co-evaluating immaterial values using qualitative and quantitative indicators [9]. Indeed, the creative capital can be defined as an innovation catalyst in which Technology, Talent, and Tolerance (3T) [10] become critical issues for assessing significant impacts on local productivity and attractiveness.

Cultural Creative Enterprises (CCEs) emphasize talents and convergent interests of individuals, private organizations, and public institutions to turn them into original goods and services, sparking a synergic and symbiotic partnership between society, industry, and landscape [11]. Meanwhile, CCEs' creativity, quality, and innovation are crucial for the sustainable competitive advantage of urban-rural systems [12] and generate a new value chain of resources in which tangible and intangible assets join shared values [13].

Some authors have identified multidimensional evaluation models recognising the need to use multi-criteria decision analysis (MCDA) for monitoring local regeneration practices by engaging multiple Stakeholders, weighting site-specific criteria, and choosing best-fit scenarios [14–20].

Despite its popularity and ease of use, the Analytic Hierarchy Process (AHP) is frequently chastised for its failure to deal with the uncertainty of a decision maker's preferences. The judgments in traditional AHP are expressed by exact values on a scale of 1–9 [21]. However, in many real-world circumstances, linguistic assessments of human judgments are often ambiguous, and representing them with precise values is unrealistic. Fuzzy AHP (F-AHP) was created to address these shortcomings accounting for uncertainty and imprecision. It is essentially a hybrid of two techniques: fuzzy set theory and AHP [22].

This contribution constitutes a proof of concept addressed to perform a preliminary framework using creative ecosystem services to evaluate an agri-food cultural value chain. It aims to expand an approach previously tested by the authors [23] to study the benefits of co-creation in terms of cultural networks and social innovation on sustainable development at a local scale.

2 Materials and Methods

The research's purpose was to propose a methodological approach for assessing creative ecosystem services within an agri-food cultural value chain. The adopted case study focuses on a CCE promoting social innovation in agri-food products and co-creation activities and providing different material and immaterial services, i.e. performing arts, networking events, storytelling, food professional consultancy, theatre school, communication, and local agri-food products promotion, packaging design.

The selected CCE – denominated *Vàzapp'* – is in Foggia, Apulia (Italy) (http://www.vazapp.it/). It constitutes an excellent case study for identifying, eliciting and assessing material and immaterial ES and their beneficiaries, which is one of the objectives the authors address to target. *Vàzapp'* provides services and events that promote the exchange of skills and information, as well as the sharing of ideas and problems related to agri-food activities, among local supply chain actors [24].

The proposed model, revised from Cerreta et al. (2020) [23], identifies the agri-food cultural value chain linked to this CCE and includes (Fig. 1):

