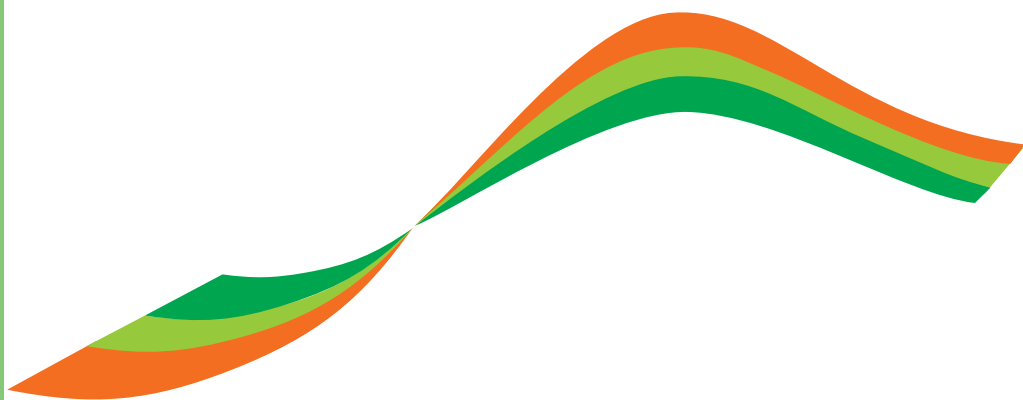




ECONOMIA
AGRO-ALIMENTARE
FOOD ECONOMY

*An International Journal
on Agricultural and Food Systems*

2026, Vol. 28, Issue 2



FrancoAngeli 

SIEA
SOCIETÀ ITALIANA DI
ECONOMIA AGRO-ALIMENTARE

**ECONOMIA
AGRO-ALIMENTARE**
Food Economy

(Rivista fondata da Fausto Cantarelli)

FrancoAngeli

Copyright © FrancoAngeli

This work is released under Creative Commons Attribution - Non-Commercial –
No Derivatives License. For terms and conditions of usage please see: <http://creativecommons.org>

Direttore scientifico / Editors-in-Chief: Valeria Borsellino (*Università degli Studi di Palermo, Italy*), Søren Marcus Pedersen (*Københavns Universitet, Denmark*)

Comitato di Direzione / Editorial Board: Giovanna Bertella (*UiT The Arctic University of Norway*); Lucia Briamonte (*CREA - Consiglio per la ricerca e l'analisi dell'economia agraria, Italy*); Luca Cacciolatti (*University of Westminster, UK*); Nicola Cantore (*UNIDO Vienna, Austria*); Alessandra Castellini (*Alma Mater Studiorum University of Bologna, Italy*); Alessio Cavicchi (*University of Pisa, Italy*); Fabio A. Madau (*University of Sassari, Italy*)

Comitato scientifico / Scientific Advisory Board: Azzurra Annunziata (*Università "Parthenope" di Napoli, Italy*); Francesco Bimbo (*University of Foggia, Italy*); Alessandro Bonadonna (*Università degli Studi di Torino, Italy*); Ignazio Cabras (*University of Northumbria in Newcastle, UK*); Roberta Capitello (*Università degli Studi di Verona, Italy*); Vincenzina Caputo (*Michigan State University, USA*); Laura Carraresi (*Nofima, Norway*); Romina Cavatassi (*The World Bank Institute for Economic Development, Italy*); Paolo Crosetto (*Institut National de Recherche pour l'Agriculture, l'alimentation et l'Environnement, France*); Annalisa De Boni (*Università degli Studi di Bari "Aldo Moro", Italy*); Rosires Deliza (*Embrapa, Brasil*); Nina Drejerska (*Warsaw University of Life Sciences, Poland*); Nadja El Benni (*Agroscope, Switzerland*); Hamid El Bilali (*International Center for Advanced Mediterranean Agronomic Studies - CIEAM, Italy*); Florence Gathoni Gachango (*Pwani University, Kenya*); Zhifeng Gao (*University of Florida, USA*); Marilena Gemtou (*Agricultural University of Athens, Greece*); Carlo Giannetto (*Università degli Studi di Messina, Italy*); Jon Henrich Hanf (*Hochschule Geisenheim, Germany*); Helena Hansson (*Swedish University of Agricultural Sciences Uppsala, Sweden*); Lee Soo Hee (*University of Kent, UK*); Stefan Hirsch (*Universität Hohenheim, Germany*); Shaosheng Jin (*Zhejiang University, P.R. of China*); Dulekha Kasturiratne (*University of Plymouth, UK*); Drini Imami (*Agricultural University of Tirana, Albania*); Bettina Maisch (*University of Applied Sciences Munich, Germany*); Giampiero Mazzocchi (*Consiglio per la Ricerca e l'Economia in Agricoltura, Italy*); Marco Medici (*UniLaSalle, France*); Luis Gaspar Miret Pastor (*Polytechnic University of Valencia, Spain*); Mangirdas Morkūnas (*Vilnius University, Lithuania*); Kehinde Oluseyi Olagunju (*Department of Agriculture, Environment and Rural Affairs, UK*); Maria Angela Perito (*Università degli Studi di Teramo, Italy*); Ludvine Petetin (*Cardiff University, UK*); Rosanna Salvia (*Università degli Studi della Basilicata, Italy*); Maria Rosaria Simeone (*Università di Napoli Federico II, Italy*); Sukhpal Singh (*Indian Institute of Management, India*); Francesca Spigarelli (*Università degli Studi di Macerata, Italy*); Agoston Temesi (*Hungarian University of Agriculture and Life Sciences, Hungary*); Humberto Thomé Ortiz (*Universidad Autónoma del Estado de Mexico, Mexico*); Samuele Trestini (*Università degli Studi di Padova, Italy*); Francesca Varia (*Consiglio per la Ricerca e l'Economia in Agricoltura, Italy*); Elena Viganò (*Università degli Studi di Urbino "Carlo Bo", Italy*); Justus Wesseler (*Wageningen University & Research, The Netherlands*); Valdemar João Wesz Júnior (*Universidade Federal da Integração Latino-Americana, Brasil*)

Segreteria di redazione / Editorial secretariat: Alessandro Palmieri - Dipartimento di Scienze e Tecnologie Agro-Alimentari - Area Economia agraria ed Estimo, *Alma Mater Studiorum* - Università di Bologna - viale Giuseppe Fanin, 50 - 40127 Bologna (BO), Italy - Tel. +39 0512096126; e-mail: economiaagroalimentare@siea.it

Società Italiana di Economia Agro-alimentare (SIEA) - Consiglio di Presidenza / Presidential Board: Christine Mauracher (Presidente) (*Università Ca' Foscari Venezia*), Gabriele Canali (*Università Cattolica del Sacro Cuore*), Raffaella Pergamo (*CREA - Consiglio per la ricerca e l'analisi dell'economia agraria*), Gabriele Scozzafava (*Università degli Studi di Firenze*), Roberta Sisto (*Università di Foggia*), Biagio Pecorino (Past President) (*Università degli Studi di Catania*)

Economia agro-alimentare/Food Economy è una rivista scientifica peer-reviewed quadrimestrale, edita da FrancoAngeli Edizioni per conto della Società Italiana di Economia Agro-alimentare (SIEA), fondata nel 1996 dall'allora presidente della SIEA Fausto Cantarelli. La rivista offre un forum internazionale per la discussione e l'analisi di tematiche mono e multidisciplinari di carattere socio-economico, politico, giuridico e tecnico, inerenti all'agricoltura e al sistema agro-alimentare. La redazione prende in considerazione articoli originali su agricoltura, agro-industria, alimenti, sicurezza alimentare, nutrizione e salute, sostenibilità e ambiente che analizzino i processi e le infrastrutture coinvolte nella produzione e distribuzione di prodotti alimentari alla popolazione, così come i processi, input ed output connessi al consumo e allo smaltimento di prodotti alimentari e affini. I contenuti includono anche i contesti sociali, politici, economici e ambientali e la gestione delle risorse umane. La pubblicazione è indirizzata ad un pubblico internazionale di ricercatori, professionisti dell'industria e dei servizi e decisori di politiche pubbliche, a livello locale, nazionale o globale. La decisione di pubblicare l'articolo, al termine del processo di valutazione e revisione, è prerogativa e responsabilità dei Direttori Scientifici. Gli scritti pubblicati impegnano la responsabilità esclusiva degli Autori.

Economia agro-alimentare/Food Economy is a triannual peer-reviewed scientific journal published by FrancoAngeli Edizioni on behalf of the Italian Society of Agri-food Economics (SIEA), founded in 1996 by the then President of SIEA Fausto Cantarelli. It offers an international forum for the discussion and analysis of mono and interdisciplinary socio-economic, political, legal and technical issues, related to agricultural and food systems. It welcomes submissions of original papers focusing on agriculture, agribusiness, food, safety, nutrition and health, sustainability and environment, including all processes and infrastructure involved in providing food to populations; as well as the processes, inputs and outputs involved in consumption and disposal of food and food-related items. Analyses also include social, political, economic and environmental contexts and human resource challenges. Submissions should be addressed to an international audience of researchers, practitioners, and policy makers, and they may consider local, national, or global scale. The decision to publish the article, at the end of the process of evaluation and review, is the prerogative and responsibility of the Editors-in-Chief. The articles published are under the total responsibility of Authors.

Administration - Distribution: FrancoAngeli s.r.l., viale Monza 106, 20127 Milano - tel. +39.02.2837141 - e-mail: riviste@francoangeli.i.

This work, and each part thereof, is protected by copyright law and is published in this digital version under the license Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0). By downloading this work, the User accepts all the conditions of the license agreement for the work as stated and set out on the website <https://creativecommons.org/licenses/by-nc-nd/4.0/deed.en> Text and Data Mining (TDM), AI training and similar technologies rights are reserved. The active links and QR codes included in the volume are provided by the author. The publisher does not assume any responsibility for the links and QR codes contained herein that lead to websites not belonging to FrancoAngeli.

ISSNe: 1972-4802

Authorized by Tribunale di Reggio Emilia n. 932 del 6 novembre 1996 - Editor in chief: dr. Stefano Angeli – Copyright © 2026 by FrancoAngeli s.r.l., Milano, Italy. Stampa: Global Print, via degli Abeti 17/1, Gorgonzola Milano.

