

Consumer preferences and business model innovation in women-led agri-food systems: Evidence from Morocco

Eleonora Sofia Rossi^{a,*}, Dina Najjar^b, Dorsaf Oueslati^c, Andrea Visioni^d, Emanuele Blasi^a

^a Department for Innovation in Biological, Agro-Food and Forest Systems (DIBAF), University of Tuscia, Via San Camillo del Lellis snc, 01100 Viterbo, Italy

^b Social, Economics and Policy Research Theme, Resilient Agricultural Livelihood Systems Program, International Center for Agricultural Research in the Dry Areas (ICARDA), Avenue Mohammed, Bearabi Alaoui, Agdal Hay Ryad, Instituts Maroc, Rabat, Morocco

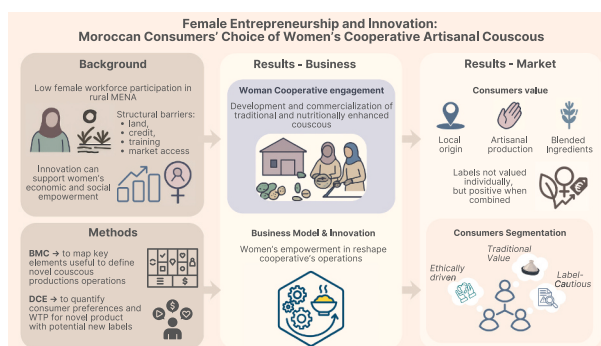
^c Social, Economics and Policy Research Theme, Resilient Agricultural Livelihood Systems Program, International Center for Agricultural Research in the Dry Areas (ICARDA), Rue Hedi Karray, Institut National de la Recherche Agronomique de Tunisie, 1004 Tunis, Tunisia

^d International Center for Agricultural Research in the Dry Areas (ICARDA), Rabat 10112, Morocco

HIGHLIGHTS

- Combines business model and consumer analysis in agri-food systems.
- Consumers value origin, artisanal production, and blended ingredients.
- Ethical and health labels are not valued when presented individually.
- Combined labels yield a positive net willingness to pay.
- Evidence supports gender-responsive, demand-informed scaling strategies.

GRAPHICAL ABSTRACT



ARTICLE INFO

Editor: Simon Fielke

Keywords:

Discrete choice experiment
Business model canvas
Food labelling
Willingness to pay
Women's empowerment
Cooperative models

ABSTRACT

CONTEXT: Transforming agri-food systems requires innovation pathways that are socially embedded, gender-responsive, and capable of scaling without reproducing existing inequalities. In low- and middle-income countries, women's cooperatives play a strategic role in linking traditional food systems with emerging markets, yet the mechanisms through which product and organisational innovations jointly create economic and social value remain insufficiently understood.

OBJECTIVE: This study investigates how product innovation and organisational innovation interact within a women-led agri-food cooperative in Morocco, and whether consumer demand can support responsible scaling while enhancing women's empowerment.

METHODS: The analysis combines a qualitative Business Model Canvas (BMC) with a quantitative Discrete Choice Experiment (DCE). The BMC assesses changes in the cooperative's value proposition, resources, and market orientation before and after targeted innovation support. The DCE evaluates consumer preferences and willingness to pay for product attributes, including artisanal production, ingredient blending, labelling, and price.

* Corresponding author.

E-mail address: e.s.rossi@unitus.it (E.S. Rossi).

<https://doi.org/10.1016/j.agsy.2026.104832>

Received 11 February 2026; Received in revised form 22 May 2026; Accepted 24 May 2026

Available online 31 May 2026

0308-521X/© 2026 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

RESULTS AND CONCLUSIONS: Consumers positively value intrinsic product attributes such as artisanal processing, blended ingredients, and local sourcing. In contrast, health and empowerment labels are not positively valued when presented individually. However, their joint configuration is associated with a positive net effect on willingness to pay, indicating that consumer responses depend on the combined presentation of attributes rather than on isolated claims. The BMC analysis reveals that targeted support, including training, improved equipment, and marketing assistance, strengthened the cooperative's capabilities, governance and market orientation. These findings suggest gender-responsive agri-food innovations could be supported when product attributes, organisational capacity, and consumer demand are aligned, although heterogeneous consumer responses and structural constraints call for adaptive, context-specific scaling strategies.

SIGNIFICANCE: The study provides empirical evidence on how demand-led gender-responsive innovation strategies can support inclusive and sustainable agri-food systems, offering practical insights for policymakers and development.

1. Introduction

Women's participation in the workforce in the Middle East and North Africa (MENA) remains among the lowest globally, due to persistent gender-based disparities in access to resources, decision-making power, and economic opportunities (Bastian and Zali, 2015; Lecoutere et al., 2023). In this context, rural women often face multiple structural barriers, yet many have managed to establish businesses, particularly in agriculture, food production, and handicrafts (Najjar et al., 2018; Ojong et al., 2021; Baruah and Najjar, 2022). Entrepreneurship in agri-food systems, particularly in cooperative settings, is widely recognized as a key driver of regional development and poverty alleviation and plays a fundamental role in fostering women's empowerment. It contributes not only to economic independence and increased social status but also to personal development and a sense of self-fulfilment (Bastian et al., 2019; Panda, 2018; Fletschner and Kenney, 2014; Venkatesh et al., 2017; Chen and Barcus, 2024).

The broader social and institutional environment, including access to resources, networks, and educational opportunities, further shapes women's empowerment (Ojediran and Anderson, 2020; Chen and Barcus, 2024). Innovation in agri-food systems is increasingly recognized as a driver of societal transformation, rather than merely a means to increase productivity or introduce new technologies (FAO, 2022; Galiè et al., 2025). This reconceptualization highlights that innovation also reshapes business models, organisational practices, and market relations, ultimately influencing how value is generated, distributed, and sustained within agri-food systems. In this context, community support and collective structures such as cooperatives play a key role. Women's cooperatives, especially in the agricultural sector, have been widely promoted as best practices that foster both economic and social empowerment (Baden, 2013; Verhofstadt and Maertens, 2015). They offer platforms for collective action that help women overcome market and institutional barriers, expand their professional networks, and fulfil gender-specific needs (Handschuch and Wollni, 2016; Mudege et al., 2015). Participation in such cooperatives enhances women's confidence, leadership skills, and participation in decision-making, contributing to their capacity to influence both private and public spheres (Das, 2014; Dohmworth and Hanisch, 2019). These effects extend beyond individual women to households and communities, supporting inclusive social and economic development (Kitole and Genda, 2024; Makandwa et al., 2023).

Despite the importance of cooperative participation, less attention has been paid to women's roles as innovators in food production and marketing. Yet, in the context of growing challenges such as drought, climate change, and rising demand for healthier or niche food products, female-led innovation may provide valuable solutions that enhance the resilience and adaptability of food systems (Bastian et al., 2022; Corrèa et al., 2021; Osei and Zhuang, 2020; Panda, 2018; Tita et al., 2025). Understanding consumer perceptions of women-led food innovations is crucial, as it informs strategies to scale these innovations responsibly, in alignment with both social objectives and market potential (Bastian

et al., 2019; Bastian et al., 2022).

This study aims to address this gap by focusing on the intersection between consumer demand and organisational innovation in women-led agri-food cooperatives. Specifically, the research investigates whether these cultural biases can be turned into market advantages that support female entrepreneurship. To address these questions, the study combines qualitative and quantitative methods. It begins with an in-depth case study of women's cooperatives in Morocco engaged in artisanal couscous production, using the Business Model Canvas to analyze how these organizations operate, innovate, and adapt to evolving market dynamics. Building on this, a Discrete Choice Experiment (DCE) was conducted to assess Moroccan consumers' preferences and Willingness To Pay (WTP) for couscous products differentiated by attributes such as the origin of raw materials, the use of healthy ingredients, the production method (e.g., handmade), and the presence of social or health-related certifications.

Through this dual approach, the study highlights how consumer preferences and cooperative strategies can be considered together to explore potential alignment. This framing supports the development of more inclusive, responsive, and potentially transformative agri-food systems in the MENA region.

1. The study pursues two primary objectives: to evaluate whether consumers recognize added value in artisanal, health-enhanced couscous products made by women, and whether such products can achieve a premium price in the market;
2. to examine how cooperative models contribute to women's empowerment, both economically and socially, through collective engagement in food production.

These objectives are addressed through a dual methodological approach that combines a DCE with a BMC analysis, allowing for a complementary examination of demand-side valuation and organisational dynamics. The study contributes to the literature in three main ways. First, it provides empirical evidence on consumer valuation of ethically and nutritionally differentiated products produced by women-led cooperatives, contributing to research on ethical consumption in developing country contexts. Second, it offers a structured analysis of organisational innovation within a women-led cooperative, highlighting how business model transformation supports empowerment processes. Third, by integrating these two perspectives, the study advances existing literature by showing how alignment between consumer demand and organisational capabilities can inform pathways for scaling gender-responsive agri-food innovations. While based on a focused case, the findings highlight broader mechanisms linking demand heterogeneity, credible value propositions, and organisational capacity-factors that shape the potential for scaling socially embedded innovations while maintaining their social objectives.

2. Background

2.1. Women employment in rural MENA

Socioeconomic marginalization in the MENA region and beyond is manifested through restricted access to land, credit, and agricultural technologies, which significantly hinders women's ability to fully engage in agricultural and food-related productive activities (De Kanter et al., 2024; Dey de Pryck and Termine, 2014; Meemken and Qaim, 2018). Research from the Global South highlights that women farmers often face greater challenges when integrating into modern value chains and are more likely to lose control over farm income as agricultural activities become more market-oriented and profitable (Chege et al., 2015; Kogut and Mejri, 2022; Oduol et al., 2017). Furthermore, entrenched cultural norms, such as patriarchal traditions and rigid gender roles, prioritize male labour in agriculture and food sectors, thereby limiting women's entrepreneurial opportunities and visibility (Ghouse et al., 2023; Kitole and Genda, 2024; Naegels et al., 2018; Nziku et al., 2022).

However, evidence suggests that income controlled by women has a disproportionately positive impact on family nutrition and child well-being, highlighting the potential systemic benefits of inclusive approaches (Chrysostome et al., 2024; Malapit and Quisumbing, 2015; Meemken and Qaim, 2018). Politically, women's underrepresentation in decision-making processes and agricultural policy formulation within the MENA region further entrenches their marginalization (Baruah and Najjar, 2022). Agricultural laws and policies frequently overlook women's specific needs, perpetuating gender inequalities and limiting their opportunities for social and economic advancement, as well as their entrepreneurial potential (Bandiera et al., 2020; Najjar et al., 2018). In this context, innovation and appropriate technologies not only enhance productivity or reduce labour burdens but also open pathways for women to reorganize their economic activities, strengthen collective action, and reposition traditional food systems as viable business opportunities. By enabling new forms of organization, market engagement, and value creation, such innovations support women's economic agency and expand their space for participation in local decision-making (Galiè et al., 2025; Vemireddy and Choudhary, 2021).

2.2. Ethical identity and Willingness to Pay in food markets

Ethical Consumers increasingly consider ethical and social attributes when making purchasing decisions, including ingredient sourcing, production practices, and social responsibility (Cook et al., 2023; Hamelin et al., 2013; Konuk, 2019). Certifications such as fair trade provide assurances regarding ethical standards (Akaichi et al., 2016; De Pelsmacker et al., 2005; Loureiro and Lotade, 2005), and consumers may be willing to pay premiums for products that combine ethical and health dimensions (Konuk, 2019; Poelmans and Rousseau, 2016; Rossi et al., 2024).

Research in developing countries remains limited, but initial evidence indicates that coherent communication of multiple social and health claims enhances perceived value, particularly when gender-specific dimensions are included (Lambarraa-Lehnhardt et al., 2021; Mouchtaropoulou et al., 2024; Sabeehuddin et al., 2023). These insights suggest that innovations can be scaled responsibly when product attributes, social messaging, and market demand are aligned, avoiding oversimplified approaches that ignore local contexts and consumer heterogeneity (Hamelin et al., 2013).