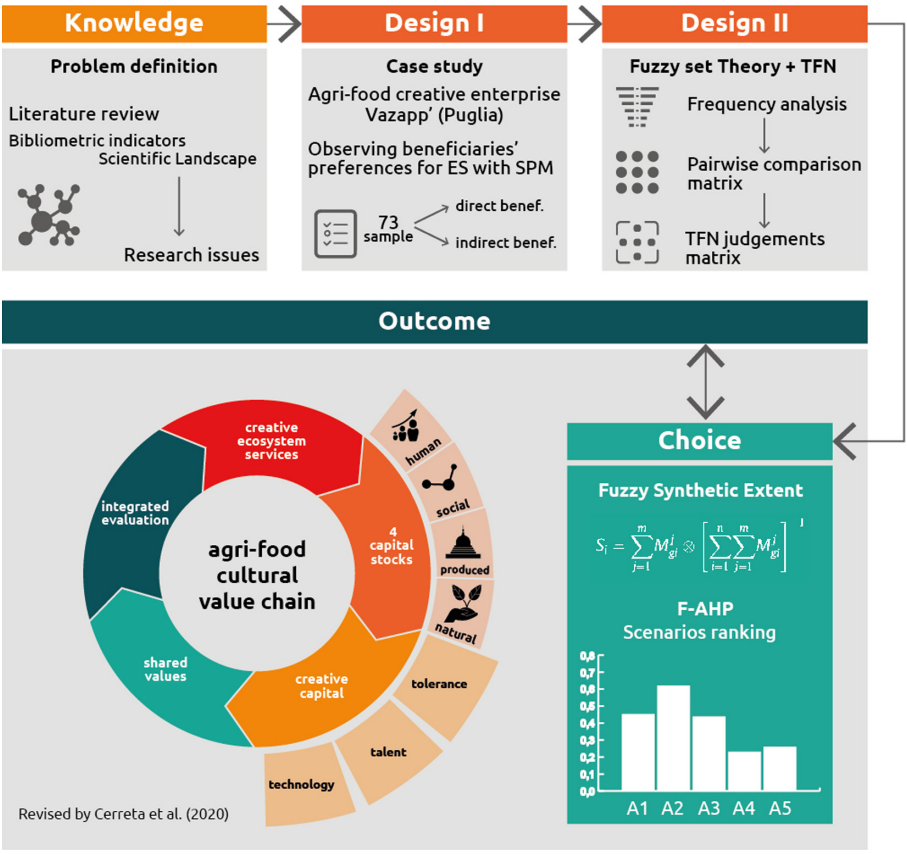

Fig. 1. The methodological workflow for assessing an agri-food value chain

- Creative ecosystem services based on innovative ecosystem solutions;
- Four capital stocks for socio-cultural ES in terms of human, social, produced, and natural benefits;
- Creative capital identified as the fifth capital stock and characterised by 3 T (tolerance, talent, and technology);
- Shared values resulting from the co-creation process generated by the creative capital;
- Integrated assessment approaches for co-evaluating creative ecosystem services.

As shown in Fig. 1, the methodology in four steps addressed to:

1. Explore the scientific literature linking natural, social, and cultural ecosystems in order to highlight primary issues and research pathways (Knowledge phase);
2. Assess direct and indirect users' preferences through a non-monetary Stated Preference Method (SPM) (Design phase I);
3. Aggregate the survey results using Triangular Fuzzy Numbers (TFN) and the fuzzy set theory (Design phase II);
4. Score creative ecosystem services criteria and rank preferable scenarios through the F-AHP (Choice/Outcome phase).

The four steps and related outcome – structured following the framework of Decision Support Systems (DSS) [25, 26] – are described in-depth in the following sections.

2.1 Knowledge Phase

The research issues have been derived from a literature review structured through the quantitative bibliometric approach of the scientific landscapes provided by van Eck and Waltman (2010) [27]. This approach allows to graph a network based on the number of keywords co-occurrences in the articles' title and abstracts within scientific databases. In our case, keywords and related logical operators to perform the analysis from the Scopus database were: (cultural AND ecosystem AND services) AND (art OR culture) AND (assessment OR valuation OR evaluation).

The analysis has allowed three strongly interrelated thematic clusters to be highlighted (Fig. 2):

- Cluster 1: Ecosystems, Culture, and Creative Ecosystems;
- Cluster 2: Ecosystem Services and Decision Making;
- Cluster 3: Ecosystems and Sustainability

A description of critical issues for each cluster follows.

Cluster 1 highlights that CES in urban settings foster more equitable communities by creating or maintaining spaces that provide immaterial services to human beings. However, to do so, consistent and reliable indicators must be established based on an epistemic knowledge of urban contexts for which there are no references and data frequently [28]. According to Rall et al. (2017) [29], social-oriented CES related to leisure, sociality, and cultural heritage are more concentrated in the inner city.