II Quarter 2026

Copyright © FrancoAngeli

This work is released under Creative Commons Attribution - Non-Commercial – No Derivatives License. For terms and conditions of usage please see: <http://creativecommons.org>

Copyright © FrancoAngeli

This work is released under Creative Commons Attribution - Non-Commercial –
No Derivatives License. For terms and conditions of usage please see: <http://creativecommons.org>

Table of Contents

Regular Article

Eda Luga, Erjola Shehu, Gentjan Mehmeti

Redefining food behavior in the digital age: Insights from Gen Z eating patterns

pag. 7

Renie Oelviani, I Gede Mahatma Yuda Bakti, Deden Dinar Iskandar, Purbayu Budi Santosa

Behavioural Determinants of Adaptation and Maladaptation in Coastal Farming: Evidence from Indonesia

» 41

Eka Nurjati, Septian Adityawati

Food Access, Spatial Differences, and Social Protection Targeting: Evidence from Central Java

» 69

Rosalyn P. Alburo, Lorelie Q. Escabal, Roberto C. Cutillar, Tylo Junior L. van Steenhuyse, Hemres M. Alburo

Gendered Labor Allocation in Smallholder Vegetable Production and Marketing: Evidence from Farming Households in Cebu, Philippines

» 93

Nour Ouzari, Claudio Bellia, Roberta Selvaggi, Alessandro Scuderi, Matilde Reitano, Gioacchino Pappalardo

The effect of PGI and Organic labelling on consumers' Willingness To Pay: Evidence from an experimental auction

» 113

Maria Emilia Garbelli

Employment Trends at Large Food and Beverage Companies in Italy 2019-2023

» 137

Kouakou Philipps Kouakou, Charlemagne Nindjin, Dominique Barjolle

Geographical Indications (GIs) in Côte d'Ivoire: Achievements and challenges

pag. 171

Anik Suwandari, Joni Murti Mulyo Aji, Ebban Bagus Kuntadi, Mohammad Rondhi, Rokhani, Rizky Yanuarti

Does Contract Farming Enhance Farmer Welfare? Evidence from Smallholder Red Chilli Farmers

» 193

Economia agro-alimentare / Food Economy

An International Journal on Agricultural and Food Systems

Vol. 28, Iss. 2, Art. 3, pp. 7-39 - ISSN 1972-4802

DOI: 10.3280/ecag2026oa21502



Redefining food behavior in the digital age: Insights from Gen Z eating patterns

Eda Luga^{*,a}, Erjola Shehu^b, Gentjan Mehmeti^a

^a Agricultural University of Tirana, Albania

^b University College of Business Tirana, Albania

Abstract

Generation Z (Gen Z), aged 10-27, represents a pivotal cohort in shaping emerging dietary patterns, balancing convenience oriented lifestyles with cultural and familial food traditions. This study examines the determinants of Gen Z's food choices in Albania by integrating Self-Determination Theory (SDT) and the Theory of Planned Behavior (TPB) to explain how convenience, perceptions of traditional recipes, impulsive eating, and digital and peer influences shape eating behavior. Using data from 302 face-to-face questionnaires analyzed through Structural Equation Modeling (SEM), the findings show that convenience and social media significantly and positively influence food choices. In contrast, a strong attachment to traditional food negatively predicts the selection of modern and convenience based options, suggesting a value-based tension between cultural identity and contemporary consumption patterns. Impulsive eating was not a significant predictor, indicating that Gen Z's food choices may be more structured and socially influenced than purely spontaneous.

The study contributes theoretically by extending SDT and TPB to a transitional food culture context and empirically by providing evidence from an underexplored Southeast European setting. The findings emphasize that food producers and policymakers should balance convenience with cultural authenticity when targeting Gen Z.

Article info

Type:

Article

Submitted:

28/11/2025

Accepted:

20/05/2026

Available online:

04/06/2026

JEL codes:

D12, I12, M31

Keywords:

Food choice
Convenience
Cultural influence
Social media
Influence
Impulsive eating

Managing Editor:

Luca Cacciolatti

* *Corresponding author:* Eda Luga - Agricultural University of Tirana, Albania. E-mail: eluga@ubt.edu.al.

Introduction

Eating patterns established during adolescence often persist into adulthood, potentially leading to long term health consequences (Gilmour, 2020). In the short term, inadequate dietary intake is associated with impaired immune function, reduced cognitive performance, and lower academic achievement among young people (Burrows *et al.*, 2017). Diets high in nutrient poor foods, combined with sedentary lifestyles, contribute to excess body weight, chronic inflammation, and compromised immune health (Morales *et al.*, 2024). Understanding the factors that shape dietary behavior during adolescence and early adulthood is therefore critical for promoting lifelong health and well-being.

Generation Z (Gen Z), currently aged approximately 10-27 years, represents a key population for examining emerging dietary patterns. This generation shows a growing preference for convenience oriented food options and international cuisine, while simultaneously valuing health and nutritional quality (Bumbac, 2020). However, most existing research has focused primarily on health related drivers, such as nutritional awareness or weight control, with limited attention to the broader social, psychological, cultural, and digital influences that also shape eating behavior. In particular, impulsivity, perceptions of traditional recipes, and digital/social media exposure remain underexplored. This is reinforced by the fact that Gen Z, characterized by both cultural diversity and a strong dependence on technology, represents a generation deeply influenced by rapid technological developments (Zoltán *et al.*, 2024).

Moreover, few studies integrate established behavioral theories to capture both intrinsic motivations within (SDT) and social cognitive determinants within (TPB), leaving a gap in understanding how these factors jointly influence food choice among Gen Z.

This research gap is particularly relevant in the Albanian context. Albania presents a transitional food environment where strong traditional dietary heritage rooted in Mediterranean patterns (Cakoni *et al.*, 2025) coexists with increasing exposure to globalized food markets, fast-food culture, and digital media influence. Rapid economic development, urbanization, and technological diffusion have reshaped young people's eating habits, yet empirical evidence on the determinants of Gen Z's food choices in Albania remains scarce. Studying this population offers a unique opportunity to examine how cultural identity interacts with modern convenience and digital influences in an emerging economy, providing insights that are both locally relevant and internationally informative.

The present study investigates the key determinants of Gen Z's eating behavior by focusing on four main dimensions: Convenience (time pressure); Perceptions of traditional recipes (heritage food, emotional attachment);

Impulsive eating tendencies (food craving and self-control), and Social Media influences (peer pressure through social media). The study integrates SDT (autonomy, competence, and relatedness) and TPB (attitudes, subjective norms, and perceived behavioral control) into a unified framework to examine the interplay between psychological, social, and cultural factors in shaping dietary choices.

By addressing these determinants, the study makes several contributions. It develops a multidimensional, theory driven model of Gen Z food behavior that extends beyond health centric explanations. Secondly it provides empirical evidence from an underexplored Southeastern European context, highlighting how traditional food heritage coexists with modern lifestyle influences. It offers practical insights for policymakers, educators, and food system stakeholders seeking to design interventions, products, and communication strategies that align with Gen Z's evolving preferences and support healthier, culturally sustainable diets.

1. Conceptual background: nutritional patterns among Gen Z

The Industrial Revolution marked a pivotal shift in human diets, driven by urbanization, technological advances, and changes in labor and production, which transformed eating habits and food accessibility (Crane-Kramer & Buckberry, 2023). In the modern era, the growth of the food processing industry has prioritized extended shelf life and enhanced taste, promoting the widespread adoption of Ultra-Processed Foods (UPFs) through natural and artificial additives (Global Research Program, 2023). While estimates of diet-related Global Burden of Disease (GBD) risk factors offer guidance for public health interventions, existing models remain insufficient for capturing the lifelong health impacts of diverse dietary choices (Fadnes *et al.*, 2022). Such shifts in nutrition have contributed to the emergence of “diseases of civilization,” including obesity, diabetes, and cardiovascular disorders (Rakhra *et al.*, 2020).

The literature indicates that both historical and contemporary structural changes in food systems shape dietary behavior and health outcomes (Fonte, 2019). Patterns are understood as the habitual ways in which foods and beverages are consumed, taking into account their quantities, proportions, diversity, combinations, nutrient composition, and the frequency of intake (Romieu, 2019). Dietary choices influence a wide range of dimensions, including health, environmental, social, and economic aspects. According to FAO and WHO (2019), optimal early life nutrition involves breastfeeding from birth, complemented by diverse minimally processed foods while limiting highly processed products. Consumers are increasingly attentive to

how their dietary choices affect their personal health, the environment, and the welfare of living beings (Vițelar *et al.*, 2019). Regardless of lifestyle, Gen Z should follow key dietary principles such as quantity (aligning intake with bodily needs), quality (ensuring nutrient completeness), balance (maintaining proper nutrient proportions), and adequacy (adapting food choice and amount to age, weight, physiological state, and activity), in order to achieve appropriate food consumption patterns (FAO & WHO, 2019). Factors influencing dietary behavior are categorized into internal factors, such as psychological and sensory aspects, and external factors, including social, economic, and cultural influences (Bumbac, 2020).

Youth, defined by the UN as individuals aged 15-24 or 15-34, are increasingly recognized as drivers of sustainable food consumption and innovation within food systems (United Nations, 2025; Halicka *et al.*, 2025). Gen Z, in particular, is the first truly global cohort, sharing cultural exposures to food, fashion, and digital media (Ruppenthal, 2025). Research identifies key Gen Z characteristics relevant to dietary behavior: Health Orientation: Gen Z perceives homemade food as healthier, valuing balanced diets and portion control shaped by parental practices (Meyerding & Ahrens, 2024); Social Awareness and Sustainability: This cohort exhibits heightened concern for environmental impacts and sustainable consumption, although knowledge of broader food systems remains limited (Marinova & Bogueva, 2022); Technological Competence: Digital literacy and social media engagement significantly influence food knowledge and preferences (Ruppenthal, 2025; Priporas *et al.*, 2017); Global Awareness and Consumer Behavior: Studies describe Gen Z as more aware of and engaged with global concerns (Vițelar, 2019). They actively participate in family decision making related to purchasing and eating patterns (Bumbac, 2020), and often prefer sellers with an active social media presence that facilitates engagement (Nickalls, 2019). Their use of technology relates to self-efficacy, perceived usefulness, and perceived risk, although they still tend to favor brick-and-mortar stores for food purchases (Vițelar, 2019). Moreover, Gen Z exhibits relatively low levels of consumer ethnocentrism (Rašković *et al.*, 2020).