2.3. Business models related to environment and social aspects

Business models are commonly defined as representations of how organizations create, deliver, and capture value (Osterwalder and Pigneur, 2010), providing a useful framework for analysing organisational change and innovation processes. In recent years, increasing attention has been devoted to the integration of environmental and

social dimensions into business models, particularly in agri-food systems, where sustainability challenges require new approaches to value creation (Cosenz et al., 2019; Geissdoerfer et al., 2018; Kolk and Tulder, 2009; Kuran and Khabbaz, 2024; Silvestre and Țircă, 2019; Richardson, 2008). Within this context, inclusive and sustainable business models are becoming essential tools to promote economic resilience, improve social conditions, and reduce environmental impact (Bacon et al., 2014; Bocken et al., 2014; Roshan and Balodi, 2024). These models often emerge through innovation processes that reconfigure production systems, supply chains, and market relationships, enabling new forms of value generation that combine economic and social objectives (Ansari et al., 2012; Devaux et al., 2018; Ghufuran et al., 2024). Women-led co-operatives represent a particularly relevant organisational form, as they combine entrepreneurial activities with collective action and social empowerment goals (Doherty and Kittipanya-Ngam, 2021; Davies and Chambers, 2018). However, existing research tends to focus primarily on organisational structures and innovation processes, often overlooking the role of consumer demand in shaping the viability of these business models. This limitation is particularly relevant in developing country contexts, where market access and consumer perceptions play a critical role in determining whether innovative products can be successfully adopted and scaled (Hall et al., 2012; Ruben, 2024). This study addresses this gap by linking organisational and demand-side perspectives. Specifically, it analyses how changes in a women-led cooperative's business model, captured through the Business Model Canvas, relate to consumer preferences for product attributes, including health- and empowerment-related labels. Rather than implying a direct causal linkage, the analysis considers these dimensions as complementary, providing parallel insights into organisational transformation and market dynamics. By considering these perspectives together, the study offers a more focused understanding of how gender-responsive agri-food innovations can be both market-relevant and socially meaningful. While the Business Model Canvas provides a structured approach to analysing value creation and delivery, it does not explicitly account for broader environmental and social externalities. Therefore, in this study it is used as an analytical tool to examine organisational change and value proposition dynamics, rather than as a comprehensive framework for sustainability assessment.

3. Materials and methods

3.1. Couscous woman cooperatives case study

The Fès-Meknès region, situated in north-central Morocco, occupies a strategic position at the intersection of key economic corridors, facilitating both domestic and international trade. Its central geographic location, combined with a rich historical legacy, underpins its economic relevance. The region is distinguished by a high agricultural potential, supported by fertile soils and a predominantly semi-arid climate. Agriculture constitutes the region's primary area of public and private investment. With 1,335,639 ha of agricultural land, Fès-Meknès accounts for approximately 15% of Morocco's total arable land, although only 9% of this area is irrigated. The dominant cropping systems are based on cereal and olive production, which represent the core of regional agricultural activity (Mana et al., 2022). According to data from the *Office de Coopération au Développement* (2022), the region hosts 5349 co-operatives, accounting for 10% of all cooperatives nationwide, the majority of which are agriculture-based. Within this cohort, 677 are women-led cooperatives, constituting approximately 9% of all women's cooperatives in Morocco (El Maaqili and Ouchen, 2025). Among these, the Ain Sebaou cooperative, the focus of the present case study, was established in 2017 in Kerch village, located in the El Menzel area of Sefrou province. The Ain Sebaou cooperative was selected as a case study due to its active involvement in the project intervention and its engagement in both product and organisational innovation processes. The project surveyed 30 cooperatives, with Ain Sebaou standing out as

one of the few demonstrating diversities in age and high levels of member engagement in decision-making—partly attributed to its participation in leadership, marketing, and governance trainings (Najjar et al., 2025). The cooperative is also among the few, estimated by local officials at around 10% of food cooperatives, that hold a health certificate, enabling it to legally access wider markets, including major agricultural expos and permanent cooperative markets in Casablanca. The cooperative represents a relevant example of a women-led initiative operating in a rural and resource-constrained context, where innovation is closely linked to both livelihood improvement and market access. While the case is not intended to be statistically representative of all women-led cooperatives in Morocco, it provides an in-depth illustration of how organisational change and product innovation can interact in practice. The findings should therefore be interpreted as indicative of broader mechanisms rather than as generalisable evidence. It was initiated by Lamia Maaloul (pseudonym), who also serves as the cooperative's president and manager. The cooperative comprises 15 members (including 5 women and 10 men) and provides employment to 5 full-time and 5 seasonal female workers. Its founding objective was to address the significant lack of employment opportunities for women in this rural and economically marginalized mountainous region, where agriculture remains the dominant livelihood strategy. The cooperative specializes in the production of traditional Moroccan agri-food products, including various types of couscous, carob and barley flours, and Zamita, a traditional roasted barley mixture. It plays a critical role in local development by providing a stable source of income to at least 10 households and by empowering women who previously lacked access to formal employment. Internally, the cooperative is managed by Lamia and her siblings. Governance is based on informal, consensus-based decision-making, and profits are distributed among members following the deduction of operational expenses. While relatively small in scale, the cooperative is considered economically viable and has ambitions for further growth. Current development constraints include the need for equipment (e.g., a grinding machine), transportation infrastructure, capacity-building in marketing and export, and financial support. However, resistance to debt-financing and logistical challenges continue to limit expansion efforts. Notwithstanding these constraints, Ain Sebaou represents a compelling model of grassroots women's economic empowerment in rural Morocco. As part of the study, the cooperative engaged in an agricultural innovation component focusing on the use of biofortified and nutritionally enhanced crop varieties. This includes the durum wheat cultivar Svevo, widely recognized in the pasta industry for its superior technological attributes. A derivative line, Svevo HA, exhibits elevated amylose content, offering enhanced nutritional benefits (Sestili et al., 2015; Koksel et al., 2024). Similarly, Faridur, another Svevo-derived line, is characterized by higher milling yield and improved nutritional quality, supporting the development of value-added cereal products (Pasqualone et al., 2023; Romano et al., 2022). Additionally, the barley variety Chifaa, noted for its high beta-glucan content, and a protein- and micronutrient-rich lentil variety were incorporated into product formulations (Moresi et al., 2024; Koksel et al., 2024). These grains were used either in pure form or as composite blends for couscous production, while lentils were used exclusively in blends with cereals to augment nutritional profiles (Romano et al., 2022).

3.2. Business model canvas methodology

The innovation process analysed in this study centers on the introduction of novel raw materials into existing production systems, leading both to the improvement of current products and the development of new offerings derived from enhanced value chains. To assess and visualize this transformative process, the Business Model Canvas (BMC) framework developed by Osterwalder and Pigneur (2010) is employed. The BMC is a strategic management tool designed to support the development, analysis, and communication of new or redesigned

business models, particularly in dynamic or transitional contexts (Pölling et al., 2017). The framework is structured into nine interrelated building blocks (see Fig. 1), which revolve around the value proposition, the central element linking supply-side capacities with demand-side expectations. In this context, the BMC is used to examine how cooperatives evolve in response to innovation, with particular attention to both upstream and downstream changes along the supply chain. The left side of the canvas encompasses key partners, key activities, key resources, and cost structure, capturing the operational and financial elements involved in production, including the actors and inputs situated upstream. Conversely, the right side focuses on customer relationships, customer segments, channels, and revenue streams, thus reflecting how innovation is communicated to the market and monetized. The BMC is populated using a set of open-ended guiding questions originally proposed by Osterwalder and Pigneur (2010) and adapted to the specific features of the cooperative model and local context, serving as a framework for the organization and interpretation of the qualitative data. These questions help identify not only core business mechanisms but also potential bottlenecks and areas of vulnerability, allowing for the formulation of tailored, strategic solutions. Crucially, the reconstruction of the cooperative's business model and its value chain is approached through the lens of the 'key agent', a central figure within the organization who articulates the value proposition and provides insight into how innovation is perceived, managed, and implemented. This perspective enables a more nuanced understanding of how novel raw materials and production processes are incorporated into existing organisational structures and market positioning, with significant implications for scalability, sustainability, and gender-inclusive innovation strategies. To support the development of the cooperative's Business Model, researchers conducted in-depth, semi-structured interviews with six women involved in the cooperative: the president, one member, and four workers. Each interview lasted approximately two hours. To enhance data reliability, interview findings were triangulated with field observations during production activities and participation in marketing days, allowing for contextual validation and deeper insight into real-world practices and interactions. Interview data were organised and interpreted according to the nine BMC components, allowing for a systematic mapping of qualitative insights into the different elements of the business model. The coding process followed a primarily deductive approach, using the nine BMC building blocks as a predefined analytical framework, while allowing for iterative refinement when new themes emerged from the data. Coding was conducted by the research team and subsequently reviewed to ensure consistency in interpretation across sources. These themes were then coded and organised according to the BMC structure, allowing for a consistent mapping of qualitative insights into the different elements of the business model. Recurrent patterns and changes emerging from the interviews were used to populate the "before" and "after" configurations of the canvas, supported by field observations and contextual evidence. The comparison between the two configurations was constructed by systematically contrasting coded interview data and observational insights, allowing for a transparent identification of changes in the cooperative's value proposition, resources, and market orientation. This approach ensured transparency in how qualitative data were translated into the BMC representation while maintaining consistency across sources. A field visit was also carried out at the cooperative's site to gain direct insights into production processes, product characteristics, and operational dynamics. To improve clarity and visual communication, a side-by-side comparison of the cooperative's Business Model "before" and "after" the innovation was developed, based on BMC templates.

One of the primary objectives of applying the Business Model Canvas in this context was to analyze the evolving value proposition of the cooperative, which is currently undergoing a significant transformation. This shift is not primarily reflected in increased revenue, but rather in enhanced product positioning and the diversification of the cooperative's offerings. As a result of the innovation process introduced by

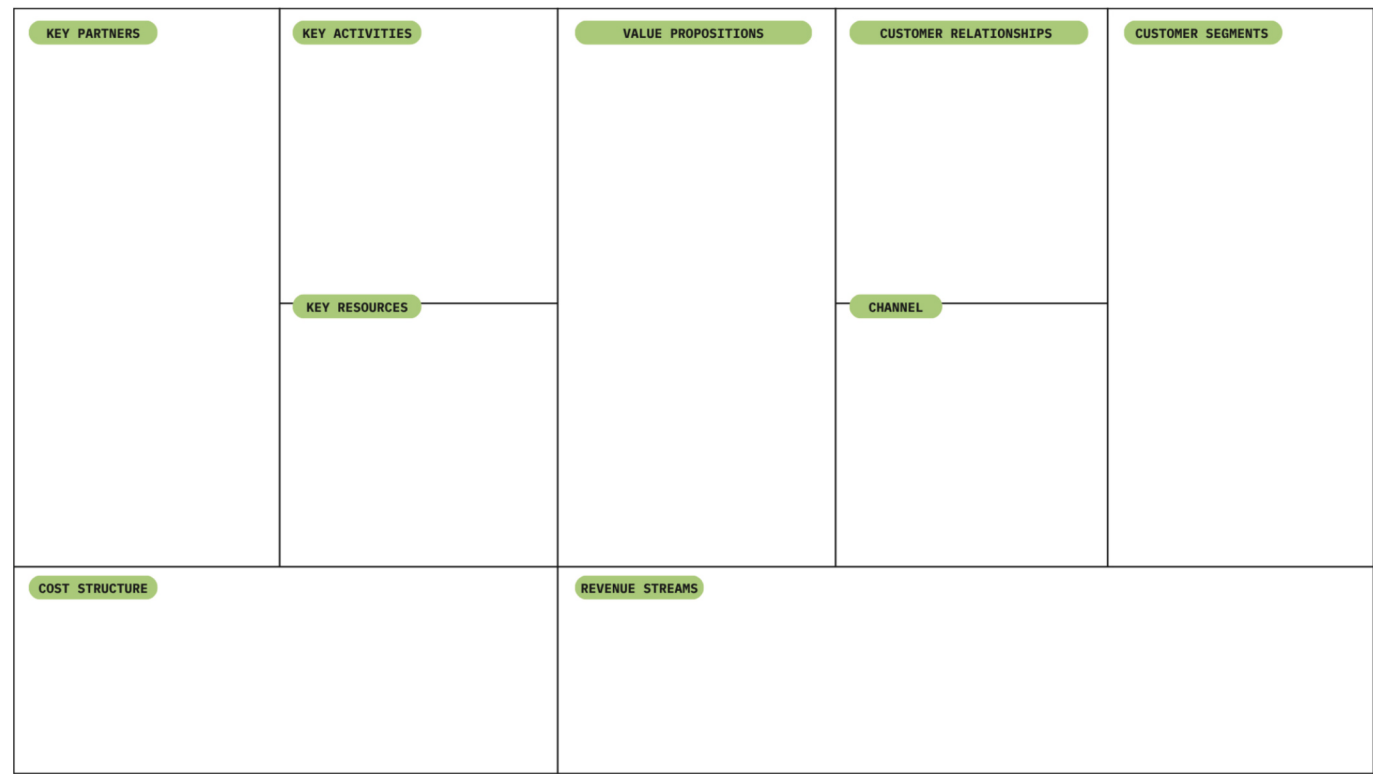


Fig. 1. Business model canvas.

the project, several new product lines have been developed, showing strong market potential. These innovations are based on the use of nutritionally enhanced raw materials and are further supported by the introduction of health- and socially oriented labelling strategies.