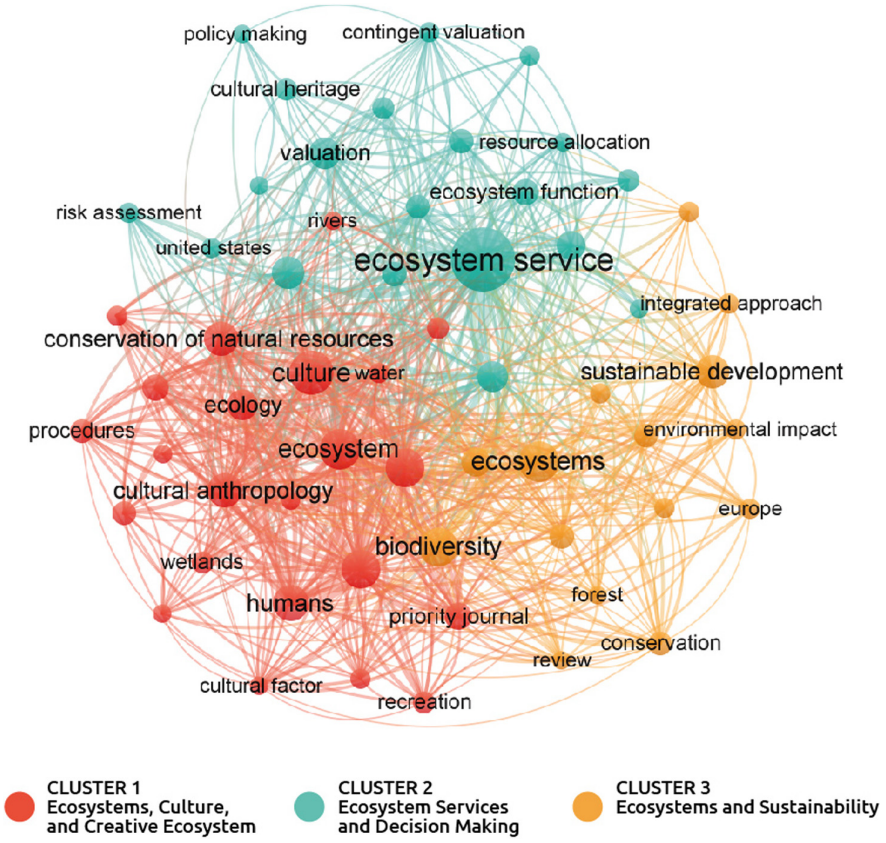

Fig. 2. The scientific landscape

A recent literature review on these issues [30] has highlighted significant publications 'growth related to CES in urban settings since 2012. The authors pointed out that CES evaluation was primarily ignored in the scientific literature and limited to monetary services like leisure and ecotourism. However, Artmann and Sartison (2018) [31] detected that the most frequently mentioned ecosystem services given by urban and peri-urban agriculture are the cultural services. They found 111 citations in 59 of 166 papers. Their findings show that: tourism prospects play a minor role (0.9% of total citations), compared to the most cited CES, which include nature experience (17%), education and learning (27%), and recreation, mental, and physical health (33%).

In 2017, the European Commission proposed a preliminary version of the Cultural and Creative Cities Monitor – a tool developed to benchmark European cities by gathering 29 descriptive indicators from nine different dimensions – including the ecological or structural essence of creative cultural activities in the urban contexts [32].

Creative industries have been referred to as those industries where creativity is at the core of all economic processes. These globally recognised industries include architecture, film production, fashion, design, video games, and other fields that require creative

ability as a source of co-creation processes [33]. Their expansion aims to reinforce the connection between creativity and various creative contributors [34]. As a result, businesses started implementing open innovation, especially crowdsourcing modules, recognising the value of the creative community and ensuring creative and trustworthy cooperation [35].

Cluster 2 includes research issues related to the ES assessment regarding potentials, flows, and demand with spatial analysis and quantitative valuation tools to inform decision-making.

Burkhard et al. (2014) [36] presented a spatial methodology based on matrices connecting CORINE land cover types to potential, flows, demands, and budget estimations for ES. These matrices demonstrated that landscapes have different ecosystem service potentials from flows, particularly in provisioning services. About CES, the difficulty of estimation was remarked upon since their immaterial nature and complex elicitation methodologies.

On the other hand, Jacobs et al. (2016) highlighted the importance of triggering methodological advancements based on practice-oriented perspectives to target mixed uses of valuation methods investigating local cases. Indeed, single-valuation procedures frequently obscure the opinions of certain actors since the tool used does not capture their valuation language [37]. Although these same actors can demonstrate their appreciation for ecosystem services in other ways, such as their willingness to volunteer for conservation or restoration projects [38], their sense of place or sacredness associated with specific locations [39], or the time spending for activities developed by a community in a natural setting.

At last, developing decision-making procedures to balance perceived and non-perceived effects of cultural ecosystems remains a challenge for practitioners, specialists, and policymakers. With this ambition, Satterfield et al. (2013) fostered a mixed-use of valuation methods to understand and measure cultural values categorising four elicitation procedures: 1. Articulation; 2. Classification; 3. Importance; 4. Spatial relevance [40].