These characteristics suggest that Gen Z's dietary choices are influenced by a combination of health-conscious motives, sustainability awareness, and digital information channels. However, their knowledge gaps indicate the potential for educational interventions to enhance informed decision making. Although some studies report contradictory findings, such as Gen Z's interest in local cuisine (Maynard, 2019) or preference for vegetarian foods, these trends are often linked to the cohort's moral and ethical orientation toward food.

The literature reveals a tension in Gen Z behavior between convenience driven, impulsive eating and health oriented choices: Impulsive Eating:

UPFs and ready-to-eat products appeal to convenience, speed, and hedonic pleasure, often leading to impulsive dietary decisions (Global Research Program, 2023; Rakhra *et al.*, 2020); Health Orientation: Simultaneously, Gen Z demonstrates awareness of the benefits of homemade or minimally processed foods, associating them with nutrition and well-being (Meyerding & Ahrens, 2024). Prior studies often conflate impulsivity with unhealthy eating, but for Gen Z, impulsivity may coexist with selective health consciousness. This conceptual distinction is critical for understanding trade-offs in dietary decisions and for the proposed conceptual model linking behavioral tendencies to food choices.

Gen Z's exposure to social media heavily shapes food knowledge, attitudes, and behaviors (Marinova & Bogueva, 2022). While platforms provide access to information about environmental sustainability and health, the reliability of such information varies, leading to partial or biased understanding. Social media also amplifies trends, peer influence, and experiential consumption, reinforcing both convenience driven and health conscious behaviors. Understanding the dual role of social media as both an educational resource and a driver of impulsive consumption is essential for modeling Gen Z dietary patterns.

Although research identifies Gen Z's distinct characteristics, the literature reveals several gaps: limited integration of behavioral, environmental, and technological influences into comprehensive models of food choice; ambiguity in constructs such as impulsive eating versus health orientation, which often overlap conceptually in prior studies; and underexplored links between traditional food perception (homemade or culturally familiar foods) and modern consumption patterns. The proposed conceptual model addresses these gaps by explicitly linking Gen Z characteristics health orientation, impulsivity, sustainability awareness, and social media influence to dietary behavior and food choice. This structure ensures theoretical clarity and a direct connection between literature and study hypotheses.

2. Drivers of Gen Z Eating Patterns: Theoretical Insights and Hypotheses

The evaluation of factors such as convenience, impulsive eating as the opposite of healthy eating patterns, social media, and traditional foods will be the aim of this study from the perspective of SDT (Deci & Ryan, 1985, 2000) and TPB (Ajzen, 1991). Integrating these frameworks allows for a comprehensive explanation of Gen Z's food choices by linking underlying motivational processes with intention formation.

SDT explains behavior through the quality of motivation and the satisfaction of three basic psychological needs: autonomy (experiencing

volition and self-endorsement), competence (feeling effective in one's actions), and relatedness (feeling connected to significant others and social groups). The theory distinguishes between autonomous regulation, driven by internalized values and personal endorsement, and controlled regulation, driven by external pressures or obligations. Behaviors supported by need satisfaction tend to be more stable and self-sustaining.

Applied to Gen Z's food consumption, convenience, impulsive eating, perceptions of traditional food, and social media influence can either support or undermine these psychological needs. Access to affordable healthy or traditional foods may enhance autonomy and competence by enabling individuals to make informed and self-directed dietary choices. In contrast, financial or time constraints may limit perceived choice, fostering more controlled forms of regulation, such as reliance on fast food. Traditional foods may satisfy relatedness by reinforcing cultural identity and family connections, particularly when chosen out of pride or emotional attachment. Similarly, impulsive eating can reflect diminished autonomy and competence when behavior is driven by emotional triggers or peer pressure. Social media environments may strengthen relatedness through shared identity and online communities, but they may also reduce autonomy when food choices are shaped by external validation or trends. Thus, SDT clarifies the presence and quality of motivation underlying Gen Z's eating behaviors.

However, SDT does not fully explain how motivational states translate into concrete behavioral intentions. TPB (Ajzen, 1991) complements this perspective by proposing that behavior is predicted by intention, which is shaped by attitudes, subjective norms, and perceived behavioral control (PBC). Attitudes reflect the individual's evaluation of the behavior, subjective norms capture perceived social expectations, and PBC refers to the perceived ease or difficulty of performing the behavior. Prior research has widely applied TPB to food-related decisions (Marques, 2022).

Within this framework, convenience may strengthen PBC by increasing perceptions of ease and accessibility (e.g., fast food availability or delivery services), thereby enhancing intention to purchase. Impulsive tendencies may correspond to favorable short term attitudes toward food consumption. Traditional food, conceptualized in terms of preference, availability, and cultural value, aligns primarily with subjective norms, as food practices are embedded in familial and cultural expectations. When Gen Z consumers perceive that important reference groups such as family members, peers, or cultural communities value traditional foods, they are more likely to form intentions consistent with these social influences.

By integrating SDT and TPB, this study connects deep motivational drivers (need satisfaction and regulatory orientation) with proximal cognitive determinants of intention. This combined framework provides stronger

explanatory power than either theory alone in understanding Gen Z's food consumption patterns and the mechanisms through which motivation is translated into intention and behavior.

Convenience

Convenience remains a central requirement for Gen Z, driving increased fast-food consumption and contributing to the internationalization of dietary habits (Bumbac, 2020). This generation expresses strong concern for ease of access and availability when making food choices (Bogard, 2024). From the TPB perspective, convenience enhances perceived behavioral control (PBC), as easily accessible and ready-to-eat options increase the perceived ability to obtain food with minimal effort. Greater perceived control, in turn, strengthens behavioral intention. Lifestyle pressures and time constraints are defining characteristics of Gen Z's daily routines, significantly shaping their consumption patterns (Brunner, 2010). These constraints often lead to reliance on quick food solutions and greater demand for ready-to-eat products (Bogard, 2024). Within a SDT framework, time scarcity may reduce perceived autonomy by limiting the range of feasible choices, pushing individuals toward externally regulated decisions such as fast-food consumption. At the same time, although Gen Z leads a fast paced lifestyle, evidence suggests a willingness to invest time in sustainable food decisions when conditions allow. However, traditional home cooked meals are increasingly perceived as less attractive due to the complexity of preparation and the effort required to source ingredients (Diddi *et al.*, 2019; Bumbac, 2020). Such complexity may lower both perceived competence (SDT) and perceived behavioral control (TPB), thereby weakening intention to prepare these meals. Affordability constitutes a critical dimension of convenience and consistently ranks among the top motivators of Gen Z's food choices. Evidence from the British Food Standards Agency highlights price as a key determinant of young people's dietary decisions (FSA, 2020). Although Gen Z is widely recognized for its interest in healthy and sustainable products, financial constraints particularly among students, who represent a substantial segment of this generation limit the adoption of such diets (Halicka *et al.*, 2025). In SDT terms, economic limitations may undermine autonomy by restricting meaningful choice, while in TPB terms, price constraints reduce perceived behavioral control, thereby weakening intention to select healthier alternatives. The literature reflects ongoing contradictions regarding whether convenience ultimately outweighs the appeal of foods requiring greater preparation effort. Nonetheless, expectations from this generation indicate a demand for a food system capable of delivering affordable, accessible, and

healthy options that reduce preparation time while preserving a sense of choice and control. Based on the literature findings, the following hypothesis is:

H1: Higher perceived convenience positively influences Gen Z's likelihood of choosing convenience food options.

Impulsive Eating as the opposite of healthy eating patterns

Psychological factors, together with individual psychological traits, are important determinants of food choices (Keller & Siegrist, 2015). Among these traits, impulsivity reflects the tendency to act quickly in response to stimuli, often without considering the consequences (Moeller *et al.*, 2011), which are frequently linked to disordered eating patterns (Bari & Robbins, 2013). From the perspective of SDT, such behaviors may indicate a lower level of self-regulation, where actions are driven more by immediate impulses than by autonomous, reflective choice. Impulsive eating is marked by spontaneous eating behaviors, commonly triggered by strong emotional states (Shope *et al.*, 2020). It is associated with rapid reactions to both negative and positive emotions (Sweerts & Romo, 2020). Impulsive behavior may also arise from an emotional urge or desire, which occurs when a person is exposed to an attractive or interesting stimulus (Oblak *et al.*, 2017). Also, these behaviors are often expressed through the rapid consumption of snack foods or other convenient items that provide immediate gratification (Joghee & Alshurideh, 2021). Impulsivity has been shown to lead to higher caloric intake and unhealthy eating patterns as well as increased purchasing of high calorie foods (Mullan *et al.*, 2014). Bénard *et al.* (2019) further demonstrate that individuals with high impulsivity levels are particularly drawn to palatable, sugar and fat rich foods. These patterns can also be interpreted through the TPB, where impulsive tendencies may weaken perceived behavioral control and strengthen favorable attitudes toward immediately rewarding food options. These findings raise the question of how Gen Z's impulsive tendencies interact with their attitudes toward healthy eating. Despite these risks, Gen Z consumers are placing increasing emphasis on product quality and healthier dietary patterns, including a notable rise in the consumption of fortified foods enriched with vitamins and minerals. This trend underscores the need for careful nutritional planning and innovation across the food system. A health focused dietary orientation may be defined as “an individual's mindset and approach to dietary choices, prioritizing nutritional quality and health benefits over other factors such as taste, convenience, or cost” (Patwardhan, 2024, p. 10). Within SDT, such an orientation may reflect more autonomous forms of motivation, where