The Business Model Canvas framework provides a structured approach to compare the cooperative's organisational model before and after the innovation process, enabling the identification of how the value proposition evolves in response to both internal capacity-building and emerging external market opportunities.

It should be noted that the Business Model Canvas, while useful for analysing organisational structure and value creation processes, does not explicitly account for environmental and social externalities. Therefore, in this study, it is employed as an analytical tool to examine organisational change and value proposition dynamics, rather than as a comprehensive framework for assessing sustainability performance.

3.3. Market assessment - The discrete choice experiment methodology

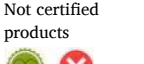
Stated preference methods, particularly DCEs, have been developed to evaluate consumer preferences and WTP for novel food products. DCEs are commonly used to assess products still under development (Poelmans and Rousseau, 2016; Probst et al., 2012; Teratanavat and Hooker, 2006). In these experiments, respondents select among sets of alternatives presented in hypothetical yet realistic scenarios.

The Discrete Choice Experiment is grounded in Random Utility Theory (McFadden, 1974) and Lancaster's theory of consumer demand (Lancaster, 1966), which assume that individuals derive utility from the attributes of a good rather than from the good itself. Within this framework, respondents are assumed to choose the alternative that maximises their utility, allowing preferences for specific product attributes to be inferred from observed choices. This theoretical foundation informs both the design of the experiment, through the selection of relevant attributes and levels, as well as the interpretation of the results, particularly in terms of estimating willingness to pay for individual product characteristics.

In the present study, the analysis focused on couscous, a traditional Moroccan food produced artisanally by cooperatives. A bibliographic review, combined with project-specific considerations and field knowledge, was used to identify the key attributes influencing consumer preferences for cereal-based products. Particular attention was given to credence attributes related to sustainability and health, such as origin, price, and certification (Blasi et al., 2024; De Groote et al., 2020; Miller et al., 2017; Pappalardo and Lusk, 2016). In line with the objectives of the study and the intervention implemented within the project, the Woman Power (WP) label was introduced to capture the social dimension of women's empowerment embedded in the production process. It refers to products produced within women-led cooperatives under conditions intended to promote fair wages, inclusive participation, and improved working conditions. While not associated with a formal certification scheme, it was presented in the choice experiment as a signal of social value linked to women's empowerment. A full-factorial candidate set was first constructed based on the selected attributes and levels (as reported in Table 1), including one four-level attribute (price) and four binary attributes. The final choice experiment was then derived using the *dcreate* routine in Stata, specifying three alternatives per choice set and four choice sets per respondent. Zero priors were specified in the design generation, reflecting the exploratory nature of the study and the absence of prior parameter estimates for the selected attributes in the study context. This approach allowed the construction of an efficient experimental design while maintaining flexibility in the absence of prior parameter estimates.

Each respondent completed four choice sets, each comprising three product alternatives plus a “no-buy” option (Fig. 2). The number of choice tasks was determined as a trade-off between statistical efficiency and respondent cognitive burden. Pilot testing in the Moroccan field context indicated that increasing the number of choice tasks led to a decline in response quality and higher rates of non-attendance. Therefore, a reduced number of choice tasks was adopted to ensure more reliable responses, while maintaining an acceptable level of statistical efficiency. The final design achieved a D-efficiency of 0.709, indicating a

Table 1
Choice experiment attributes and levels.

Attribute	Description	Level - Morocco
Raw materials origins	Geographical origin of raw materials	Imported 
Type of processing	Processing method of the product	National Industrial 
Flour blend	Type of flour used in couscous production	Handmade Not mixed 
Healthy food (HF) label	Product made from raw materials (e.g. wheat, lentils and barley) with health benefits, such as high fiber or nutritional content	Mixed Certified products Not certified products 
Woman power (WP) label	Product produced by women receiving fair wages and working under just conditions	Certified products Not certified products 
Price	Price MAD/Kg	22 MAD/Kg 23 MAD/KG 24 MAD/KG 26.5 MAD/KG

moderate level of statistical efficiency, which is considered acceptable in studies where respondent engagement and data quality are prioritized (Louviere et al., 2000; Hensher et al., 2005). The final dataset consists of 1860 choice observations (465 respondents $\times$ 4 choice tasks). To assess the potential impact of the relatively compact design, we examined patterns of non-attendance and re-estimated the models after excluding

respondents who consistently selected the same alternative (Train, 2009). This additional step provides a robustness check on the estimated preferences and helps mitigate potential biases associated with simplified choice behaviour.

The literature suggests that factors such as socio-demographics, socioeconomic status, purchasing habits, and product familiarity affect sustainable and healthy food purchasing (Bruschi et al., 2015; De Groote et al., 2011; Gharbi et al., 2021; Miller et al., 2014; Zanchini et al., 2022). These factors were incorporated into a questionnaire, which included five sections: a DCE section, a section on purchase habits, two sections on labels related to women's empowerment and healthy food, and a final section on socio-demographic details, including income brackets. A convenience sampling approach was adopted (Iliyasu and Etikan, 2021), with respondents recruited through in-person interviews (supported by ICARDA) in different purchasing locations (e.g., markets and supermarkets) across major urban areas (Capital city and secondary cities). While this approach ensured variability in socio-demographic characteristics, the sample is not intended to be statistically representative of the broader Moroccan population. The sample consisted of 465 respondents. The data collection process complied with standard ethical research practices. Participation in the survey was voluntary, and respondents were informed about the purpose of the study before taking part. Informed consent was obtained from all participants, and all responses were collected anonymously. All participants were aged 18 or older, and verbal consent was obtained from each participant before data collection began. Once consent was obtained, a check was marked next to a statement entitled "informed consent obtained" to document the participant's agreement, and the interview commenced only afterward. This process was approved by ICARDA's Institutional Review Board (IRB), with oral consent being documented through written form and witnessed by the enumerator and the respondent.

	Option 1	Option 2	Option 3	Option 4
Raw material origin	 IMPORTED	 NATIONAL	 NATIONAL	I wouldn't choose any of these
Type of production	 INDUSTRIAL	 HANDMADE	 HANDMADE	
Blend	 MIXED	 NOT MIXED	 MIXED	
Healthy Food Label	 YES LABEL	 YES LABEL	 NO LABEL	
Woman power Label	 NO LABEL	 YES LABEL	 NO LABEL	
Price (MAD/-pack)	24 MAD/Kg	22 MAD/Kg	26.5 MAD/Kg	

Fig. 2. Choice set example Morocco.

3.4. Empirical approach

A Mixed logit model (MXL) was applied to estimate consumers' preferences and willingness to pay. The MXL framework accounts for preference heterogeneity by allowing selected parameters to vary randomly across individuals, thereby relaxing the restrictive assumptions of standard logit models. A linear and additive utility function was used with the mixed logit model as follows:

$$U_{ijt} = ASC_{it} + \beta_{1i} Origin_{ijt} + \beta_{2i} Production_{ijt} + \beta_{3i} Blend_{ijt} + \beta_{4i} HF cert_{ijt} + \beta_{5i} WP cert_{ijt} + \beta_{6i} HP * WP_{ijt} + \beta_{7i} WP * Gender_{ijt} + \beta_{8i} Price_{ijt} + \varepsilon_{ijt} \quad (1)$$

In this specification, only the Alternative Specific Constant (ASC) is treated as a random parameter, while all product attributes and interaction terms are specified as fixed coefficients. This choice ensures internal consistency and model parsimony, particularly in the analysis of the joint effect of the HF and WP labels. In the model, the Alternative Specific Constant (ASC) is a dummy variable that takes the value 1 when the no-buy option is chosen and 0 otherwise. The "Origin" attribute is coded as a dummy variable, where "Imported" serves as the base category. The "Production" attribute is a dummy variable that equals 1 if the couscous is produced *Handmade*, and 0 otherwise. The "Blend" attribute is a dummy variable that takes the value 1 if the product is made with *Mixed flour*, and 0 otherwise. The attributes "HF (*Healthy Food*)" and "WP (*Woman Power*)" represent labels and are coded as dummy variables, taking the value 1 if the couscous is certified, and 0 otherwise. The "Price" attribute is treated as a continuous variable. In addition to the main effects, interaction terms were included to explore combined and heterogeneous effects across attributes. The interaction term $HF \times WP$ was introduced to test whether the joint presence of the two labels is valued differently from the sum of their individual effects. The interaction term WP label and gender ($WP \times Gender$) was included to assess whether gender influences the likelihood of selecting products carrying the WP label.

The empirical specification builds on an initial Mixed Logit framework designed to capture preference heterogeneity. However, to ensure parsimony and internal consistency in the interpretation of joint attribute effects, the final specification treats all product attributes and interaction terms as fixed coefficients. This choice is supported by the limited empirical evidence of substantial heterogeneity in the label-related parameters and by the need for a coherent representation of the combined valuation of the HF and WP attributes. As a robustness check, an alternative specification was estimated allowing the Alternative Specific Constant (ASC) to vary randomly across individuals. The results are stable across specifications, confirming the robustness of the estimated preferences. The model was estimated using simulated maximum likelihood with 500 Halton draws and a burn-in of 15 draws. Sensitivity checks with alternative numbers of draws confirmed the stability of the estimated coefficients.

To further explore preference heterogeneity, the Latent Class Logit (LCL) model was employed (De Magistris and Gracia, 2016; Ortega et al., 2011; Natali et al., 2022; Thiene et al., 2013). This approach provides additional insights into the identification of distinct consumer segments and supports the analysis of segment-specific preferences. The LCL model extends the traditional Conditional Logit framework by explicitly accounting for variations in individual preferences. Rather than assuming uniformity across the entire sample, the model identifies a finite number of latent classes, within which individuals are assumed to have homogeneous preferences, while heterogeneity is captured across classes through segment-specific parameters (Hensher et al., 2005; Hess, S. et al., 2008; Shen, 2009).

The model was estimated using maximum likelihood through the `llogitml2` routine in Stata. Class membership probabilities was modelled as a function of socio-demographic and attitudinal variables, including gender, age, education level, income, purchase location, and interest in ethical and health labels. The $WP \times Gender$ interaction was

not included in the LCM specification in order to maintain model parsimony and avoid over-parameterisation, given the limited number of observations within each class. The probability of belonging to class s is defined as:

$$P_{i/s} = \frac{\exp(\beta'_s x_{ijt})}{\sum_{k=1}^J \beta'_s x_{ikt}} \quad s = 1, \dots, S \quad (2)$$

The optimal number of classes is determined through model selection criteria, specifically by minimizing the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) (Shen, 2009; Louviere et al., 2000).

Once the parameters are estimated, marginal willingness to pay is computed for each attribute as marginal rate of substitution between the attribute and the price. The WTP was calculated using Delta method as:

$$WTP_k = -\frac{\beta_k}{\beta_p} \quad (3)$$

4. Results

4.1. Business model analysis

The Business Model Canvas analysis provides a comprehensive framework to evaluate how women-led cooperatives, function and adapt within their institutional and market environments, and how targeted innovation processes have influenced their operational and strategic dimensions. The analysis focused on the case study of Ain Sebaou cooperative.

Before the innovation (Fig. 3), the cooperative's activities were primarily focused on producing traditional Moroccan food items. These products were developed using traditional recipes and techniques inherited from previous generations, with manual production carried out by members of the cooperative. Most raw materials were sourced either from members' family farms or from trusted local producers. Due to limited technical resources, essential processes such as grinding were outsourced to nearby mills, and storage relied on naturally ventilated facilities.