Cluster 3 includes articles linking sustainability to ecosystems and exploring the nature-culture nexus.

Diaz et al. (2018) have identified a twofold perspective in agri-food co-production in high-diversity agriculture as, on the one hand, a process that combines a collection of biological and technological inputs aimed at optimizing biodiversity, and, on the other hand, as a "practice of care" by social relationships and association with immaterial values [41].

According to Arowolo et al. (2018), land-use/land-cover (LULC) dynamics have had a significant impact on providing ecosystem services for human existence, livelihood, and well-being [42]. The recent conversion of these natural ecosystems into croplands, tree plantations, and urban areas has resulted in massive food production, fiber, lumber, housing, and other items worldwide [43]. Unfortunately, the gains of these transformations were accompanied by a deterioration in the provision of several ecosystem services, with nearly 60% of ecosystem services degrading in the last five decades [44].

2.2 Design (I)

The Design phase was divided into two sub-steps. The first step (Design I) was addressed to observe beneficiaries' preferences for ES through a Stated Preference Method (SPM). The second step (Design II) has allowed performing an integrated assessment to elicit shared values using Triangular Fuzzy Number (TFN) and Fuzzy Synthetic Extent. The problem modelling in the design phases has allowed creative ecosystem services to be evaluated based on the agri-food cultural value chain.

Within the Design I phase, the study has used the Stated Preference method (SPM)n results obtained by the "*Vàzapp'* survey" (https://bit.ly/2O55BEG) for assessing creative ecosystem services in Cerreta et al. (2020) [23].

The overall number of respondents are 75 people, among which 46,6% (35 persons) include direct beneficiaries of *Vàzapp'*, while 53,4% (40 persons) refers to people that never heard about this practice; nevertheless, they can be considered as potential beneficiaries. They have been sampled according to their interest to be involved in rural experiences, urban resilience strategies and cultural activities linked to agri-food chain discovery and knowledge. The representative sample, indeed, is composed of people with a high education level (45,2% hold a master-degree, while 41,1% are involved in Post-doc) and with job positions as employee (39,7%) and freelance (26,0%).

The survey's objectives were addressed to score the six ES according to preferences expressed on a 5-point Likert scale. Following questions have assessed how much time a person is willing to participate within creative experiences and identified shared values among involved stakeholders (e.g., working partnerships, consultancy, sponsorships).

According to the goals of *Vàzapp'*, the following six ecosystem services have been chosen: Good Job Opportunity, Nutrient Food, Cooperation and Community, and Disintermediation, Natural Ecosystem Enhancement, and Environmental Education. The following are the conditions for choosing the six ES: Exploring Good Job Opportunities entails learning how *Vàzapp'* or a similar practice may help create an enabling environment that encourages jobs through funding and formal/informal collaboration. Nutrient Food has been chosen as the foundation of a cultural agri-food value chain. Cooperation and Community is in line with the goal of these practices, which is to improve the collaboration among stakeholders. Furthermore, this practice ensures Disintermediation as the most appropriate service for reducing steps within a supply chain. Natural Ecosystem Enhancement and Environmental Education have been chosen because cultural activities concentrate on preserving local practices and bequeathed agricultural techniques and the education of new generations in respecting nature.

2.3 Design (II)

The second step of the Design phase has aimed to elicit shared values in terms of priorities using Triangular Fuzzy Numbers (TFN) [45] by arranging data for multi-criteria modelling. The purpose is to define creative ecosystem services based on the agri-food cultural value chain enabling relationships within the local community and boosting innovative services. Among survey respondents, the authors have selected the forty potential beneficiaries' preferences related to site-specific creative scenarios to be replicated in other contexts.

Experts have employed fuzzy logic for a long time to facilitate decision making in many investigation fields when complete and exact information is lacking. TFN have allowed the uncertainty – linked to the priority's assessment of criteria and alternatives – to be included in the decision making problem.

In this application, the authors adopted the mathematical approach by Lyu et al. (2019) [46] changing the frequency range of priorities – observed in the aggregated results of the survey's respondents – into TFN.