healthy eating is aligned with personal values and internalized goals rather than external pressures. Positive attitudes toward organic products, interest in detailed nutritional labeling, and recognition of the health advantages of “better for you” foods illustrate a strong connection between health concerns and food behavior (Ashton *et al.*, 2015; Jo *et al.*, 2016; Liu *et al.*, 2022). This connection has been identified as a particularly strong motivator for Gen Z in their food-related decisions (Mitic & Vehapi, 2020). In TPB terms, these positive evaluations shape attitudes and strengthen intentions to select healthier alternatives. Compared with previous generations, Gen Z has been exposed to greater education emphasizing the benefits of fresh over processed foods and a stronger emphasis on food quality. This is reflected in their pronounced preference for fruits and vegetables as alternatives to meat (NPD, 2019; Bogueva & Marinova, 2020). They value authenticity, freshness, and purity, favoring natural sources, particularly whole plants, fruits, and vegetables (Food Frontier, 2019), and their demand for innovation in taste, texture, and functionality positions them as influential actors in the future evolution of food systems (Wheeler, 2020). From an SDT perspective, this may signal a need for competence (making informed choices) and autonomy (expressing identity through food). Gen Z’s openness to diversity also extends to food, shaped by growing up in a globalized environment that has familiarized them with international and ethnic cuisines (Campisi, 2020). For this generation, what matters is the effect of food on the body its benefits, potential harms, and its role in personal wellbeing. They demonstrate a preference for products that offer solutions rather than problems. Such behaviors may enhance perceived behavioral control (TPB) and intrinsic motivation (SDT), reinforcing intentional and health-oriented food decisions. However, the coexistence of strong health consciousness and impulsive tendencies suggests a potential tension between reflective intentions and spontaneous behaviors. When impulsive traits dominate, immediate gratification may override autonomous motivation and planned intentions, increasing the attractiveness of convenient, ready to consume options.

Based on the literature findings, the following hypothesis is:

H2: Strong impulsive tendencies positively influence Gen Z’s likelihood of choosing convenience food.

Traditional Food Perception

Traditional food refers to culinary practices rooted in gastronomic heritage, typically consumed on specific occasions (Guerrero, 2009). It carries an authentic value, is prepared using traditional techniques,

relies on inherited recipes (Colozza, 2021; Fibri 2019; Putra 2023), and often incorporates ingredients sourced from local farms or wild resources available in the surrounding area (Pieniak 2009). Quaranta and Salvia (2011), defines tradition as “the combination of representations, concepts, theoretical and practical knowledge, behaviors, attitudes, etc., that a group or a society accepts to ensure continuity between the past and the present.” The conceptual development of traditional food has been explored extensively, raising questions regarding distinctions between “traditional foods” and related categories such as typical, artisanal, local, ethnic, regional foods.

Amilien and Hegnes (2013) propose four defining dimensions common across these categories: place, time, knowledge, and cultural meaning of particular importance is the sociocultural value, which refers to the benefits of consuming traditional cuisine, including the preservation of cultural heritage and the strengthening of community connections (Apak & Gürbüz, 2023).

Research on Gen Z’s engagement with traditional foods is limited, likely due to their young age. Food serves as a means of recalling memories and reinforcing emotional connections within communities (Abarca & Colbi, 2016; Kim & Lee, 2020). The aromas and flavors of home cooking evoke memories of one’s place of origin, providing comfort and continuity (Bailey, 2017) and contributing to cultural identity formation (Volpato & Ellena, 2023). Despite this, aspects of nostalgia and emotional connections with food remain underexplored in the literature (Vignolles & Pichon, 2014; Ju *et al.*, 2016). Nostalgia can evoke both positive and negative emotions (Espinoza-Ortega, 2021), generating simultaneous feelings of joy and sadness (Vignolles & Pichon, 2014). Food nostalgia has been analyzed in relation to time and space (Kessous & Roux, 2008), and for Gen Z, it is often linked to childhood, particularly with sweets and fried foods, which are associated with rewarding experiences. Food can serve as an emotional refuge, especially in the context of relationships between parent and child, and the sensory arousal elicited by nostalgic foods is cognitive, emotional, and physical (Anderson, 2016).

Although nostalgia highlights a contrast with past practices where food was prepared from scratch (Locher *et al.*, 2005), cooking traditional meals is often perceived as complicated by young people (Sanda, 2014), leading to a preference for industrialized foods that are more convenient. Nevertheless, according to the literature, Gen Z is highly active in cooking, inspired by media and online platforms, experimenting with new flavors and recipes (Hartman Group, 2018; Bumbac *et al.*, 2020). Additionally, traditional foods are generally perceived as natural, healthy, and reliable, often produced without chemicals or pesticides, and their recipes and ingredients emphasize unique cultural characteristics (Cerjak *et al.*, 2014). In emerging markets such as Albania, characterized by information gaps and food safety concerns

(Haas *et al.*, 2021), local and traditional foods are considered a rational alternative to organic products, which are more expensive and distributed through limited channels (Cvijanović, 2020; Orea-Giner, 2023).

Previous studies indicate that Gen Z recognizes the economic and sociocultural sustainability value of traditional foods, although ecological benefits are less well acknowledged. Traditional foods represent a familiar, affordable, and economically rational means to promote sustainability (Kristia, 2024). Despite being exposed to alternative options such as fast food, Generation Z continues to demand quality foods with controlled quantity and composition (Liew, 2021).

Based on the literature findings, the following hypothesis is:

H3: Positive attitudes toward traditional food negatively influence Gen Z's likelihood of choosing convenience food.

Social Media/Peer Influence

Social media, in particular, has transformed daily life and communication (Rani & Tyagi, 2023), with food consumption emerging as one of its most impacted domains (Moghbeli *et al.*, 2023). As the food system evolves, Gen Z increasingly favors sugary and fatty snacks over traditional meals (Chen, 2024), reflecting a broader shift in dietary patterns influenced by technology. Social media refers to platforms that facilitate interactive, user created content, allowing individuals to share images, ideas, videos, music, or commentary. This includes social networking sites such as Facebook, blogging and microblogging services like Twitter, and media-sharing platforms including Instagram, YouTube, and TikTok (Ventola *et al.*, 2014). This digital revolution has introduced a new paradigm in how food is perceived and consumed (Rini *et al.*, 2024), as platforms showcase visually appealing images, videos, posts, trendy diets, and global culinary experiences that shape users' attitudes toward eating (Rounsefell *et al.*, 2020; Canet *et al.*, 2021). Such exposure not only informs healthy eating goals (Krishnan & Zhou, 2019) through attention cues and behavioral prompts (Patwardhan, 2024) but can also provoke impulsive responses when foods are presented attractively, triggering cravings strong, irresistible desires for specific foods (Cherpitel *et al.*, 2010). Research highlights significant associations between obesity rates and the prevalence of social media followers of sugary drink or fast-food brands on platforms like Instagram and Twitter (Gu *et al.*, 2021). Among adolescents, marketing on social media has been shown to increase preferences for and consumption of unhealthy foods (Fleming-Milici &

Harris, 2020; Filippone, 2022), creating a complex digital environment that influences food choices and social norms. At the same time, social media can foster impulsive behaviors that challenge the regulation of eating habits (Filippone, 2022), though it also has the potential to promote healthy food consumption (Ventura *et al.*, 2021). However, exposure to idealized body images and unrealistic dietary expectations on these platforms can have significant psychological consequences (Chung *et al.*, 2021; Sidani *et al.*, 2016). Theoretical frameworks help explain these patterns. SDT emphasizes that food choices are shaped by intrinsic motivations and the fulfillment of psychological needs autonomy, competence, and relatedness (Deci & Ryan, 1985, 2000). Meanwhile, TPB highlights how attitudes, subjective norms, and perceived behavioral control influence eating behaviors (Ajzen, 1991), providing insight into how social media affects both intentions and actual consumption. Together, these theories clarify why Gen Z may gravitate toward visually appealing, convenient, or trendy foods despite potential health risks. Digital platforms accelerate interactions beyond the reach of face-to-face communication, allowing food companies to influence beliefs, attitudes, and norms at scale. Studies show that social media advertising for fast food can shape adolescents' perceptions, dietary behaviors, and purchase intentions (Thaichon, Quach, 2021). Peer influence further reinforces these behaviors, as adolescents' eating habits are affected by perceived social norms and pressures to conform during this developmental stage (Rice & Klein, 2019; Sharps & Robinson, 2017). While face-to-face peer interactions have long been recognized for their role in shaping health behaviors, social media extends this influence, affecting the full spectrum of adolescents' dietary choices from healthy to unhealthy (Chung, 2021).

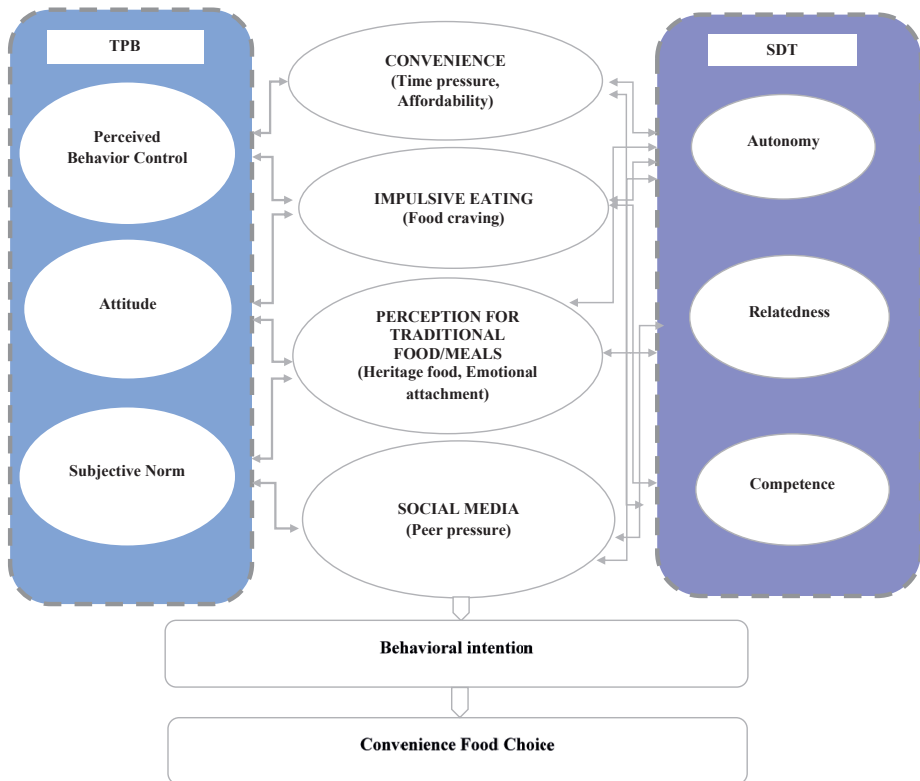
Based on the literature findings, the following hypothesis is:

H4: Exposure to social media and peer influence positively influences Gen Z's likelihood of choosing convenience food.