The cooperative's value proposition was initially rooted in artisanal quality and cultural authenticity, alongside its social mission of generating income for rural women in a marginalized region. Products were marketed through local and national exhibitions, solidarity markets, small-scale retailers, and direct sales at the cooperative's headquarters. Promotion relied largely on word-of-mouth and the distribution of business cards. Despite being formally registered with key institutions such as the Agricultural Development Agency (ADA) and the National Office for Sanitary Safety of Food Products (ONSSA), the cooperative lacked consistent institutional support and access to structured training. Digital literacy and mobility constraints further limited efforts to reach wider markets or partner with larger commercial actors.

Following the innovation process the BMC underwent a substantial transformation, resulting in a stronger strategic alignment between the cooperative's social mission and its economic activities (Fig. 4 and Table 2). The components reflecting major changes were visually emphasized in a different colour to clearly identify the innovation-driven shifts. The introduction of nutrient-enhanced raw materials enabled the cooperative to diversify its product portfolio and improve the nutritional quality of its offerings. This development was accompanied by the creation of new recipes and labelling approaches that combined nutritional claims with messages emphasizing the social impact of the cooperative's activities, particularly in terms of women's empowerment through inclusive and sustainable production practices.

In this context, the cooperative's value proposition has evolved from a focus on tradition and local identity to a more integrated model that incorporates nutritional, ethical, and social dimensions.

The innovation processes also facilitated the acquisition of essential equipment, including a milling machine and an electric dehydrator,

KEY PARTNERS Public authorities: •Regional/Provincial Direction of Agriculture(DRA/DPA) •National Office of Cooperation Development(ODCO) •Regional Investment Center(CRI) •Chamber of Agriculture •National Agricultural Advisory Office (ONCA) •Agricultural Development Agency(ADA) •National Initiative for Human Development (INDH) Certification body: •The National Office for Sanitary Safety of Food Products (ONSSA) International org/ project •National Development Initiative Farmers/contributing members/raw material supplier •Own production, when possible •Local farmers and seed market for grain	KEY ACTIVITIES Agricultural and Production •Storage of cereals/raw material •Processing •Simple packaging with no logo •Storage Additional Services •Time-based availability tracking and management •Expert advice from Rural women's support office KEY RESOURCES Natural Resources: •Cereals (Wheat and barley) Infrastructure: •Storage facilities Knowledge and Expertise: •Local territories and raw materials knowledge	VALUE PROPOSITIONS Local handmade products •Diversification of Products: couscous, balboula, flour	CUSTOMER RELATIONSHIPS •Producer-to-consumer market under the leadership of the ministry of agriculture CHANNEL •National trade fairs and events. •Local middlemen •Solidarity market in Casablanca •Facebook page •Word of mouth •Business card	CUSTOMER SEGMENTS Local, regional and national market: •Products are sold locally and at the solidarity market in Casablanca, or nationally at trade fairs.
COST STRUCTURE Variable Costs: •Raw materials (herbs, cereals/grains/flour) •Labor costs (for harvesting, processing, packaging) •Packaging •Transportation and logistics Fixed Costs: •Electricity, rent, and other overhead expenses •Machines provided by donors, reducing capital investment costs Other Costs: •Certification fees, marketing, and labeling expenses		REVENUE STREAMS Direct Sales: •Sales from couscous, balboula, flour Membership Fees: •Membership fees paid by cooperative members Support Funding: •Financial support from public authorities and international projects (National Development Initiative)		

Fig. 3. The *before* business model canvas of Ain Sebaou cooperative.

KEY PARTNERS Public authorities: •Regional/Provincial Direction of Agriculture(DRA/DPA) •National Office of Cooperation Development(ODCO) •Regional Investment Center(CRI) •Chamber of Agriculture •National Agricultural Advisory Office (ONCA) •Agricultural Development Agency(ADA) •National Initiative for Human Development (INDH) Certification body: •The National Office for Sanitary Safety of Food Products (ONSSA) International org/ project •National Development Initiative Farmers/contributing members/raw material supplier •Own production, when possible •Local farmers and seed market for grain	KEY ACTIVITIES Agricultural and Production •Storage of cereals/raw material •Processing •Food labels for wheat and barley products, with logos and labels containing nutritional values. •Storage Additional Services •Time-based availability tracking and management •Expert advice from Rural women's support office KEY RESOURCES Resources and Infrastructure: •Cereals(Wheat-barley) •Milling machine •Electrical dehydrator •Storage facilities Knowledge and Expertise: •Local territories/raw materials knowledge •Trainings on digital marketing, governance and sanitary certification •Recipes for products and awareness-raising campaigns	VALUE PROPOSITIONS Local handmade products •Diversification of Products: couscous, balboula, flour •Wheat variety with higher amylose used for couscous •Barley variety with superior Beta glucan, it reduces the work of women in threshing and reduces post-harvest losses •Blended products using highly nutritious varieties	CUSTOMER RELATIONSHIPS •Producer-to-consumer market under the leadership of the ministry of agriculture CHANNEL •National trade fairs and events. •Local middlemen •Solidarity market in Casablanca •Facebook page •Word of mouth •Business card	CUSTOMER SEGMENTS Local, regional and national market: •Products are sold locally and at the solidarity market in Casablanca, or nationally at trade fairs.
COST STRUCTURE Variable Costs: •Raw materials (herbs, cereals/grains/flour) •Labor costs (for harvesting, processing, packaging) •Packaging •Transportation and logistics Fixed Costs: •Electricity, rent, and other overhead expenses •Machines provided by donors, reducing capital investment costs Other Costs: •Certification fees, marketing, and labeling expenses		REVENUE STREAMS Direct Sales: •Sales from couscous, balboula, flour •Willingness-to-pay study results taken into account in pricing and logo use •Improve product value by using food labels and sanitary certifications, which affect pricing Membership Fees: •Membership fees paid by cooperative members. Support Funding: •Financial support from public authorities and international projects (National Development Initiative).		

* Colour-highlighted boxes indicate components where key changes occurred

Fig. 4. The *after* BMC of Ain Sebaou cooperative –.

* Colour-highlighted boxes indicate components where key changes occurred.

reducing reliance on external services and improving overall production efficiency. Through the expansion of partnerships the cooperative

strengthened its access to innovation, increased its visibility in formal markets, and enhanced its engagement with consumers interested in

Table 2
Ain Sebaou cooperative's business model before and after innovation.

BMC Element	Before Innovation	After Innovation
Key Partners	Local mills, limited interaction with agricultural agencies	Partnerships expanded to include research institutions, equipment donors, and training providers
Key Activities	Manual production of couscous and flour	Introduction of new processing technologies (disc mill, dehydrator); quality and hygiene improvements
Value Proposition	Traditional, handmade products rooted in heritage	Nutritionally enhanced and health-labelled products; social and environmental value emphasized
Customer Relationships	Informal communication (word-of-mouth, business cards)	Use of branding and packaging; training on digital engagement and customer trust building
Channels	Solidarity markets, local exhibitions, small retailers	Same channels, with future development of digital and certified product sales
Customer Segments	Local consumers, mostly salaried professionals	Broader segmentation including health-conscious and ethically motivated consumers
Key Resources	Member labour, basic tools, small storage, limited capital	Enhanced raw materials, improved equipment, increased knowledge through targeted training
Cost Structure	High manual labour and outsourcing costs	Cost reduction via in-house processing, increased efficiency through new tools
Revenue Streams	Direct local sales, occasional development program contributions	Diversified revenue with potential for premium pricing on certified, health-enhanced products

both social and health-related attributes. In addition, capacity-building activities, such as training in cooperative governance, digital marketing, and labelling, played a key role in strengthening managerial capabilities and supporting access to new market segments.

4.2. Consumer sample

Table 3 summarizes the key descriptive statistics of the survey sample, primarily composed of relatively young respondents (average age ~ 40), mostly women (77%), with a high education level (80% secondary or above). The majority reside in Casablanca (49%) and Rabat (36%), and many earn between 6000 and 12,000 MAD monthly. Employment spans private (24%), public sectors (25%), freelancers (14%), and homemakers (20%). Regarding purchasing habits, women are predominantly responsible for food purchases. Supermarkets and solidarity markets are the most common venues for couscous purchases. Couscous is a staple in the diet, with most consuming it at least weekly. Consumers place strong emphasis on nutritional and ethical product attributes. Interest in health-focused labels is highest (4.25), closely followed by WP labels (4.15), indicating social justice considerations are important but slightly secondary. The origin of raw materials ranks as the most influential attribute (4.30), while price is less prioritized (3.76). Overall, consumers tend to favour product quality, health benefits, and sustainability over cost when making purchasing decisions.

4.3. Consumer result

The MXL and LCM estimations are shown in Table 4. The MXL model indicates that price has a negative and statistically significant effect on product choice, confirming that higher prices reduce the likelihood of selection. The ASC option is negative, but not statistically significant, suggesting limited systematic influence of the opt-out alternative across the sample. To assess the potential influence of simplified choice behaviour, the model was re-estimated after excluding respondents who consistently selected the same alternative. The results remained

Table 3
Sample statistics.

Socio-demographic Variable	Results	Food habits Variable	Results
Age (avg)	42.96	<i>Responsible food purchase (%)</i>	
Gender (Female %)	76.47	Myself	47.28
Household size (avg)	4.30	Me, together with my spouse	29.19
Child (avg)	1.00	Me together with another family member	16.34
<i>Educational level (%)</i>		Another family member	7.19
Semi or illiteracy	4.36	<i>Location of couscous purchase (%)</i>	
Primary	11.33	Supermarket	47.27
Secondary	31.37	Solidarity market	47.93
University	52.94	Other market	0.24
<i>Work categories (%)</i>		Directly from producers	0.09
Freelance	14.38	Other	0.14
Employee (private)	24.18	<i>Frequency eat CC</i>	
Employee (public)	24.84	Never	0.22
Retired	6.32	Less than once a month	1.31
Homemaker	19.83	Once a month	2.18
Unemployed	1.31	Once every two weeks	6.97
Student	5.88	Once a week	62.53
Other	3.27	Several times a week	26.80
<i>Income (%)</i>		<i>Purchase habits (avg value)¹</i>	
0–1000 MAD	0–100 \$	HF label interest	4.25
1000–2000 MAD	100–201 \$	WP label interest	4.15
2000–3000 MAD	202–302 \$	Type of production	4.36
3000–6000 MAD	302–604 \$	Raw materials origin	4.29
6000–12,000 MAD	605–1208	Nutritional content	4.69
Over 12,000 MAD	Over 1209 \$	Price	3.76
<i>City (%)</i>			
Rabat	36.38		
Casablanca	49.02		
Other	14.60		

Source: own elaborations - ¹Data is expressed as an average score on a Likert scale of 1–5 (1 = not at all–5 = at all)

qualitatively unchanged, confirming the robustness of the main results (see Appendix Table A1). Regarding product attributes, product origin has a positive and significant impact, indicating a preference for domestically sourced raw materials. Similarly, handmade production and the use of blended flours are positively valued, highlighting the importance of intrinsic product characteristics. The HF and WP labels each have negative and significant coefficients when considered individually. In contrast, their interaction term is positive and statistically significant ($\beta = 3.704$; $p < 0.001$). To formally assess the net effect of the combined presence of the two labels, a post-estimation linear combination test was conducted ($\beta_{HF} + \beta_{WP} + \beta_{HF \times WP}$), which confirms a positive and highly significant combined effect ($\beta = 1.76$; $p < 0.001$). This indicates that the joint configuration yields a positive net utility despite the negative individual effects. Additionally, the interaction between gender and the WP label reveals that female respondents are more positively influenced by this certification, indicating gender-based differences in value alignment. The significant standard deviation of the Alternative Specific Constant (ASC) indicates substantial heterogeneity in respondents' propensity to opt out, suggesting variation in baseline choice behaviour across individuals. The results from the MXL model informed the subsequent application of the LCL, which identified distinct consumer segments. The optimal number of classes was determined using AIC and BIC criteria (Yoo, 2020), comparing model fit across specifications with two, three, and four classes. The three-class solution provided the best fit. Consistent with the literature, class membership probabilities were modelled as a function of socio-demographic variables (Rossi et al., 2024; Teuber et al., 2016).