The operative steps producing TFN are the following:

- Each criterion's scores are summed up, including the total number of scores allocated and the number of times the survey's respondents assigned a score. Each score becomes an interval number, with the lowest and highest values given to each factor (criterion/alternative), as shown in Tables 1, 2.
- The pairwise comparison of two elements results in forming a judgment matrix in which each coefficient may be characterised as a ratio of the two factors' interval values (Table 3).
- A crisp number replaces the previous interval ratio, which may generally meet the judgement matrix's consistency criterion. A triangular fuzzy number returns the equivalent crisp value in the judgement matrix, and a judgement matrix composed entirely of TFN is established (Table 4).

Table 1. Criteria preferences range.

Alternatives (scenarios)	Preference range					Number interval
	1	2	3	4	5	
C1 - Good job opportunities			10	8	22	3-5
C2 - Sustainable food			1	16	23	3-5
C3 - Cooperation and community activities			3	8	29	3-5
C4 - Disintermediation of agri-food products		1	5	22	12	2-5
C5 - Natural ecosystems enhancement			1	13	26	3-5
C6 - Environmental education			2	9	29	3-5

Table 2. Scenarios preferences range.

Alternatives (scenarios)	Preference range					Number interval
	1	2	3	4	5	
A1 - Social dinner for agri-food professionals	11	13	10	6		1-4
A2 - Celebration days for local products	11	9	14	4	2	1-5
A3 - Performing arts in rural settings	7	14	12	2	5	1-5
A4 - Performing media storytelling agri-food	14	11	9	3	3	1-5
A5 - Other	23	3	9	9		1-4

Frequencies attributed by respondents based on the 5-points Likert scale and related to the most scored among the six ecosystem services have been grouped into preferences ranges, as shown in Table 1.

The same procedure has been applied for the preferable scenarios, which have been scored in terms of willingness to spend time for activities linked to the agri-food cultural value chain. The unit of measure has been changed from hours/month to 5-points Likert following this rule: the more the donated time, the more the scored value (Table 5).

Interval numbers referred to alternatives range 1–5 for three up to five scenarios, while scenarios A1 and A5 range 1–4.

Table 3. Judgment matrix with the ratios of criteria‘s interval values.

1	3–5/3–5	3–5/3–5	3–5/2–5	3–5/3–5	3–5/3–5
3–5/3–5	1	3–5/3–5	3–5/2–5	3–5/3–5	3–5/3–5
3–5/3–5	3–5/3–5	1	3–5/2–5	3–5/3–5	3–5/3–5
2–5/3–5	2–5/3–5	2–5/3–5	1	2–5/3–5	2–5/3–5
3–5/3–5	3–5/3–5	3–5/3–5	3–5/2–5	1	3–5/3–5
3–5/3–5	3–5/3–5	3–5/3–5	3–5/2–5	3–5/3–5	1

Table 4. TFN judgments matrix for criteria.

1	1	1	1	1	1
1/1*	1/1*	1/1*	1/1*	1/1*	1/1*
1/1*	1/1*	1/1*	1/1*	1/1*	1/1*
2*	2*	2*	2*	2*	2*
1/1*	1/1*	1/1*	1/1*	1/1*	1/1*
1/1*	1/1*	1/1*	1/1*	1/1*	1/1*

Table 5. Transformation from Hours/month to 5-points Likert

Hours/month	Likert value
≤1	1
1 < x ≤ 2	2
2 < x ≤ 6	3
6 < x ≤ 8	4
8 < x ≤ 10	5

The preparatory steps in the Design II phase have allowed returning the AHP comparisons matrices avoiding the pairwise comparison procedures, which are limitations related to the standard AHP procedure.

2.4 Choice Phase

The choice phase has been addressed to rank beneficiaries' preferences for ES with F-AHP to determine how creative ecosystem services can support innovative cultural networks scenarios in the agri-food value chain. The proposed model has aimed to provide recommendations to Decision Makers in terms of creative activities to be pursued.

The decision problem has assessed five scenarios for innovative cultural networks: A1 – Social dinner for agri-food professionals, A2 – Celebration days for local products, A3 – Performing arts in rural settings, A4 – Performing media storytelling for agri-food, A5 – Other. Meanwhile, the decision variables corresponding to the criteria within the hierarchical structure (Fig. 3) have included the six selected ecosystem services.