Based on the literature above, a conceptual framework has been developed, as presented in the figure 1.

Following the formulation of the study hypotheses, the next section describes the materials and methods used to empirically test these relationships among Gen Z consumers in Albania.

Figure 1 - Theoretical Framework



4. Methodology

Data Collection

Data for the current study were collected in 2025 from students at the Agricultural University of Tirana, Albania to investigate Gen Z consumers' behaviors and attitudes regarding food choice trends. Data were collected via a structured questionnaire administered in person. The questionnaire consisted of closed-ended questions organized into three sections.

Section A collected demographic information, including gender, age, employment or study status, living arrangements (living with family or independently), and monthly income. For respondents living with family, total family income was recorded, while individuals living independently reported their personal monthly income.

Section B focused on general food consumption patterns and attitudes, including changes in diet over the past five years, the proportion of imported versus domestic food consumed, perceived food quality, frequency of fast-food consumption, and the relative importance of various food attributes, such as taste, price, convenience, peer influence, and online recommendations.

Section C measured factors influencing food choice using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). This section assessed constructs including Convenience, Impulsive Eating, environmental concerns, Traditional Food Perception, international food influence, Social Media / Peer Influence, and actual food selection behaviors.

The survey was conducted in person to maximize response rates, minimize potential sampling bias, and allow clarification of questions when needed. While all participants were enrolled at a single university, they come from different regions of Albania, providing geographic diversity and enhancing the representativeness of the sample for the national student population. Nonetheless, this limitation is acknowledged in the interpretation of the results. Participation was voluntary, and all responses were collected anonymously.

Measurement Development

To test the study hypotheses, reliable and valid measures were developed for all constructs. Each construct was measured using multiple items adapted from previously validated scales. A pretest with a small group of students ensured that the questions were clear and understandable, and minor adjustments were made based on feedback.

Internal consistency was evaluated using Cronbach's alpha, with values above 0.70 considered acceptable (Nunnally, 1981). A construct is considered valid not only when it demonstrates convergent validity, meaning that the items intended to measure the construct load significantly on the same factor, but also when it shows discriminant validity, ensuring that the factors are distinct from one another and do not exhibit high covariance (Bagozzi *et al.*, 1991).

Exploratory Factor Analysis (EFA) was conducted in SPSS to examine the underlying structure of the measurement items. Composite scores for each construct were generated from the EFA results and were used in subsequent analyses. The study variables, measurement scales, and sources of each item are summarized in Table 1.

Table 1 - Study Variables, Measurement, and Sources

No.	Variable	Measurement Scale	Source
1.	Convenience	Likert Scale	Adapted from: Chen <i>et al.</i> , 2024
2.	Impulsive Eating	Likert Scale	Adapted from: Vermeir & Roose, 2020
3.	Traditional Food	Likert Scale	Adapted from: Espinoza-Ortega, 2021
4.	Social Media	Likert Scale	Adapted from: Chung, 2021; Zhang <i>et al.</i> , 2024
5.	Food Choice	Likert Scale	Adapted from: Ilieva <i>et al.</i> , 2025

The data were analyzed using SPSS and AMOS. Following the EFA, Confirmatory Factor Analysis (CFA) was performed in AMOS to validate the measurement model. Finally, Structural Equation Modeling (SEM) was applied in AMOS to test the hypothesized relationships between the independent constructs and the dependent variable. SEM provides a robust framework for hypothesis testing, ensuring that the constructs are reliable and valid for analyzing the relationships between variables.

5. Results

Sample Characteristics

A total of 302 valid questionnaires were obtained. As presented in Table 2, 114 respondents (37.7%) were male and 188 (62.3%) were female.

Table 2 - Socio-demographic characteristics of study sample

Socio-Demographic Characteristics	Groups	Frequency	%
Gender	Male	114	37.7
	Female	188	62.3
	Total	302	100
Living with	Family	283	93.7
	Alone	19	6.3
	Total	302	100
Work and study status	University & part-time job	201	66.6
	Only university	80	26.5
	Only working	21	7.0
	Total	302	100

Most participants (283; 93.7%) lived with their family, while 19 (6.3%) lived independently. Regarding work and study status, 201 students (66.6%) were enrolled in university while also working part-time, 80 (26.5%) were solely university students, and 21 (7.0%) were employed full-time. The participants' mean age was 20.65 years ($SD = 1.67$), consistent with the Gen Z age range. The mean monthly family income was 150,860.93 ALL ($SD = 51,503.19$), reflecting a broad socioeconomic range.

Measurement Model Results

EFA using principal component extraction with Varimax rotation revealed a five-factor solution, which we labelled Convenience, Impulsive Eating, Traditional Food Perception, Social Media / Peer Influence, and Food Choice (Costello & Osborne, 2005; Field, 2018; Watkins, 2018). All factors demonstrated excellent internal consistency with Cronbach's alpha ranging from 0.982 to 0.997 (Cronbach, 1951). Item loadings were consistently high (≥ 0.93), confirming a clear factor structure. A summary of factor reliabilities and item counts is presented in Table A.1, while detailed factor loadings for all items are provided in Appendix A.

Following the EFA, CFA was performed using AMOS to validate the proposed measurement model. The CFA results indicated a good fit to the data: $\chi^2 (118) = 201.751$, $p < 0.001$; $CMIN/DF = 1.71$; Comparative Fit Index (CFI) = 0.993; Tucker-Lewis Index (TLI) = 0.991; and Root Mean Square Error of Approximation (RMSEA) = 0.049, confirming the adequacy of the model structure.

Table 3 presents composite reliability (CR), average variance extracted (AVE), maximum shared variance (MSV), maximum reliability (MaxR(H)), and the inter-construct correlation matrix (with the square roots of AVE on the diagonal) for the five latent constructs: Social Media / Peer Influence (Soc Med), Convenience (Conv), Impulsive Eating (Imp Eat), Traditional Food Perception (Trad Food), and Food Choice (Food Cho). CR values ranged from 0.979 to 0.997, exceeding the recommended threshold of 0.70 and indicating strong internal consistency (Bagozzi *et al.*, 1991; Hair *et al.*, 2010). Convergent validity was confirmed, as AVE values ranged from 0.922 to 0.991, well above the 0.50 criterion (Fornell & Larcker, 1981; Hair *et al.*, 2010; Malhotra & Dash, 2011; Mehmeti & Luga, 2024). Discriminant validity was supported by each construct's AVE exceeding its MSV, and by the square root of AVE on the diagonal being greater than the inter-construct correlations, consistent with the Fornell-Larcker criterion (Fornell & Larcker, 1981; Hair *et al.*, 2010).

Overall, these results demonstrate a robust measurement model with strong reliability, convergent validity, and discriminant validity, providing a sound foundation for subsequent structural model testing.

Table 3 - Validity/Reliability and factor correlation matrix with square root of the AVE on the diagonal

	CR	AVE	MSV	MaxR(H)	Soc Med	Conv	Imp Eat	Trad Food	Food Cho
Soc Med	0.991	0.973	0.249	0.991	0.986				
Conv	0.989	0.957	0.118	0.992	0.291	0.978			
Imp Eat	0.992	0.967	0.067	0.992	0.030	0.259	0.984		
Trad Food	0.979	0.922	0.052	0.984	-0.198	-0.159	-0.030	0.960	
Food Cho	0.997	0.991	0.249	0.997	0.499	0.344	0.087	-0.228	0.996

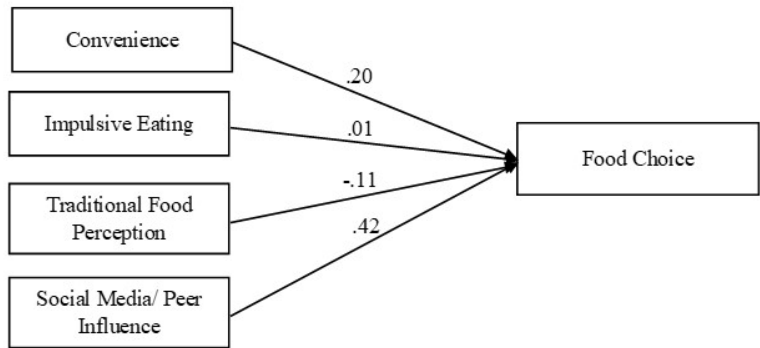
Note: CR - Composite Reliability, AVE - Average Variance Extracted, MSV - Maximum Shared Variance, MaxR - Maximum Reliability.

Soc Med - Social Media / Peer Influence; Conv - Convenience; Imp Eat - Impulsive Eating; Trad Food - Traditional Food; Food Cho - Food Choice.

Structural Model Results

The structural model demonstrated a good fit to the data, as indicated by the following indices: $\chi^2 = 189.157$, $df = 117$, $p < .001$; CMIN/DF = 1.617; CFI = 0.994; TLI = 0.992; and RMSEA = 0.045. Given this satisfactory model fit, hypotheses were tested by examining the structural coefficients presented in Table 4. Convenience had a significant positive effect on Food Choice, supporting Hypothesis 1 (H1). Traditional Food Perception exhibited a significant negative effect on Food Choice, confirming Hypothesis 3 (H3). Social Media / Peer Influence showed a strong positive influence on Food Choice, supporting Hypothesis 4 (H4). Impulsive Eating did not significantly influence Food Choice, and thus Hypothesis 2 (H2) was not supported. This non-significant effect suggests that, in this sample of Gen Z university students, food selection may be less driven by spontaneous hedonic impulses and more influenced by structured lifestyle and environmental factors. Specifically, habitual consumption patterns, family or cultural routines, and exposure to digital media may overshadow individual impulsive tendencies, indicating that convenience and peer driven influences are more salient determinants of dietary behavior in this cohort. These results are presented in the Structural Equation Modeling (SEM) diagram (Figure 2).