Class 1 represents the majority of the sample (62.09%) and is characterized by strong positive preferences for intrinsic product attributes,

Table 4
MXL and LCL estimation.

Variables	Mixed Logit		Latent Class Model					
	Mean (SE)	P-value	Class1		Class2		Class 3	
			<i>Traditional value Consumers</i>		<i>Selective Value Consumers</i>		<i>Context-Sensitive Consumers</i>	
			Mean (SE)	P-value	Mean (SE)	P-value	Mean (SE)	P-value
ASC	−1.453 (1.184)	0.220	−8.718 (1.728)	0.000	−8.718 (1.728)	0.000	−8.718 (1.728)	0.000
Origin (base imported)	0.954 (0.101)	0.000	3.346 (0.333)	0.000	−0.122 (0.312)	0.696	0.510 (0.212)	0.016
Production (base industrial)	1.364 (0.131)	0.000	4.413 (0.781)	0.000	1.631 (0.477)	0.001	0.271 (0.230)	0.238
Blend (base no blended)	1.932 (0.227)	0.000	3.583 (0.966)	0.000	2.101 (0.951)	0.027	0.534 (0.461)	0.246
HF label	−0.842 (0.294)	0.004	−3.721 (0.592)	0.000	−2.896 (0.782)	0.000	2.163 (0.731)	0.003
WP Label	−1.097 (0.267)	0.000	−3.374 (0.931)	0.000	−1.885 (1.014)	0.063	1.482 (0.494)	0.003
HF*WP Label interaction	3.703 (0.479)	0.000	7.599 (2.066)	0.000	7.631 (1.235)	0.000	−1.096 (1.041)	0.292
WP*Gender interaction	0.400 (0.156)	0.010						
Price	−0.258 (0.043)	0.000	−0.875 (0.078)	0.000	−0.422 (0.067)	0.000	−0.363 (0.066)	0.000
Standard deviation								
ASC	1.625 (0.123)	0.000						
Covariates								
Gender					0.229 (0.436)	0.600	0.821 (0.468)	0.080
Age					−0.018 (0.017)	0.274	−0.023 (0.018)	0.189
Educational Level					0.463 (0.265)	0.081	0.553 (0.288)	0.055
Income					−0.311 (0.201)	0.121	−0.208 (0.226)	0.359
Purchase Location (Base: solidarity market)					4.074 (0.445)	0.000	−1.841 (1.110)	0.097
WP label interest					0.725 (0.243)	0.003	0.548 (0.234)	0.019
HF label interest					−0.203 (0.241)	0.400	0.019 (0.248)	0.939
Constant					−2.241 (1.511)	0.138	−2.583 (1.503)	0.086
Class Prob.			62.09		18.30		19.61	

Source: own elaborations. Standard errors in parentheses; The sign of the estimated standard deviations is not informative and should be interpreted in absolute value. The MXL is reported as a robustness check.

namely local origin, artisanal production, and blended composition. While the individual effects of the HF and WP labels are negative within this group, their interaction yields a significant positive utility, indicating that the combined presence of the two labels is valued more favourably than when they are presented separately. Members of this segment appear sceptical of ethical labels in isolation but are responsive when such attributes are presented as part of a coherent value proposition. Accordingly, this segment can be described as “*Traditional Value Consumers*”.

Class 2, comprising 18.30% of the sample, exhibits a distinct preference structure. Consumers in this segment are more likely to shop at solidarity markets and demonstrate a stronger interest in the WP label. They express significant preferences for handmade and blended products, while the country of origin does not significantly influence their choices. Similar to Class 1, the individual effects of the HF and WP labels are weak or negative, yet their interaction term remains significantly positive. This suggests that these consumers respond more favourably to integrated and contextually consistent combinations of product attributes and labelling cues. This group can therefore be interpreted as “*Selective Value Consumers*”.

In contrast, Class 3 accounts for 19.61% of the sample and exhibits a markedly different preference structure. Consumers in this class assign positive and statistically significant utility to both the HF and WP labels when presented individually, reflecting an orientation toward ethical

and social attributes. However, the interaction term is negative and non-significant, indicating that the simultaneous presence of both labels does not enhance, and may even reduce, the perceived product value. Moreover, this group shows weak or non-significant responses to intrinsic attributes such as origin, production method, and blend, suggesting a greater reliance on labelling cues. Relative to Class 1, individuals in this segment tend to have higher educational attainment, greater engagement with solidarity markets, and increased interest in the WP label. This segment can thus be characterized as “*Context-Sensitive Consumers*”.

The class membership model provides further insights into the characteristics associated with each segment. In particular, higher levels of education and greater interest in ethical and health labels are associated with a higher probability of belonging to Class 3, suggesting that these consumers are more responsive to social and value-based attributes. By contrast, individuals in Class 1 are less influenced by labelling attributes and exhibit stronger preferences for intrinsic product characteristics such as origin, production method, and composition. In addition, purchase location appears to play a relevant role: consumers who frequently purchase from solidarity markets are more likely to belong to segments that show higher sensitivity to ethical attributes, whereas other consumers display more cautious or heterogeneous responses to labelling strategies. Overall, these findings indicate that both socio-demographic characteristics and attitudinal factors contribute to

explaining heterogeneity in consumer preferences. These associations should be interpreted as indicative rather than causal.

4.4. Willingness to pay analysis

The estimation of consumers' WTP for various product attributes across both the MXL and LCL reveals substantial preference heterogeneity (Table 5). The Mixed Logit model provides average population-level estimates, whereas the LCM uncovers discrete consumer segments with different valuation patterns.

According to the MXL results, consumers on average are willing to pay substantial premiums for domestic origin (+3.70 MAD/kg), artisanal production (+5.29 MAD/kg), and blended products (+7.49 MAD/kg), suggesting a clear preference for higher-quality and locally differentiated goods. The HF and WP labels are associated with negative WTP values, when considered individually (−3.27 MAD/kg and −4.25 MAD/kg, respectively). By contrast, the interaction between the two labels is positive (+14.35 MAD/kg). When evaluated jointly with the negative main effects, the net willingness to pay for the combined configuration remains positive but more moderate (+6.84 MAD/kg), confirming that the valuation should be interpreted based on the combined contribution of all three parameters rather than the interaction term alone.

The Latent Class Model further disaggregates the average effects into three distinct consumer segments, revealing nuanced heterogeneity in preferences. Class 1 reflects the general patterns observed in the MXL. Consumers in this group exhibit strong WTP for origin (+3.823 MAD/kg), artisanal production (+5.043 MAD/kg), and blended flours (+4.094 MAD/kg). Conversely, the standalone HF and WP labels are associated with negative WTP values (−4.252 MAD/kg and −3.855 MAD/kg, respectively). However, consistent with the overall model, the

Table 5
Willingness to pay results.

Variables	Mixed Logit	Latent Class Model		
		Class1 Traditional value Consumers	Class2 Selective Value Consumers	Class 3 Context- Sensitive Consumers
Origin (base imported)	3.70 MAD/Kg (0.37 \$/Kg)	3.823 MAD/ Kg (0.378 \$/Kg)	−0.289 MAD/Kg (−0.029 \$/Kg)	1.406 MAD/ Kg (0.139 \$/Kg)
Production (base industrial)	5.29 MAD/Kg (0.53 \$/Kg)	5.043 MAD/ Kg (0.499 \$/Kg)	3.867 MAD/ Kg (0.383 \$/Kg)	0.747 MAD/ Kg (0.074 \$/Kg)
Blend (base no blended)	7.49 MAD/Kg (0.75 \$/Kg)	4.094 MAD/ Kg (0.405 \$/Kg)	4.983 MAD/ Kg (0.493 \$/Kg)	1.472 MAD/ Kg (0.146 \$/Kg)
HF label	−3.27 MAD/Kg (−0.33 \$/Kg)	−4.252 MAD/ Kg (−0.421 \$/Kg)	−6.869 MAD/Kg (−0.680 \$/Kg)	5.960 MAD/ Kg (0.590 \$/Kg)
WP Label	−4.25 MAD/Kg (−0.43 \$/Kg)	−3.855 MAD/ Kg (−0.382 \$/Kg)	−4.471 MAD/Kg (−0.443 \$/Kg)	4.083 MAD/ Kg (0.404 \$/Kg)
HF*WP Label interaction	14.35 MAD/Kg (1.44 \$/Kg)	8.684 MAD/ Kg (0.859 \$/Kg)	18.098 MAD/Kg (1.791 \$/Kg)	−3.020 MAD/Kg (−0.299 \$/Kg)
HF + WP + interaction (net)	6.84 MAD/Kg (0.68 \$/Kg)	0.576 MAD/ Kg (0.058 \$/Kg)	6.75 MAD/ Kg (0.68 \$/Kg)	7.02 MAD/Kg (0.70 \$/Kg)

Source: own elaborations, in grey LCM model not significant coefficients. \$ value in parentheses. Currency conversions from MAD to USD are based on an average exchange rate of approximately 10 MAD/USD, reflecting the exchange rate at the time of data analysis (April 2026).

interaction of HF and WP yields a significantly positive valuation (+8.684 MAD/kg). When considering the combined effect of the two labels and their interaction, the net WTP for this segment is close to zero (approximately 0.58 MAD/kg), indicating a largely neutral valuation of the joint configuration. Class 2 values production method and blending attributes positively, with WTP values of +3.867 MAD/kg and +4.983 MAD/kg, respectively. Notably, this segment exhibits the highest WTP for the combined HF and WP labels (+18.098 MAD/kg), despite assigning strongly negative values to each label individually (−6.869 MAD/kg for HF and −4.471 MAD/kg for WP). The net WTP for the combined configuration remains strongly positive (approximately 6.75 MAD/kg), suggesting that this group responds favourably to the joint presentation of the two attributes. In Class 3, origin is positively valued (1.406 MAD/kg). Interestingly, this group assigns positive and significant WTP to both the HF (+5.960 MAD/kg) and WP (+4.083 MAD/kg) labels when presented individually, suggesting a genuine appreciation for ethical and social labelling. The interaction between gender and the WP label is not statistically significant in this segment, suggesting that differences in valuation by gender cannot be robustly identified for this group.

5. Discussions

This study addressed two interconnected questions: whether consumers perceive added value in artisanal, health-enhanced couscous produced by women, and how cooperative business models can support women's economic and social empowerment. By combining Discrete Choice Experiment results with Business Model Canvas analysis, the findings enable a joint interpretation of market dynamics and organisational change. The first objective, related to consumer valuation, is addressed by the DCE results, which show that consumers positively value intrinsic product attributes such as artisanal production, local origin, and ingredient blending, while the valuation of ethical and health labels depends on their combined presentation. By contrast, ethical and health labels are not positively valued when considered individually, but their valuation becomes positive when they are evaluated as part of a combined configuration. The second objective, concerning the role of cooperative models in supporting women's empowerment, is addressed through the BMC analysis, which illustrates how organisational changes in resources, capabilities, and market orientation contribute to strengthening women's economic and social agency. Importantly, it is important to note that the two empirical components are not directly linked at the level of observation or causal inference, as they refer to different units of analysis and populations. Accordingly, the findings should be interpreted as complementary rather than jointly explanatory. The two approaches provide parallel insights that, when considered together, help identify potential alignments between consumer demand and organisational innovation, without implying a direct causal relationship between them. Within these boundaries, the study contributes to the literature by connecting two strands of research that are often treated separately: consumer valuation of ethical and health attributes, and organisational innovation in women-led agri-food enterprises. By analysing these dimensions in parallel, the study provides insights into the conditions under which gender-responsive innovations may be both socially meaningful and market-relevant.

5.1. Consumer valuation and perceived value of women-made, health-enhanced products

Results from the MXL and LCM models indicate that consumers attach substantial value to attributes such as local origin, artisanal production, and ingredient blending. These preferences suggest that combining traditional food practices with product innovation can generate products that resonate with health-conscious and ethically aware consumers (Dekhili et al., 2011; Hamelin et al., 2013;

Mouchtaropoulou et al., 2024; Cook et al., 2023; Rossi et al., 2024; Borrello et al., 2022).