In this study, the authors adopted linguistic variables and the related triangular fuzzy conversion scale by Chang (1996) [47] since it allows highlighting a difference when identical elements are compared (Just equal) or different ones achieve the same importance (Equally important).

Fuzzy pairwise comparisons matrices – obtained in the design II phase – were processed to derive the weights at criteria and alternatives levels. The fuzzy synthetic extent by Chang (2008) has allowed TFN sum and multiplication – identified with the symbol ⊛ – within the matrices' rows and columns following the Eq. (1):

$$S_i = \sum_{j=1}^{m} M_{gi}^{j} \circledast \left[\sum_{i=1}^{n} \quad \sum_{j=1}^{m} M_{gi}^{j}\right]^{-1} \tag{1}$$

Where M_{gi}^{j} represents the (l,m,u) values that describe a fuzzy event for each TFN and is equal to the Eq. (2):

$$\sum_{j=1}^{m} M_{gi}^{j} = \left(\sum_{j=1}^{m} l_j, \sum_{j=1}^{m} m_j, \sum_{j=1}^{m} u_j\right) \tag{2}$$

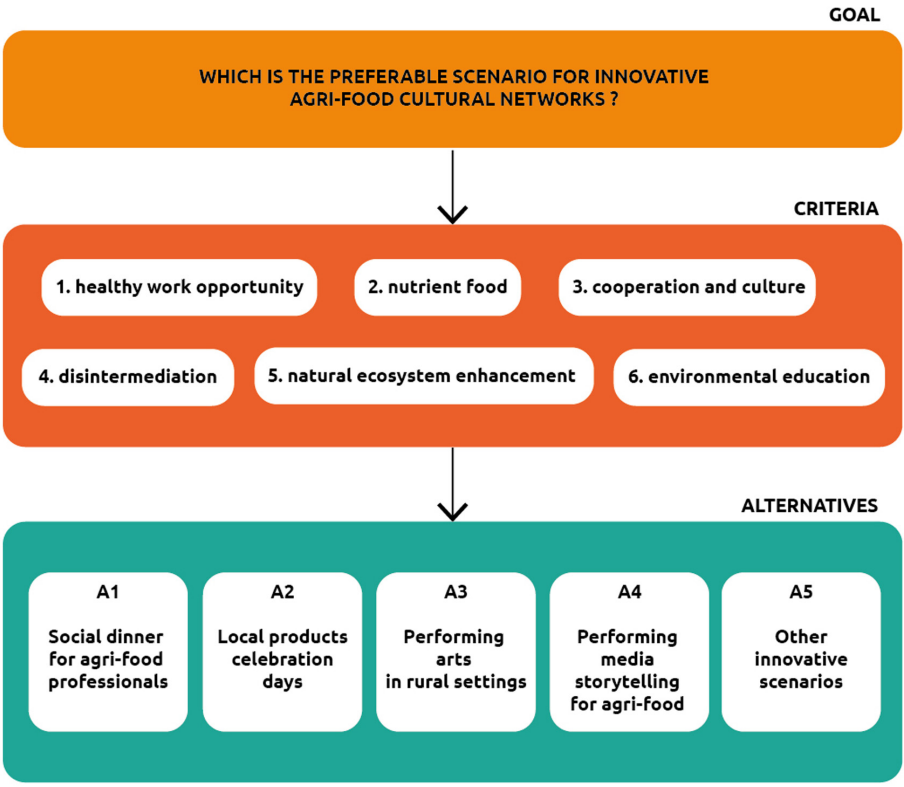

Fig. 3. The AHP hierarchical structure

Where: l_j is the smallest possible value; m_j is the most promising value; u_j is the largest possible value. After some fuzzy operations, an equations system has been solved respecting conditions in the Eq. (3):

$$\mu_{M_2}(d) = \begin{cases} 1 & \text{if } M_2 \geq M_1 \\ 0 & \text{if } l_1 \geq u_2 \\ \frac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)} & \text{otherwise} \end{cases} \tag{3}$$

Finally, the results of the equations system have returned the priorities for criteria and, thus, the ranking of alternatives.