Figure 2 - Structural Equation Modeling Diagram



Note: Standardized path coefficients are shown on arrows.

Overall, the results highlight the predominant role of lifestyle and media related factors over impulsive tendencies in shaping food choices, emphasizing that structural and socially mediated determinants may be more predictive than dispositional traits among Gen Z consumers.

Table 4 - Structural model results

Hypothesis (H)		Estimate	Std-Estimate	S.E.	C.R.	P	Results
H1	Food Choice ← Convenience	0.213	0.201	0.054	3.983	***	√
H2	Food Choice ← Impulsive Eating	0.012	0.011	0.048	0.245	0.807	×
H3	Food Choice ← Traditional Food Perception	-0.180	-0.114	0.076	-2.358	0.018	√
H4	Food Choice ← Social Media / Peer Influence	0.395	0.419	0.047	8.378	***	√

Note: *** significant at $p < .001$, √ - Supported, × - Not Supported.

6. Discussion

The structural model indicates that Convenience is the strongest positive predictor of Food Choice among Gen Z, reinforcing prior evidence that this cohort prioritizes time-efficient, easily accessible, and affordable processed food options (Johansen *et al.*, 2025; Nguyen & Simpson, 2024). The highest loadings were associated with pre-preparation characteristics (e.g., cutting,

mixing, partial cooking), suggesting that Convenience operates not only as a time-saving mechanism but also as a means of reducing cognitive effort in food selection. This finding is consistent with previous research identifying Convenience as a central requirement for contemporary consumers (Arenas-Gaitán *et al.*, 2021; Bogard *et al.*, 2024). However, unlike older generations for whom Convenience may function as a secondary attribute (Chen *et al.*, 2024), our results suggest that for Gen Z it represents a primary decision criterion.

Similarly, Social Media / Peer Influence emerged as a strong positive predictor of Food Choice, confirming the pivotal role of digital environments in shaping dietary preferences (Jang *et al.*, 2024; Brenkusová *et al.*, 2025). While some studies suggest that social media can promote healthier behaviors, others associate it with increased consumption of unhealthy foods (Ventura *et al.*, 2021), consistent with our findings. Exposure to influencers and marketing stimuli has been shown to increase willingness to try new products (Nguyen & Nguyen, 2024), while also contributing to unrealistic expectations and higher consumption frequency of convenience-oriented foods (Patwardhan *et al.*, 2024). Moreover, digital platforms have been linked to misinformation and the normalization of unhealthy dietary patterns (Chung *et al.*, 2021), as well as broader shifts in traditional eating practices (Rounsefell *et al.*, 2020).

In contrast, Traditional Food orientation demonstrated a significant negative association with convenience-driven food choices, suggesting that cultural attachment and heritage-based preferences may serve as protective factors against the adoption of fast-food consumption patterns (Kristia *et al.*, 2024; Mitchell & Vehapi, 2021).

Unexpectedly, Impulsive Eating did not significantly predict Food Choice. Rather than indicating a methodological limitation, this finding may reflect the structured and socially embedded nature of food consumption within the present sample. Notably, 93.7% of participants reported living with their families. As highlighted by Ares *et al.* (2024), eating habits are strongly shaped during childhood and adolescence, and early-established routines may stabilize food-related behaviors in later stages of life. In such contexts, family norms and shared meal practices may function as regulatory mechanisms that attenuate the influence of individual impulsive tendencies. Instead of being guided by spontaneous hedonic reactions, food choices may be embedded within pre-existing household routines and culturally reinforced expectations. Ares *et al.* (2024) further emphasize the importance of fostering rational and functional food-related competencies while minimizing impulsive drivers, which may help explain the reduced explanatory power of impulsivity in this cohort. Additionally, broader generational evidence indicates that Gen Z consumers prioritize sustainability and authenticity in food purchasing decisions (Deloitte, 2023), suggesting a value oriented and reflective

consumption style. Taken together, these findings imply that ultra-processed food consumption in this context is less a product of uncontrolled impulses and more a function of structurally conditioned, socially normalized, and culturally mediated decision making processes (Shope *et al.*, 2020).

From a theoretical standpoint, these findings extend the explanatory scope of both Theory of Planned Behavior and Self-Determination Theory in the context of Gen Z food behavior. Within TPB, Convenience appears to strengthen perceived behavioral control by increasing the perceived ease and feasibility of consumption, while Social Media / Peer Influence reflects evolving subjective norms and socially shaped attitudes. Importantly, the non-significant role of Impulsive Eating supports TPB's core assumption that behavior is largely reasoned rather than purely spontaneous. However, the findings also suggest that contemporary digital environments may intensify normative pressures beyond what traditional TPB applications have considered, indicating the need to incorporate digitally mediated norms more explicitly in future theoretical applications.

From an SDT perspective, Traditional Food orientation reflects dimensions of relatedness and internalized value alignment, indicating that cultural attachment may operate through more autonomous motivational processes. At the same time, the strong effects of Convenience and Social Media suggest that externally structured environments and controlled motivational dynamics can significantly shape food choices. The absence of an impulsivity effect further implies that motivational regulation may override dispositional tendencies when food behavior is embedded in stable cultural and family contexts.

Methodologically and conceptually, these results highlight the importance of adopting an integrated framework that simultaneously incorporates lifestyle, digital, and cultural determinants when examining Gen Z food choices. Rather than relying exclusively on health-centric or trait-based explanations, the findings support a context-sensitive perspective in which structural constraints, digitally mediated norms, and cultural identity collectively shape dietary behavior.

Practical implications

The findings of this study offer several practical implications for actors across the agro food system.

First, food manufacturers and food-service operators should integrate elements of Convenience into product design by offering items that reduce preparation time while retaining nutritional quality and cultural familiarity. For example, traditional dishes could be reformulated into ready-to-cook

meal kits, pre portioned ingredients, partially prepared components, or frozen versions requiring minimal preparation time. Packaging innovations such as resalable containers, single-portion formats, or microwave-ready options may further enhance perceived ease of use. By combining efficiency with recognizable flavors and culturally embedded recipes, producers can better align with Gen Z's demand for time saving yet identity consistent food solutions.

Second, marketing strategies should adapt to the central role of Social Media/Peer Influence in shaping perceptions and purchasing behavior. Campaigns may benefit from collaborating with credible influencers who demonstrate practical preparation methods, transparent sourcing practices, or culturally meaningful narratives. Short form video content showcasing quick preparation of traditional inspired meals, behind the scenes production transparency, and user generated content challenges may enhance engagement. Emphasizing authenticity and sustainability values increasingly prioritized by Gen Z can further strengthen brand credibility.

Third, initiatives promoting Traditional Food should highlight not only symbolic and cultural value but also functional and practical attributes. Traditional products can be repositioned as modern and adaptable by offering simplified recipes, time efficient preparation instructions, or digital tutorials accessible via *quick response* – QR codes on packaging. Restaurants and retailers could introduce “modernized traditional” menu lines that preserve core ingredients while adapting format and serving style to contemporary consumption habits. Such strategies may help bridge the gap between cultural continuity and convenience oriented lifestyles.

Finally, public-policy interventions should recognize that structural drivers such as convenience and digital exposure appear more influential than impulsive tendencies in shaping Gen Z dietary behavior. Public health strategies may therefore benefit from improving the availability and affordability of convenient, nutritionally balanced options in schools, universities, and urban food environments. Nutrition education programs could incorporate digital literacy components, helping young consumers critically evaluate online food marketing, influencer content, and nutrition misinformation. Additionally, integrating culturally grounded dietary education into school curricula may reinforce traditional food knowledge while promoting practical cooking competencies that align with contemporary time constraints.

By combining industry innovation, digitally adapted communication strategies, and culturally sensitive public health initiatives, stakeholders can more effectively respond to the evolving dietary patterns of Gen Z consumers.

Limitations and future research

This study is subject to several limitations. First, the cross-sectional design restricts causal inference, as relationships among Convenience, Social Media / Peer Influence, Traditional Food orientation, and Food Choice were examined at a single point in time. Although the structural model identifies significant associations, temporal ordering and causal direction cannot be definitively established.

Second, the sample consists exclusively of Albanian young adults, which may limit the generalizability of the findings across different cultural, economic, or food system contexts. Albania represents a transitional food environment where traditional dietary patterns coexist with rapidly expanding convenience oriented options. As such, the relative influence of cultural attachment and digital exposure may differ in more industrialized or culturally distinct settings. An additional limitation concerns about the sampling frame is that participants were recruited from students at the Agricultural University of Tirana, although they originate from several cities across the country. While this geographic diversity enhances internal variation, the academic background of respondents may introduce a form of educational or domain related bias. Students enrolled in an agricultural focused institution may possess greater awareness of food systems, nutrition, or sustainability issues compared to the broader Gen Z population. This could influence their reported attitudes toward traditional food, convenience, or sustainability related considerations, potentially limiting the external validity of the findings.

Third, the study relies on self-reported measures, which may introduce social desirability bias and recall inaccuracies. Participants may underreport unhealthy food consumption or overstate culturally valued behaviors such as preference for Traditional Food. Additionally, the constructs were measured using perceptual scales, which capture subjective evaluations rather than objective consumption data. While reliability and validity indicators were satisfactory, future research could strengthen measurement precision by incorporating behavioral tracking methods (e.g., food diaries, purchase records, or digital consumption data).

Moreover, Impulsive Eating was assessed as a dispositional tendency rather than through situational or experimentally induced impulse conditions. This may have limited the ability to detect context dependent impulsive behaviors that emerge under time pressure, emotional stress, or digital cue exposure.

Future research should therefore adopt more diversified methodological approaches. Longitudinal designs would allow examination of how digital exposure and convenience orientation evolve over time and whether they reinforce habitual ultra-processed food consumption. Experimental studies

could manipulate social media stimuli (e.g., influencer endorsement vs. neutral content) or convenience framing to test causal effects on food selection. Mixed methods approaches combining structural modeling with qualitative interviews or focus groups may provide deeper insight into how Gen Z interpret and internalize cultural and digital food cues in everyday decision-making contexts.