Labelling effects, however, were more nuanced. The negative individual coefficients associated with the HF and WP labels indicate that these attributes are not positively valued when presented in isolation. This result may reflect limited familiarity with certification schemes, scepticism toward standalone ethical claims, or uncertainty regarding the credibility of individual labels (Akaichi et al., 2016; Loureiro and Lotade, 2005; De Pelsmacker et al., 2005). While these interpretations are consistent with existing literature on consumer responses to ethical and social labels (Hamelin et al., 2013; Konuk, 2019), the present data do not allow direct identification of the underlying mechanisms. By contrast, when the two labels are considered jointly, the results indicate a positive net effect once the negative individual effects are taken into account. This suggests that consumer responses are driven by the configuration of attributes rather than by isolated label effects. Similar patterns have been observed in studies showing that combinations of credence attributes can enhance perceived product legitimacy when they form a coherent value proposition (Lambarraa-Lehnhardt et al., 2021; Sabeehuddin et al., 2023). The Latent Class Model further reveals that this pattern is not uniform across consumers. While some segments exhibit a clear positive valuation of the combined label configuration, others display neutral or weak responses, indicating that the effectiveness of combined labelling strategies is context-dependent and segment-specific. Importantly, this effect emerges from the combined contribution of the individual coefficients and their interaction, rather than from the interaction term alone. From a methodological perspective, these findings underscore the importance of interpreting interaction effects jointly with their associated main effects. Overall, the results suggest that the evaluation of socially embedded food innovations depends not only on the presence of ethical or health attributes, but also on how these attributes are combined and presented within a coherent value proposition.

5.2. Cooperatives, empowerment, and the role of innovation: connecting BMC and consumer insights

The Business Model Canvas analysis illustrates how women-led cooperatives translate evolving market signals into organisational adaptation. Investments in improved raw materials, processing technologies, branding, and capacity building strengthened the cooperative's operational efficiency and managerial autonomy, enhancing its readiness to engage with more formalized market channels (Dohmworth and Hanisch, 2019; Handschuch and Wollni, 2016; Verhofstadt and Maertens, 2015). When interpreted alongside the DCE findings, these organisational changes acquire strategic relevance. Rather than implying a direct linkage between the two empirical components, the results suggest that consumer preferences can inform the direction of business model adaptation, while organisational capabilities determine the feasibility of responding to these market signals. In particular, preferences for artisanal production and blended ingredients provide a market rationale for reinforcing local knowledge and craftsmanship, while the conditional and heterogeneous valuation of health and empowerment labels indicates that communication strategies need to be carefully designed. At the same time, it is important to acknowledge that the consumer sample is composed of urban respondents, whereas the cooperative currently operates within a predominantly local and rural market context. This implies that the demand-side analysis reflects potential rather than actual market interactions. Although the cooperative already accesses urban markets through participation in fairs and solidarity events, these channels remain occasional and limited in scale. Reaching urban consumers more systematically would therefore require the development of more stable and structured distribution channels, such as partnerships with retailers or the use of digital marketing and e-commerce platforms.

From an organisational perspective, the BMC analysis should be interpreted as a qualitative and exploratory assessment of change rather

than as evidence of causal impact. As multiple interventions, including training, equipment provision, and the introduction of new raw materials, were implemented simultaneously, it is not possible to attribute observed changes to specific components. The analysis thus illustrates patterns of transformation in the cooperative's value proposition and operational structure, rather than isolating the effects of individual innovations. Nonetheless, structural constraints remain. Limited digital visibility, restricted access to broader distribution channels, and financial constraints may inhibit sustained market expansion. Addressing these barriers requires supportive institutional environments, including training, certification pathways, branding support, and market facilitation mechanisms (Lambarraa-Lehnhardt et al., 2021; Lecoutere et al., 2023; Drine and Grach, 2012; Mathew, 2010; Tlaiss and McAdam, 2021). In this light, innovation emerges as most effective when embedded within context-sensitive support systems that enable organisational strengthening while safeguarding social objectives (DeMerritt-Verrone and Kellum, 2021; Schut et al., 2020; Woltering et al., 2019). These findings also have important practical implications for policymakers, development programmes, and cooperatives. For policymakers, the results highlight the need to support not only production capacity but also market access and distribution infrastructure, particularly in enabling rural cooperatives to reach urban consumers. Strengthening certification systems and improving the clarity and credibility of ethical and health labels may also contribute to greater consumer engagement and market uptake. For development programmes, the results suggest that interventions should adopt an integrated approach, combining technical support (e.g., improved inputs and equipment) with training in marketing, branding, and communication strategies. In particular, the effectiveness of combined health and empowerment messaging indicates that value propositions should be designed in a coherent and context-sensitive manner. For cooperatives, the findings underscore the importance of aligning product attributes with consumer preferences while maintaining organisational capacity to deliver consistent quality and credible claims. This includes investing in branding, storytelling, and market positioning, as well as exploring new distribution channels such as urban fairs, partnerships with retailers, and digital platforms. At the same time, the results do not support a uniform premium for ethical or health claims but rather suggest that their effectiveness depends on how they are integrated into a coherent value proposition. Overall, the findings suggest that gender-responsive innovation in agri-food systems depends on the alignment between consumer demand, organisational capacity, and enabling institutional conditions, while also highlighting the importance of bridging existing gaps between potential market demand and actual market access. In this sense, organisational and demand-side insights should be interpreted as complementary perspectives that jointly inform, rather than directly determine, pathways for scaling gender-responsive innovations.

6. Limitations

Despite these noteworthy findings, this study presents several limitations. First, the analysis is grounded in a single case study of a cooperative that benefited from targeted support, including training, equipment, and market facilitation. While this enables a detailed understanding of innovation processes under favourable conditions, it may introduce a degree of positive selection bias and limits generalisability beyond similar contexts.

Second, although the study integrates organisational and demand-side perspectives, the case is not intended to be statistically representative; rather, the findings should be interpreted as analytically generalisable, highlighting mechanisms that may apply across comparable settings.

Third, the consumer analysis relies on a Discrete Choice Experiment conducted using convenience sampling in urban areas, which limits representativeness, particularly with respect to rural populations. In addition, as with all stated-preference methods, the results may be

subject to hypothetical bias, where respondents may overstate their willingness to pay compared to actual market behaviour. The relatively high magnitude of some estimates, particularly for the combined HF and WP labels, may also reflect the salience of bundled ethical and health attributes within a controlled experimental setting. Furthermore, the Woman Power label, not being a formal certification, may have been interpreted inconsistently across respondents, and may also be subject to social desirability bias, as participants could express support for socially valued attributes such as women's empowerment beyond their actual purchasing behaviour.

Finally, the study captures organisational changes and consumer preferences at a specific point in time, without observing long-term behavioural outcomes or market dynamics. Future research could build on this work through longitudinal designs and real-market experiments to better assess the sustainability and scalability of gender-responsive agri-food innovations.

7. Conclusions

This study examined how product innovation and cooperative strengthening contribute to economic and social value within a Moroccan women-led food enterprise. By integrating a Business Model Canvas assessment with a Discrete Choice Experiment, the analysis showed that consumers value artisanal production, blended ingredients, and health-enhanced attributes, particularly when nutritional and empowerment cues are communicated through coherent and credible labelling strategies.

These findings indicate that traditional food knowledge, when strategically reframed, can align with emerging ethical and health-oriented demand patterns. At the organisational level, the cooperative's experience demonstrates that targeted technical, managerial, and market-oriented support can enhance women's agency, strengthen governance structures, and improve market positioning. More broadly, the results indicate that innovation processes are most effective when they support the development of internal capabilities and respond to differentiated demand structures within agri-food value chains.

Appendix A. Appendix

At the same time, expansion pathways require careful consideration of contextual constraints and potential trade-offs. Mainstreaming empowerment-oriented innovations without adequate institutional support may risk symbolic appropriation, uneven benefit distribution, or increased workload for cooperative members. Observed demand heterogeneity further indicates that market uptake depends on adaptive strategies rather than uniform replication.

Overall, the findings highlight that the viability of gender-responsive enterprises in agri-food systems depends on the alignment between organisational capacity, credible value propositions, and supportive institutional environments. While the results are context-specific, they provide indicative insights into mechanisms that may inform the development and scaling of similar initiatives in comparable settings.

CRediT authorship contribution statement

Eleonora Sofia Rossi: Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Dina Najjar:** Writing – review & editing, Validation, Investigation, Data curation. **Dorsaf Oueslati:** Writing – original draft, Investigation, Formal analysis, Data curation. **Andrea Visioni:** Writing – review & editing, Supervision. **Emanuele Blasi:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

This paper is funded by the PRIMA Foundation (Horizon2020), PRIMA SECTION 1 2020 AGROFOOD VALUE CHAIN IA TOPIC: 1.3.1-2020, MEDWHEALTH project grant no. 2034.

Table A1
Robustness check excluding invariant choosers.

Variable	Full sample	Restricted sample
Origin	0.954***	0.992***
Production	1.364***	1.436***
Blend	1.932***	1.975***
Price	−0.258***	−0.261***
HF label	−0.843**	−0.900***
WP label	−1.097***	−1.144***
HF × WP	3.704***	3.824***
WP × Gender	0.400**	0.412**

Notes: The restricted sample excludes respondents who consistently selected the same alternative across all choice tasks. Results are qualitatively unchanged across specifications.

Data availability

Data will be made available on request.

References

Akaichi, F., de Grauw, S., Darmon, P., Revoredo-Giha, C., 2016. Does fair trade compete with carbon footprint and organic attributes in the eyes of consumers? Results from a pilot study in Scotland, the Netherlands and France. *J. Agric. Environ. Ethics* 29, 969–984. <https://doi.org/10.1007/s10806-016-9642-7>.

Ansari, S., Munir, K., Gregg, T., 2012. Impact at the 'bottom of the pyramid': the role of social capital in capability development and community empowerment. *J. Manag. Stud.* 49, 813–842. <https://doi.org/10.1111/j.1467-6486.2012.01042.x>.

Bacon, C., Sundstrom, W.A., Eugenia, M.E.F., Gomez, F., Mendez, V.E., Santos, R., Goldoftas, B., Dougherty, I., 2014. Explaining the 'hungry farmer paradox': smallholders and fair-trade cooperatives navigate seasonality and change in Nicaragua's corn and coffee markets. *Glob. Environ. Chang.* 25, 133–149.

Baden, S., 2013. Women's Collective Action: Unlocking the Potential of Agricultural Markets. Oxfam International Research Report.