3 Results

The Knowledge phase has allowed the problem definition to emerge from the literature about the three clusters referring to as: 1. Ecosystems, Culture, and Creative Ecosystems; 2. Ecosystem Services and Decision Making; 3. Ecosystems and Sustainability. The number of examined papers amounts to 156, subdivided into 122 articles, 17 review articles, 7 conference papers, 9 book chapters, and 1 note. A growing interest of authors

for these issues from 2000 to 2021, with a pick of publications in 2014, has been detected (Fig. 4).

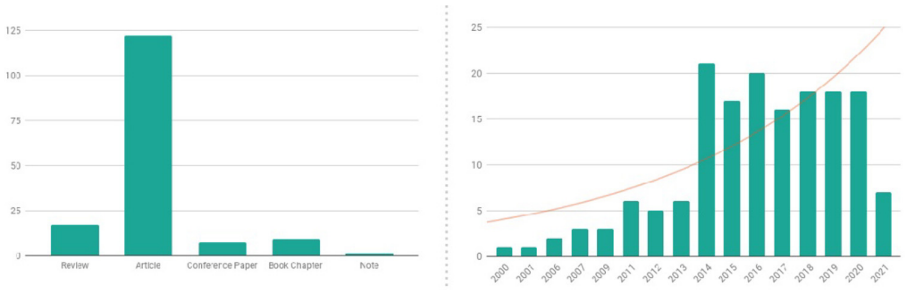

Fig. 4. Article's typology (on the left) and number of publications 2000–2021 (on the right)

The literature survey allowed us to highlight and go in depth to the following research questions: how does creative capital implement the four capital stocks to boost co-creation processes in terms of connections between community knowledge and individual talents? How practice-oriented research at a local scale helps to investigate and, thus, produce shared values linked to ecosystem services? What about the integrated evaluations' role in incorporating both perceived and non-perceived values for the assessment of ES? What innovative ecosystem solutions in the agri-food co-production aim to optimize biodiversity and, concurrently, strengthen social innovation as a "practice of care"?

In response to these questions the 4-step methodology to study the agri-food cultural value chain has been implemented.

In particular, four capital stocks for socio-cultural ES to be analysed regarding human, social, natural, and produced benefits emerged. Within these capital stocks, the six ecosystem services referring to the case study have been prioritised and assessed together with the innovative cultural agri-food activities towards creative ecosystem services.

The Design phase results concerning the indirect beneficiaries' preferences are presented below.

The first question relates to the priorities of six ecosystem services which *Vazapp'* or similar practices can spark. *Cooperation and community* and *Environmental Education* score at the top of the ranking with 29 respondents which attributed maximum Likert value to these services. 74,4% of potential beneficiaries attribute extreme importance to *Cooperation and Community*.

The second observation aims to understand how much time a person could spend enjoying the creative activities provided by agri-food cultural value chain. The overall time amounts to 474 h per month which 40 people are willing to spend to be directly engaged in these activities. Art performances and acting schools emerge as the most interesting activities in which people have declared to spend more time (10 h per month and more).

The results of fuzzy extent analysis - calculated for criteria and alternatives of the decision problem – have allowed to obtain the global ranking (Fig. 5).

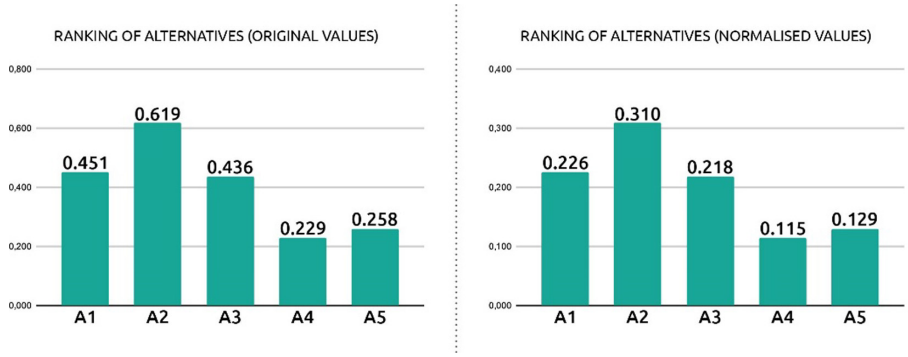

Fig. 5. Final ranking of the alternatives

Following the AHP method, local weights of criteria were multiplied for alternatives 'weights with the Eq. (1) to derive the global alternatives 'priorities. The results in Fig. 5 show that A2 scores high with 31% of preferences. At the second position, A1 and A3 emerge with similar scoring. Finally, A4 and A5 place the last position in the ranking with a short deviation. It means that potential beneficiaries of CES prefer local food events for leisure and the exchange of information related to techniques and procedures for sustainable agriculture.