Cross national comparative research would further clarify whether the buffering effect of Traditional Food orientation observed in this study persists across societies with varying degrees of culinary continuity and market modernization. Finally, future studies could examine potential interaction effects or mediation mechanisms for example, whether cultural identity moderates the impact of social media exposure, or whether perceived behavioral control mediates the relationship between convenience and food choice.

Conclusion

This study contributes to the literature on food behavior by demonstrating that Generation Z's dietary choices are best understood through an integrated perspective that combines structural, digital, and cultural determinants. Rather than framing ultra-processed food consumption primarily as a consequence of impulsive or purely health related decision making, the findings highlight the dominant role of convenience oriented lifestyles and digitally mediated social norms within a culturally embedded context.

The study advances generational research by showing that Gen Z food behavior reflects a hybrid consumption logic: one that simultaneously embraces efficiency and digital connectivity while maintaining selective attachment to traditional food values. This dual orientation challenges simplified narratives portraying Gen Z either as purely convenience driven consumers or as uniformly sustainability focused actors. Instead, their food choices appear to be shaped by the interaction between modern food environments and culturally internalized identities.

From a theoretical standpoint, the research enriches applications of the TPB and SDT by illustrating how digitally mediated norms and perceived convenience can outweigh dispositional traits such as impulsivity in predicting food related decisions. The findings suggest that contemporary food behavior models should more explicitly account for digital exposure and cultural continuity as interacting mechanisms within younger cohorts.

Moreover, by examining Gen Z within a transitional food system context, this study extends existing evidence beyond highly industrialized Western settings and provides insight into how modernization and cultural heritage coexist in shaping dietary patterns. In doing so, it offers a more context-

sensitive understanding of generational food behavior in emerging and transforming markets.

Overall, the study underscores the need to move beyond health centric or trait based explanations of youth food consumption and toward multidimensional frameworks that integrate lifestyle efficiency, digital influence, and cultural identity. Such an approach offers a more comprehensive foundation for future research on generational food behavior in increasingly digitalized and culturally dynamic food environments.

References

- Abarca, M. E., & Colby, J. R. (2016). Food memories: Seasoning the narratives of our lives. *Food, Foodways*, 24(1), 1-8.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. Doi: 10.1016/0749-5978(91)90020-T.
- Amilien, V., & Hegnes, A. W. (2013). The dimensions of “traditional food” in reflexive modernity: Norway as a case study. *Journal of the Science of Food and Agriculture*, 93(14), 3455-3463.
- Anderson, L. (2016). Cooking up the past: Culinary nostalgia and gender critique in *Cuéntame qué pasó*. *Hispanic Research Journal*, 17(1), 34-48. Doi: 10.1080/14682737.2015.1125103.
- Apak, Ö. C., & Gürbüz, A. (2023). The effect of local food consumption of domestic tourists on sustainable tourism. *Journal of Retailing and Consumer Services*, 71, 103192. Doi: 10.1016/j.jretconser.2022.103192.
- Arenas-Gaitán, J., Peral-Peral, B., & Reina-Arroyo, J. (2021). Food-related lifestyles across generations. *British Food Journal*, 124(5), 1485-1501. Doi: 10.1108/BFJ-04-2021-0393.
- Ares, G., De Rosso, S., Mueller, C., Philippe, K., Pickard, A., Nicklaus, S., van Kleef, E., & Varela, P. (2024). Development of food literacy in children and adolescents: Implications for the design of strategies to promote healthier and more sustainable diets. *Nutrition Reviews*, 82(4), 536-552.
- Ashton, L. M., Hutchesson, M. J., Rollo, M. E., Morgan, P. J., Thompson, D. I., & Collins, C. E. (2015). Young adult males’ motivators and perceived barriers towards eating healthily and being active: A qualitative study. *International Journal of Behavioral Nutrition and Physical Activity*, 12, 93.
- Bagozzi, R. P., Yi, Y., & Phillips, L. W. (1991). Assessing construct validity in organizational research. *Administrative Science Quarterly*, 36(3), 421-458. Doi: 10.2307/2393203.
- Bailey, A. (2017). The migrant suitcase: Food, belonging and commensality among Indian migrants in The Netherlands. *Appetite*, 110, 51-60.
- Bari, A., & Robbins, T. W. (2013). Inhibition and impulsivity: Behavioral and neural basis of response control. *Progress in Neurobiology*, 108, 44-79. Doi: 10.1016/j.pneurobio.2013.06.005.

- Bogard, J. R., Downs, S., Casey, E., Farrell, P., Gupta, A., Miachon, L., Naughton, S., Staromiejska, W., & Reeve, E. (2024). Convenience as a dimension of food environments: A systematic scoping review of its definition and measurement. *Appetite*, 194, 107198. Doi: 10.1016/j.appet.2023.107198.
- Bogueva, D., & Marinova, D. (2020). Cultured meat and Australia's Generation Z. *Frontiers in Nutrition*, 7, 148.
- Brenkusová, J., Turčínková, J., & Šácha, J. (2025). Social networks and conspicuous food consumption: A comparative study among Generations Z, X, and Y in the Czech Republic. *European Journal of Business Science and Technology*, 11(1), 85-98.
- Brunner, T. A., van der Horst, K., & Siegrist, M. (2010). Convenience food products: Drivers for consumption. *Appetite*, 55(3), 498-506. Doi: 10.1016/j.appet.2010.08.017.
- Bumbac, R., Bobe, M., Procopie, R., Pamfilie, R., Gius, S., & Enache, C. (2020). How Zoomers' eating habits should be considered in shaping the food system for 2030 – A case study on the young generation from Romania. *Sustainability*, 12, 7390. Doi: 10.3390/su12187390.
- Burrows, T., Goldman, S., Olson, R. K., Byrne, B., & Coventry, W. L. (2017). Associations between selected dietary behaviours and academic achievement: A study of Australian school-aged children. *Appetite*, 116, 372-380.
- Campisi, V. (2020). Gen Z's influential food preferences. *The Food Institute*. -- <https://foodinstitute.com/focus/gen-z-preferences>.
- Canet, N. L., Luna, D., E, M. C., & A, E. F. (2021). Impacts of social media in promoting food products. *International Journal of Tourism and Hospitality*, 1(S1), S27-S43.
- Cakoni, R., Moramarco, S., Kosiqi, A., Andreoli, A., & Buonomo, E. (2025). Dietary habits and nutritional status of youths living in rural and semi-urban Albania in the ongoing nutrition transition: Preliminary results. *Children*, 12(1), 98. Doi: 10.3390/children12010098.
- Cerjak, M., Haas, R., Brunner, F., & Tomić, M. (2014). What motivates consumers to buy traditional food products? Evidence from Croatia and Austria using word association and laddering interviews. *British Food Journal*, 116(11), 1726-1747. Doi: 10.1108/BFJ-02-2014-0090.
- Chen, J., Xu, A., Tang, D., & Zheng, M. (2024). Divergence and convergence: A cross-generational study on local food consumption. *Scientific Reports*, 14, 13463.
- Cherpitel, C. J., Borges, G., Ye, Y., Bond, J., Cremonte, M., Moskalewicz, J., & Swiatkiewicz. (2010). Performance of a craving criterion in DSM alcohol use disorders. *Journal of Studies on Alcohol and Drugs*, 71(1), 674-684. Doi: 10.15288/jsad.2010.71.674.
- Chung, A., Vieira, D., Donley, T., Tan, N., Jean-Louis, G., Gouley, K. K., & Seixas, A. (2021). Adolescent peer influence on eating behaviors via social media: Scoping review. *Journal of Medical Internet Research*, 23(6), e19697.
- Colozza, D. (2021). Dietary health perceptions and sources of nutritional knowledge in an urban food environment: A qualitative study from Indonesia. *Public Health Nutrition*, 24, 2848-2858.
- Costello, A. B., & Osborne, J. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation*, 10(1), 7.

- Crane-Kramer, G., & Buckberry, J. (2023). Changes in health with the rise of industry. *International Journal of Paleopathology*, 40, 99-102. Doi: 10.1016/j.ijpp.2022.12.005.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–334.
- Cvijanović, D., Ignjatijević, S., Tankosić, J. V., & Cvijanović, V. (2020). Do local food products contribute to sustainable economic development?. *Sustainability*, 12, 1-14.
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227-268. Doi: 10.1207/S15327965PLI1104_01.
- Deloitte. (2023). *Gen Z and Millennial Survey: Waves of change: Acknowledging progress, confronting setbacks*. Deloitte Insights. -- <https://www2.deloitte.com/global/en/pages/about-deloitte/articles/gx-gen-z-survey.html>.
- Diddi, S., Yan, R., Bloodhart, B., Bajtelsmit, V., & McShane, K. (2019). Exploring young adult consumers’ sustainable clothing consumption intention-behavior gap: A Behavioral Reasoning Theory perspective. *Sustainable Production and Consumption*, 18, 200-209.
- Espinoza-Ortega, A. (2021). Nostalgia in food consumption: Exploratory study among generations in Mexico. *International Journal of Gastronomy and Food Science*, 25, 100399. Doi: 10.1016/j.ijgfs.2021.100399.
- Fadnes, L. T., Økland, J. M., Haaland, Ø. A., & Johansson, K. A. (2022). Estimating impact of food choices on life expectancy: A modeling study. *PLoS Medicine*, 19(2), e1003889. Doi: 10.1371/journal.pmed.1003889.
- FAO & WHO. (2019). *Sustainable healthy diets: Guiding principles*. Food and Agriculture Organization of the United Nations. -- www.fao.org/3/ca6640en/ca6640en.pdf.
- Fibri, D. L. N., & Frøst, M. B. (2019). Consumer perception of original and modernized traditional foods of Indonesia. *Appetite*, 133, 61-69.
- Field, A. (2018). *Discovering statistics using IBM SPSS Statistics* (5th ed.). Sage.
- Filippone, L., Shankland, R., & Hallez, Q. (2022). The relationships between social media exposure, food craving, cognitive impulsivity and cognitive restraint. *Journal of Eating Disorders*, 10(1), 184. Doi: 10.1186/s40337-022-00698-4.
- Fleming-Milici, F., & Harris, J. L. (2020). Adolescents’ engagement with unhealthy food and beverage brands on social media. *Appetite*, 146, 104501. Doi: 10.1016/j.appet.2019.104501.
- Fonte, M. (2019). Food systems, consumption models and risk perception in late modernity. *International Journal of Sociology of Agriculture and Food*, 10, 13-21.
- Food Frontier. (2019). Hungry for plant-based: Australian consumer insights. -- <https://foodfrontier.org/wp-content/uploads/2019/10/Hungry-For-Plant-Based-Australian-Consumer-Insights.pdf>.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. Doi: 10.1177/002224378101800104.
- FSA. (2020). *The Future Consumer - Food and Generation Z*. FSA: Tokyo, Japan.
- Gilmour, A., Gill, S., & Loudon, G. (2020). Young adolescents’ experiences and views on eating and food. *Young Consumers*, 21(4), 389-402.