- Bandiera, O., Buehren, N., Burgess, R., Goldstein, M., Gulesci, S., Rasul, I., Sulaiman, M., 2020. Women's empowerment in action: evidence from a randomized control trial in Africa. *Am. Econ. J. Appl. Econ.* 12 (1), 210–259. <https://doi.org/10.1257/app.20170416>.
- Baruah, B., Najjar, D., 2022. Gender Equality, Climate Change and Agriculture in the MENA region: Priorities and Possibilities.
- Bastian, B., Zali, M., 2015. Entrepreneurial motives and their antecedents in North Africa and the Middle East. *Acad. Manag. Proc.* 2015, 17355. <https://doi.org/10.5465/AMBPP.2015.17355abstract>.
- Bastian, B.L., Metcalfe, B.D., Zali, M.R., 2019. Gender inequality: entrepreneurship development in the MENA region. *Sustainability* 11 (22), 6472. <https://doi.org/10.3390/su11226472>.
- Bastian, B., Metcalfe, B., Dajani, H., 2022. *Women, Entrepreneurship and Development in the Middle East*. Routledge, p. 324. ISBN 9780367637231.
- Blasi, E., Rossi, E.S., Pietrangeli, R., Nasso, M., Cicatiello, C., Palombieri, S., Sestili, F., 2024. Functional biscuits, a healthy addition to your coffee break—evaluating consumer acceptability and willingness to pay. *Foods* 13, 1731. <https://doi.org/10.3390/foods13111731>.
- Bocken, N., Short, S., Rana, P., Evans, S., 2014. A literature and practice review to develop sustainable business model archetypes. *J. Clean. Prod.* 65, 42–56. <https://doi.org/10.1016/j.jclepro.2013.11.039>.
- Borrello, M., Cecchini, L., Vecchio, R., Caracciolo, F., Cembalo, L., Torquati, B., 2022. Agricultural landscape certification as a market-driven tool to reward the provisioning of cultural ecosystem services. *Ecol. Econ.* <https://doi.org/10.1016/j.ecolecon.2021.107286>.
- Bruschi, V., Teuber, R., Dolgoplova, I., 2015. Acceptance and willingness to pay for health-enhancing bakery products - empirical evidence for young urban Russian consumers. *Food Qual. Prefer.* <https://doi.org/10.1016/j.foodqual.2015.07.008>.
- Chege, C.G., Andersson, C.I., Qaim, M., 2015. Impacts of supermarkets on farm household nutrition in Kenya. *World Dev.* 72, 394–407. <https://doi.org/10.1016/j.worlddev.2015.03.016>.
- Chen, Z., Barcus, H., 2024. The rise of home-returning women's entrepreneurship in China's rural development: producing the enterprising self through empowerment, cooperation, and networking. *J. Rural. Stud.* 105, 103156. <https://doi.org/10.1016/j.jrurstud.2023.103156>.
- Chrysostome, E.V., Barnard, H., Ika, L., 2024. Examining underexplored aspects of female entrepreneurship in the african context. *J. Afr. Bus.* 25 (1), 1–8.
- Cook, B., Costa Leite, J., Rayner, M., Stoffel, S., van Rijn, E., Wollgast, J., 2023. Consumer interaction with sustainability labelling on food products: a narrative literature review. *Nutrients* 15, 3837. <https://doi.org/10.3390/nu15173837>.
- Corrêa, V., Brito, F., Lima, R., Queiroz, M., 2021. Female entrepreneurship in emerging and developing countries: a systematic literature review. *Int. J. Gend. Entrep.* <https://doi.org/10.1108/IJGE-08-2021-0142>. ahead-of-print.
- Cosenz, F., Picanço, R.V., Rosati, F., 2019. Dynamic business modeling for sustainability: exploring a system dynamics perspective to develop sustainable business models. *Bus. Strateg. Environ.* <https://doi.org/10.1002/bse.2395>.
- Das, P., 2014. Women's participation in community-level water governance in urban India: the gap between motivation and ability. *World Dev.* 64, 206–218.
- Davies, I.A., Chambers, L., 2018. Integrating hybridity and business model theory in sustainable entrepreneurship. *J. Clean. Prod.* 177, 378–386.
- De Groote, H., Kimenju, S.C., Morawetz, U.B., 2011. Estimating consumer willingness to pay for food quality with experimental auctions: the case of yellow versus fortified maize meal in Kenya. *Agric. Econ.* 42 (1), 1–16. <https://doi.org/10.1111/j.1574-0862.2010.00466>.
- De Groote, H., Mugalavai, V., Ferruzzi, M., Onkware, A., Ayua, E., Duodu, G., Ndegwa, M., Hamaker, B., 2020. Consumer acceptance and willingness to pay for instant cereal products with food-to-food fortification in Eldoret, Kenya. *Food Nutr. Bull.* 41, 037957211987684. <https://doi.org/10.1177/0379572119876848>.
- De Kanter, E., Trevenen-Jones, A., Billiard, C.M.J., 2024. Nutrition security and traditional food markets in Africa: gender insights. *Front. Sustainability* 5, 1321499. <https://doi.org/10.3389/frs.2024.1321499>.
- De Magistris, T., Gracia, A., 2016. Consumers' willingness-to-pay for sustainable food products: the case of organically and locally grown almonds in Spain. *J. Clean. Prod.* 118, <https://doi.org/10.1016/j.jclepro.2016.01.050>.
- De Pelsmacker, P., Driesen, L., Rayp, G., 2005. Do consumers care about ethics? Willingness to pay for fair-trade coffee. *J. Consum. Aff.* 39 (2), 363–385. <https://doi.org/10.1111/j.1745-6606.2005.00019.x>.
- Dekhili, S., Sirieix, L., Cohen, E., 2011. How consumers choose olive oil: the importance of origin cues. *Food Qual. Prefer.* 2011 (22), 757–762.
- DeMerritt-Verrone, P., Kellum, J., 2021. The Role of Agricultural Collectives in Gender Transformative Food and Water Systems. Technical Report. CARE, Georgia, USA. <https://www.care.org/wp-content/uploads/2022/02/Collectives-report-Final-Screen-1.pdf>.
- Devaux, A., Torero, M., Donovan, J., Horton, D., 2018. Agricultural innovation and inclusive value-chain development: a review. *J. Agribus. Dev. Emerg. Econ.* 2018 (8), 99–123.
- Dey de Pryck, J., Termine, P., 2014. Gender inequalities in rural labor markets. In: Quisumbing, A.R., Meinzen-Dick, R., Raney, T.L., Croppenstedt, R., Behrman, J.A., Peterman, A. (Eds.), *Gender in Agriculture*. Springer, Amsterdam, pp. 343–370.
- Doherty, B., Kittipanya-Ngam, P., 2021. The role of social enterprise hybrid business models in inclusive value chain development. *Sustainability* 13 (2), 499. <https://doi.org/10.3390/su13020499>.
- Dohmworth, C., Hanisch, M., 2019. Women's active participation and gender homogeneity: evidence from the south Indian dairy cooperative sector. *J. Rural. Stud.* 72, 125–135. <https://doi.org/10.1016/j.jrurstud.2019.10.005>.
- Drine, I., Grach, M., 2012. Supporting women entrepreneurs in Tunisia. *Eur. J. Dev. Res.* 2413, 450–464. <https://doi.org/10.1057/ejdr.2011.13>.
- El Maaqili, Y., Ouchen, A., 2025. L'adoption de la digitalisation par les coopératives marocaines: une étude préliminaire de la région Fès-Meknès. *Marches Organ.* 54 (3), 67–93.
- FAO, 2022. Transforming Food Systems: Pathways for Country-Led Innovation. FAO and World Economic Forum.
- Fletschner, D., Kenney, L., 2014. Rural women's access to financial services: credit, savings, and insurance. *Gend. Agric.* 187–208.
- Galié, A., Kramer, B., Spielman, D.J., Kawarazuka, N., Rietveld, A.M., Aju, S., 2025. Inclusive and gender-transformative seed systems: concepts and applications. *Agric. Syst.* 226, 104320. <https://doi.org/10.1016/j.agry.2025.104320>.
- Geissdoerfer, M., Vladimirova, D., Evans, S., 2018. Sustainable business model innovation: a review. *J. Clean. Prod.* 198. <https://doi.org/10.1016/j.jclepro.2018.06.240>.
- Gharbi, L., Guennouni, M., Aouane, M., 2021. Factors influencing the choice to buy food products in Morocco. *E3S Web Conf.* 234, 00035. <https://doi.org/10.1051/e3sconf/202123400035>.
- Ghouse, S.M., Durrah, O., Shekhar, R., Arslan, A., 2023. Personal characteristics and strategic entrepreneurial behaviour of rural female entrepreneurs: insights from Oman. *J. Small Bus. Strateg.* 33 (2), 89–106. <https://doi.org/10.53703/001c.88921>.
- Ghufran, M., Khan, K.I.A., Musarat, M.A., Alaloul, W., 2024. Circular economy in developing countries for sustainable development: a review. *J. Infrastruct. Policy Dev.* 8, 5640. <https://doi.org/10.24294/jipd5640>.
- Hall, J., Matos, S., Sheehan, L., Silvestre, B., 2012. Entrepreneurship and innovation at the base of the pyramid: a recipe for inclusive growth or social exclusion? *J. Manag. Stud.* 49 (4), 785–812. <https://doi.org/10.1111/j.1467-6486.2012.01044.x>.
- Hamelin, N., Harcar, T., Benhari, Y., 2013. Ethical consumerism: a view from the food industry in Morocco. *J. Food Prod. Mark.* 19 (5), 343–362. <https://doi.org/10.1080/10454446.2013.724368>.
- Handschuh, C., Wollni, M., 2016. Traditional food crop marketing in sub-Saharan Africa: does gender matter? *J. Dev. Stud.* 52 (3), 343–359.
- Hensher, D.A., Rose, J.M., Greene, W.H., 2005. *Applied Choice Analysis: A Primer*. Cambridge University Press. <https://doi.org/10.1017/CBO9781316136232>.
- Hess, S., Ben-Akiva, M., Gopinath, D., Walker, J., 2008. Advantages of latent class over continuous mixture models in capturing heterogeneity. *European Transport Conference 2008*, Noordwijkerhout, Netherlands.
- Ilyasu, R., Etikan, I., 2021. Comparison of quota sampling and stratified random sampling. *Biom. Biostat. Int. J. Rev.* 10, 24–27. <https://doi.org/10.15406/bbij.2021.10.00326>.
- Kitole, F.A., Genda, E.L., 2024. Empowering her drive: unveiling the resilience and triumphs of women entrepreneurs in rural landscapes. *Women's Stud. Int. Forum* 104, 102912. <https://doi.org/10.1016/j.wsif.2024.102912>.
- Kogut, C.S., Meiri, K., 2022. Female entrepreneurship in emerging markets: challenges of running a business in turbulent contexts and times. *Int. J. Gend. Entrep.* 14 (1), 95–116. <https://doi.org/10.1108/IJGE-03-2021-0052>.
- Koksel, H., Çakmak, T.Z., Özkan, K., Pekacar, Z., Oruc, S., Kahraman, K., Özer, C., Sagic, O., Sestili, F., 2024. A novel high-amylose wheat-based functional cereal soup (Tarhana) with low Glycemic index and high resistant starch. *J. Cereal Sci.* 117, 103911. <https://doi.org/10.1016/j.jcs.2024.103911>.
- Kolk, A., Tulder, R., 2009. International business, corporate social responsibility and sustainable development. *Int. Bus. Rev.* 19, 119–125. <https://doi.org/10.1016/j.ibusrev.2009.12.003>.
- Konuk, F., 2019. Consumers' willingness to buy and willingness to pay for fair trade food: the influence of consciousness for fair consumption, environmental concern, trust and innovativeness. *Food Res. Int.* 120. <https://doi.org/10.1016/j.foodres.2019.02.018>.
- Kuran, O., Khabbaz, L., 2024. Stakeholder dynamics in rural Lebanese women's entrepreneurship. *J. Enterprising Communities People Places Glob. Econ.* 18. <https://doi.org/10.1108/JEC-01-2024-0006>.
- Lambaraa-Lehnhardt, F., Ihle, R., Elyoubi, H., 2021. How successful is origin Labeling in a developing country context? Moroccan consumers' preferences toward local products. *Sustainability* 13, 8433. <https://doi.org/10.3390/su13158433>.
- Lancaster, K.J., 1966. A new approach to consumer theory. *J. Polit. Econ.* 74 (2), 132–157. <https://doi.org/10.1086/259131>.
- Lecoutere, E., Achandi, E., Ampaire, L., Fischer, G., Gumucio, T., Najjar, D., Singaraju, N., 2023. Fostering an enabling environment for equality and empowerment in Agri-food systems. *Glob. Food Sec.* 40. <https://doi.org/10.1016/j.gfs.2023.100735>.
- Loureiro, M.L., Lotade, J., 2005. Do fair trade and eco-labels in coffee wake up the consumer conscience? *Ecol. Econ.* 53 (1), 129–138. <https://doi.org/10.1016/j.ecolecon.2004.11.002>.
- Louviere, J.J., Hensher, D.A., Swait, J.D., 2000. *Stated Choice Methods: Analysis and Applications*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511753831>.
- Makandwa, G., Makudza, F., Muparangi, S., 2023. Augmenting family businesses in craft tourism through entrepreneurial skills development among southern Africa rural women. In: Valeri, M. (Ed.), *Family Businesses in Tourism and Hospitality*. Tourism, Hospitality & Event Management. Springer, Cham. https://doi.org/10.1007/978-3-031-28053-5_2.
- Malapit, H.J.L., Quisumbing, A.R., 2015. What dimensions of women's empowerment in agriculture matter for nutrition in Ghana? *Food Policy* 52, 54–63. <https://doi.org/10.1016/j.foodpol.2015.02.003>.
- Mana, A.A., Allouhi, A., Hamrani, A., Jamil, A., Ouazzani, K., Barrahmoune, A., Daffa, D., 2022. Survey review on artificial intelligence and embedded systems for