4 Discussion and Conclusions

The research results allow preliminary reflections about the definition of creative ecosystem services for overcoming critical issues concerning cultural, economic, environmental, and social conflicts that generally affect the southern Italian communities. Pursuing objectives of effectiveness, efficiency, productivity, and sustainability-related to CCEs enabling key-factors that refer to creative capital, shared value, and innovative cultural networks can contribute to solving structural problems at the foundations of agri-food value chains, e.g., the agri-food products quality reduction, low management skills of producers, the deprivation of agri-food producers in socio-economic terms.

The proposed approach aims to implement the current scientific debate on CES for regional regeneration from a systemic and transdisciplinary point of view, where multi-criteria evaluations are combined with creative services and social innovation tools from a multi-stakeholder perspective. In addition, analysed ES assessment studies foster combining objective and subjective evaluations and including tangible and intangible values. In this perspective, the co-creation transforms these values into shared values boosting innovation in cultural services and social cohesion towards a sustainable development.

Each research step has attempted to respond to different questions highlighted from the scientific landscape analysis.

The **Knowledge phase** highlighted that the creative capital implements the four capital stocks of CES thanks to a creative ecosystem aimed to gain a competitive advantage by introducing innovation, inter-industry and individuals' cooperation, which is a prerequisite for ecosystem development. Furthermore, the scientific landscape methodology was a potential of this study since it allowed the most relevant issues in terms of

co-occurrences in the scientific debate to emerge faster and efficiently. In this way, the primary literature was structured and clustered into thematic domains, facilitating the research questions' elicitation. Indeed, the literature analysis highlighted that CES and the creative ecosystem could empower the connections between community knowledge and individual talents generating innovation, international openness and local development. On the counterpart, some limitations related to the Knowledge phase entail extending the analysis to other cases to compare them according to the generalized methodological structure mentioned above.

The **Design phase** showed how practice-oriented research at a local scale helps to investigate and, thus, produce shared values linked to ES. Indeed, the SPM demonstrated the beneficiaries' high interest in CES and innovative cultural networks able to activate creative ecosystem services. Moreover, the fuzzy set theory has allowed uncertainty to be included in the decision-making problem incorporating both perceived and non-perceived values in terms of evaluation criteria. The first potential of this phase concerns using a mixed survey including both subjective and objective evaluation in a holistic perspective. Limitations are related to a low number of respondents and a limited sample regarding beneficiaries' typologies and their localisation. The main gain of the Design phase is also related to the simplification of questionnaires for the AHP since it allows avoiding the pairwise comparison that can be troublesome to human thinking. Nevertheless, simplifying the evaluation interface through questionnaires means increasing mathematical procedures for data aggregation, which is time-consuming.

The **Choice phase** has demonstrated what innovative ecosystem solutions in the agri-food co-production aim to optimize biodiversity and, concurrently, strengthen social innovation as a "practice of care". Indeed, ranking scenarios for innovative cultural networks showed that recognising the critical role of community, cooperation, and immaterial values implements the stakeholders' awareness of ES and the creative capital as sustainable development and local competitive advantage.

The choice phase limitations are linked to the scenario's generation, which should be obtained by a co-evaluation process merging potential and direct beneficiaries of CES.

The overall research weak point concerns the time consuming of such a value chain building process and the scarcity of local economic resources, especially in Southern Italy. Continuous and capillary action of trust and awareness-building of the cultural agri-food value chain is necessary, accompanying social and local physical transformations. The main difficulty lies in making people and institutions understand that investing time and money in the intangible values co-creation greatly helps transform tangible assets towards long-term sustainable development.

In this perspective, the research follow-up addresses the co-creation of creative ecosystem services in synergy with local stakeholders and beneficiaries, generating new job opportunities, awareness and innovation through an advanced form of shared responsibility. The creativity embedded in innovative cultural networks contributes to shape creative clusters in the agri-food value chain as the driving force of sustainable projects.

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