- agriculture safety: a proposed IoT agro-meteorology system for local farmers in Morocco. In: *Smart Embedded Systems and Applications*, pp. 211–242.
- Mathew, V., 2010. Women entrepreneurship in Middle East: understanding barriers and use of ICT for entrepreneurship development. *Int. Entrep. Manag. J.* 6, 163–181. <https://doi.org/10.1007/s11365-010-0144-1>.
- McFadden, D., 1974. Conditional logit analysis of qualitative choice behavior. In: Zarembka, P. (Ed.), *Frontiers in econometrics*. Academic Press, pp. 105–142.
- Meemken, E.M., Qaim, M., 2018. Can private food standards promote gender equality in the small farm sector? *J. Rural. Stud.* 58, 39–51. <https://doi.org/10.1016/j.jrurstud.2017.12.030>.
- Miller, S., Driver, T., Velasquez, N., Saunders, C., 2014. Maximising Export Returns (MER): Consumer Behaviour and Trends for Credence Attributes in Key Markets and A Review of How these may be Communicated. AERU Research Report No. 332. Lincoln University, New Zealand.
- Miller, S., Tait, P., Saunders, C., Dalziel, P., Rutherford, P., Abell, W., 2017. Estimation of consumer willingness-to-pay for social responsibility in fruit and vegetable products: a cross-country comparison using a choice experiment. *J. Consum. Behav.* 16. <https://doi.org/10.1002/cb.1650>.
- Moresi, M., Visioni, A., Cimini, A., 2024. A cradle-to-retailer environmental profile of yellow lentils (*Lens culinaris* ssp. *Orientalis*) as such or malted. *Appl. Sci.* 14 (23), 11207. <https://doi.org/10.3390/app142311207>.
- Mouchtaropoulou, E., Mallidis, I., Giannaki, M., Koukaras, K., Fröh, S., Ettinger, T., Benmehaia, A.M., Kacem, A., Achour, L., Detzel, A., Gianotti, A., Samoggia, A., Ayfantopoulou, G., Argiriou, A., 2024. Consumer willingness to pay for fair and sustainable foods: who profits in the Agri-food chain? *Front. Sustain. Food Syst.* 8, 1504985. <https://doi.org/10.3389/fsufs.2024.1504985>.
- Mudege, N.N., Nyekanyeka, T., Kapalasa, E., Chevo, T., Demo, P., 2015. Understanding collective action and women's empowerment in potato farmer groups in Ntcheu and Dedza in Malawi. *J. Rural. Stud.* 42, 91–101. <https://doi.org/10.1016/j.jrurstud.2015.09.002>.
- Naegels, V., Mori, N., D'Espallier, B., 2018. An institutional view on access to finance by Tanzanian women-owned enterprises. *Ventur. Cap.* 20 (2), 191–210.
- Najjar, D., Baruah, B., Aw-Hassan, A., Bentaibi, A., Kassie, G.T., 2018. Women, work, and wage equity in agricultural labour in Saiss, Morocco. *Dev. Pract.* 28 (4), 525–540. <https://www.jstor.org/stable/48538723>.
- Najjar, D., Oueslati, D., Ghanem, H.B., Amil, R., Hssain, J.A., Nidkazza, Z., Oussoulous, N., 2025. Seeds of change: cultivating feminist leadership in the co-operatives of the MENA region. *Gend. Dev.* 33 (2), 401–428. <https://doi.org/10.1080/13552074.2025.2523159>.
- Natali, F., Cacchiarelli, L., Branca, G., 2022. There are plenty more (sustainable) fish in the sea: a discrete choice experiment on discarded species in Italy. *Ecol. Econ.* <https://doi.org/10.1016/j.ecolecon.2022.107413>.
- Nziku, D.M., Ramadani, V., Dana, L.P., 2022. Women Entrepreneurs in Tanzania. In: Dabić, M., Dana, L.P., Nziku, D.M., Ramadani, V. (Eds.), *Women Entrepreneurs in Sub-Saharan Africa. Contributions to Management Science*. Springer, Cham. https://doi.org/10.1007/978-3-030-98966-8_11.
- Oduol, J.B.A., Mithöfer, D., Place, F., Nang'ole, E., Olwande, J., Kirimi, L., Mathenge, M., 2017. Women's participation in high value agricultural commodity chains in Kenya: strategies for closing the gender gap. *J. Rural. Stud.* 50, 228–239. <https://doi.org/10.1016/j.jrurstud.2017.01.005>.
- Ojdiran, F., Anderson, A., 2020. Women's entrepreneurship in the global south: empowering and emancipating? *Adm. Sci.* 10 (4), 87. <https://doi.org/10.3390/admsci10040087>.
- Ojong, N., Simba, A., Dana, L.P., 2021. Female entrepreneurship in Africa: a review, trends, and future research directions. *J. Bus. Res.* 132 (2021), 233–248.
- Ortega, D., Wu, L., Wang, H.H., Widmar, N., 2011. Modeling heterogeneity in consumer preferences for select food safety attributes in China. *Food Policy* 36, 318–324. <https://doi.org/10.1016/j.foodpol.2010.11.030>.
- Osei, C., Zhuang, J., 2020. Rural poverty alleviation strategies and social capital link: the mediation role of women entrepreneurship and social innovation. *SAGE Open* 10, 215824402092550. <https://doi.org/10.1177/2158244020925504>.
- Osterwalder, A., Pigneur, Y., 2010. *Business Model Generation: A handbook for visionaries, game changers, and challengers*. Wiley, Hoboken, NJ.
- Panda, S., 2018. Constraints faced by women entrepreneurs in developing countries: review and ranking. *Gender Manag.* 33 (4), 315–331.
- Pappalardo, G., Lusk, J.L., 2016. The role of beliefs in purchasing process of functional foods. *Food Qual. Prefer.* 53, 151–158.
- Pasqualone, A., Palombieri, S., Koksel, H., Summo, C., De Vita, P., Sestili, F., 2023. Milling performance and bread-making aptitude of the new soft kernel durum wheat variety Faridur. *Int. J. Food Sci. Technol.* 58 (1), 268–278. <https://doi.org/10.1111/ijfs.16200>.
- Poelmans, E., Rousseau, S., 2016. How do chocolate lovers balance taste and ethical considerations? *Br. Food J.* 118 (2), 343–361.
- Pölling, B., Prados, M.-J., Torquati, B.M., Giacchè, G., Recasens, X., Paffarini, C., Alfranca, O., Lörleberg, W., 2017. Business models in urban farming: a comparative analysis of case studies from Spain, Italy and Germany. *Morav. Geogr. Rep.* 25 (3), 166–180. <https://doi.org/10.1515/mgr-2017-0015>.
- Probst, L., Houedjofonon, E., Ayerakwa, H.M., Haas, R., 2012. Will they buy it? The potential for marketing organic vegetables in the food vending sector to strengthen vegetable safety: a choice experiment study in three west African cities. *Food Policy* 37 (3), 296–308.
- Richardson, J., 2008. The business model: an integrative framework for strategy execution. *Strat. Change* 17, 133e144. <https://doi.org/10.1002/jsc.821>.
- Romano, G., Del Coco, L., Milano, F., Durante, M., Palombieri, S., Sestili, F., Visioni, A., Jilal, A., Fanizzi, F.P., Laddomada, B., 2022. Phytochemical profiling and untargeted metabolite fingerprinting of the MEDWHEALTH wheat, barley and lentil wholemeal flours. *Foods* 11, 4070. <https://doi.org/10.3390/foods11244070>.
- Roshan, R., Balodi, K., 2024. Sustainable business model innovation of an emerging country Startup: an imprinting theory perspective. *J. Clean. Prod.* 475, 143687. <https://doi.org/10.1016/j.jclepro.2024.143687>.
- Rossi, E.S., Cacchiarelli, L., Severini, S., Sorrentino, A., 2024. Consumers preferences and social sustainability: a discrete choice experiment on 'quality agricultural work' ethical label in the Italian fruit sector. *Agric. Econ.* 12, 14. <https://doi.org/10.1186/s40100-024-00307-9>.
- Ruben, R., 2024. From market-based development to value chain transformation: what markets can (not) do for rural poverty alleviation? *J. Rural. Stud.* 109, 103328. <https://doi.org/10.1016/j.jrurstud.2024.103328>.
- Sabeehuddin, H., Wooliscroft, B., Ganglmair-Wooliscroft, A., 2023. Drivers of ethical consumption: insights from a developing country. *J. Macromark.* 43 (2), 175–189.
- Schut, M., Leeuwis, C., Thiele, G., 2020. Science of scaling: understanding and guiding the scaling of innovation for societal outcomes. *Agric. Syst.* 184, 102908. <https://doi.org/10.1016/j.agry.2020.102908>.
- Sestili, F., Palombieri, S., Botticella, E., Mantovani, P., Bovina, R., Lafiandra, D., 2015. Tilling mutants of durum wheat result in a high amylose phenotype and provide information on alternative splicing mechanisms. *Plant Sci.* 233, 127–133. <https://doi.org/10.1016/j.plantsci.2015.01.009>.
- Shen, J., 2009. Latent class model or mixed logit model? A comparison by transport mode choice data. *Appl. Econ.* 41, 2915–2924. <https://doi.org/10.1080/00036840801964633>.
- Silvestre, B., Tîrcă, D.M., 2019. Innovations for sustainable development: moving toward a sustainable future. *J. Clean. Prod.* 208, 325–332. <https://doi.org/10.1016/j.jclepro.2018.09.244>.
- Teratanavat, R., Hooker, N.H., 2006. Consumer valuations and preference heterogeneity for a novel functional food. *J. Food Sci.* 71 (7), S533–S541.
- Teuber, R., Dolgoplova, I., Nordström, J., 2016. Some like it organic, some like it purple and some like it ancient: consumer preferences and WTP for value-added attributes in whole grain bread. *Food Qual. Prefer.* 52, 244–254. <https://doi.org/10.1016/j.foodqual.2016.05.002>.
- Thiene, M., Scarpa, R., Galletto, L., Boatto, V., 2013. Determinants of WTP for prosecco wine: a latent class regression with attitudinal responses. *Br. Food J.* 11, 279–289. <https://doi.org/10.1108/00070701311302249>.
- Tita, D., Mahdi, K., Devkota, K.P., Devkota, M., 2025. Climate change and agronomic management: addressing wheat yield gaps and sustainability challenges in the Mediterranean and MENA regions. *Agric. Syst.* 224, 104242. <https://doi.org/10.1016/j.agry.2024.104242>.
- Tlaiss, H.A., McAdam, M., 2021. Islam, Arab women's entrepreneurship and the cultural of success. *Int. J. Entrep. Behav. Res.* 27 (3), 821–844. <https://doi.org/10.1108/IJEBR-08-2020-0523>.
- Train, K.E., 2009. *Discrete Choice Methods with Simulation*, 2nd ed. Cambridge University Press.
- Vemireddy, V., Choudhary, A., 2021. A systematic review of labor-saving technologies: implications for women in agriculture. *Glob. Food Sec.* 29, 100541. <https://doi.org/10.1016/j.gfs.2021.100541>.
- Venkatesh, V., Shaw, J.D., Sykes, T.A., Wamba, S.F., Macharia, M., 2017. Networks, technology, and entrepreneurship: a field quasi-experiment among women in rural India. *Acad. Manag. J.* 60 (5), 1709–1740.
- Verhofstadt, E., Maertens, M., 2015. Can agricultural cooperatives reduce poverty? Heterogeneous impact of cooperative membership on farmers' welfare in Rwanda. *Appl. Econ. Perspect. Policy* 37 (1), 86–106.
- Woltering, L., Fehlenberg, K., Gerard, B., Ubels, J., Cooley, L., 2019. Scaling – from “reaching many” to sustainable systems change at scale: a critical shift in mindset. *Agric. Syst.* 176, 102652. <https://doi.org/10.1016/j.agry.2019.102652>.
- Yoo, H.I., 2020. lcglogit2: an enhanced command to fit latent class conditional logit models. *Stand. Genom. Sci.* 20 (2), 405–425. <https://doi.org/10.1177/1536867X2093>.
- Zanchini, R., Di Vita, G., Brun, F., 2022. Lifestyle, psychological and socio-demographic drivers in functional food choice: a systematic literature review based on bibliometric and network analysis. *Int. J. Food Sci. Nutr.* 73 (6), 709–725. <https://doi.org/10.1080/09637486.2022.2048361>.