- Global Research Program. (2023). *Ultra-processed foods: A global threat to public health* (Updated November 2023). -- www.globalfoodresearchprogram.org/wp-content/uploads/2023/11/GFRP_FactSheet_UltraProcessedFoods_2023_11.pdf.
- Gu, Y., Coffino, J., Boswell, R., Hall, Z., & Bragg, M. A. (2021). Associations between state-level obesity rates, engagement with food brands on social media, and hashtag usage. *International Journal of Environmental Research and Public Health*, 18(23).
- Guerrero, L., Guàrdia, M. D., Xicola, J., *et al.* (2009). Consumer-driven definition of traditional food products and innovation in traditional foods: A qualitative cross-cultural study. *Appetite*, 52, 345-354.
- Haas, R., Imami, D., Miftari, I., Ymeri, P., Grunert, K., & Meixner, O. (2021). Consumer perception of food quality and safety in Western Balkan countries: Evidence from Albania and Kosovo. *Foods*, 10(1), 160. Doi: 10.3390/foods10010160.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Pearson.
- Halicka, E., Kaczorowska, J., Rejman, K., & Plichta, M. (2025). Investigating the consumer choices of Gen Z: A sustainable food system perspective. *Nutrients*, 17, 591. Doi: 10.3390/nu17030591.
- Ilieva, G., Yankova, T., Ruseva, M., Dzhavarova, Y., Klisarova-Belcheva, S., & Dimitrov, A. (2025). Consumer Perceptions and Attitudes Towards Ultra-Processed Foods. *Applied Sciences*, 15(7), 3739. Doi: 10.3390/app15073739.
- International Food Information Council (IFIC). (2022). *Gen Z's perspectives on food from the Food & Health Survey*. <https://foodinsight.org/spotlight-generation-z>.
- Jang, J. A., Kim, J. M., & Jung, H. (2024). Impact of social media use on segmentation of dining out behavior among younger generations: A case study in South Korea. *Foods*, 13(24), 4146. Doi: 10.3390/foods13244146.
- Jo, J., Lusk, J. L., Muller, L., & Ruffieux, B. (2016). Value of parsimonious nutritional information in a framed field experiment. *Food Policy*, 63, 124-133.
- Joghee, S., & Alshurideh, M. (2021). Expats impulse buying behaviour in UAE: Customer A perspective. *Journal of Management Information and Decision Sciences*, 24(1), 1-15.
- Johansen, K., Lee, S., & Patel, R. (2025). Convenience as a key driver of meal choice among Generation Z: A crossnational survey. *Journal of Youth Studies*, 28(4), 456-473.
- Keller, C., & Siegrist, M. (2015). Does personality influence eat styles and food choices? Direct and indirect effects. *Appetite*, 84, 128-138.
- Kessous, A., & Roux, E. (2008). A semiotic analysis of nostalgia as a connection to the past. *Qualitative Market Research: An International Journal*, 11(2), 192-212. Doi: 10.1108/13522750810864440.
- Kim, S., & Lee, H. (2020). Emotional connections and cultural meanings of food: A cross-cultural study. *Appetite*, 147, 104539.
- Kristia, K., Kovács, S., & Erdey, L. (2024). Generation Z's appetite for traditional food: Unveiling the interplay of sustainability values as higher-order construct and food influencers in Indonesia. *Discover Sustainability*, 5, 493.
- Liew, L. Y., Razali, N. A. W., Huat, K., Boon, J. G., & Sui, C. F. (2021). *AIP Conference Proceedings*, 2347, 020270.

- Liu, C., Yao, X., Zheng, Y., Zhu, Y., & Cao, D. (2022). Organic foods purchase intention, food safety information, and information on organic foods: Value orientations as a mediator. *Social Behavior and Personality: An International Journal*, 50(1), 1-13.
- Locher, J., Yoels, W. C., Maurer, D., & Van Ells, J. (2005). Comfort foods: An exploratory journey into the social emotional significance of food. *Food, Culture & Society*, 13(4), 273-297. Doi: 10.1080/07409710500334509.
- Malhotra, N. K., & Dash, S. (2011). *Marketing research: An applied orientation* (6th ed.). Pearson Education.
- Marinova, D., & Bogueva, D. (2022). Generation Z and food choices. In G. Bogueva, D. Marinova, & P. R. Failla (Eds.), *Food in a planetary emergency* (pp. 195-214). Springer. Doi: 10.1007/978-981-16-7707-6_11.
- Marques, S. C. D. C. *et al.* (2022). The importance of local food products attributes in Brazilian consumer preferences. *Future Foods*, 5, 100125. Doi: 10.1016/j.fufo.2022.100125.
- Maynard, M. (2019, June 6). The food world's next big question: What does Generation Z want to eat? *Forbes*. -- www.forbes.com/sites/michelinemaynard/2019/06/06/the-food-worlds-next-big-question-what-does-generation-z-want-to-eat/.
- Mehmeti, G., & Luga, E. (2024). Factors that affect the intention of consumers to buy food products online. *Economia agro-alimentare / Food Economy*, 26(2), 55-82. Doi: 10.3280/ecag2024oa17191.
- Meixner, O., Malleier, M., & Haas, R. (2024). Towards sustainable eating habits of Generation Z: Perception of and willingness to pay for plant-based meat alternatives. *Sustainability*, 16, 3414. Doi: 10.3390/su16083414.
- Meyerding, S. G. H., & Ahrens, S. (2024). Generation Z's perception of food healthiness: The case of Kellogg's cereals – A qualitative study in Germany and Ireland. *Cleaner and Responsible Consumption*, 14, 100218. Doi: 10.1016/j.clrc.2024.100218.
- Mitic, S., & Vehapi, S. (2021). Food choice motives of Generation Z in Serbia. *Economics of Agriculture*, 68, 127-140.
- Moeller, F. G., Barratt, E. S., Dougherty, D. M., Schmitz, J. M., & Swann, A. C. (2011). Psychiatric aspects of impulsivity. *American Journal of Psychiatry*, 158, 1783-1793. Doi: 10.1176/appi.ajp.158.11.1783.
- Moghbeli, F., Rahimian, S., Farajzadeh, A., Khamineh, A., Keikhay Moghadam, H., & Ghasemi, R. (2023). Social media and nutritional habits among nutrition students: A social work perspective. *Frontiers in Health Informatics*, 12, 173.
- Morales, F., Montserrat-de la Paz, S., Leon, M. J., & Rivero-Pino, F. (2024). Effects of malnutrition on the immune system and infection and the role of nutritional strategies regarding improvements in children's health status: A literature review. *Nutrients*, 16(1), 1. Doi: 10.3390/nu16010001.
- Mullan, B., Allom, V., Brogan, A., Kothe, E., & Todd, J. (2014). Self-regulation and the intention-behavior gap: Exploring dietary behaviours in university students. *Appetite*, 73, 7-14.
- Nguyen, T., & Nguyen, D. M. (2024). What will make Generation Y and Generation Z continue to use online food delivery services: A uses and gratifications theory perspective? *Journal of Hospitality Marketing & Management*, 33(4), 415-442. Doi: 10.1080/19368623.2023.2277731.

- Nguyen, T., & Simpson, P. (2024). Time-scarcity and convenience-food consumption patterns in young adults: Evidence from Vietnam. *Appetite*, 172, 106212.
- Nickalls, S. (n.d.). Infographic: 27% of Gen Zers say they always write a product review after making a purchase. *Adweek*. -- www.adweek.com/brand-marketing/infographic-27-of-gen-zers-say-they-always-write-a-product-review-after-making-a-purchase/.
- NPD (2019). Gen Zs are getting older and making their mark on restaurants and eating trends. *The NPD Group*. -- www.npd.com/news/press-releases/2019/gen-zs-are-getting-older-and-making-their-mark-on-restaurants-and-eating-trends/.
- Nunnally, J. C. (1981). *Psychometric theory* (2nd ed.). McGraw-Hill.
- Oblak, L., Pirc Barčič, A., Klarić, K., Kitek Kuzman, M., & Grošelj, P. (2017). Evaluation of factors in buying decision process of furniture consumers by applying AHP method. *Drvna Industrija*, 68(1), 55-63. Doi: 10.5552/drind.2017.1625.
- Orea-Giner, A., & Fusté-Forné, F. (2023). The way we live, the way we travel: Generation Z and sustainable consumption in food tourism experiences. *British Food Journal*, 125, 330-351.
- Patwardhan, V., Mallya, J., Kaliappan, S., & Dilip Kumar, D. (2024). Influence of social media on young adults' food consumption behavior: Scale development. *Cogent Social Sciences*, 10(1), 2391016. Doi: 10.1080/23311886.2024.2391016.
- Pieniak, Z., Verbeke, W., Vanhonacker, F., Guerrero, L., & Hersleth, M. (2009). Association between traditional food consumption and motives for food choice in six European countries. *Appetite*, 53, 101-108.
- Priporas, C. V., Stylos, N., & Fotiadis, A. K. (2017). Generation Z consumers' expectations of interactions in smart retailing: A future agenda. *Computers in Human Behavior*, 77, 374-381. Doi: 10.1016/j.chb.2017.01.058.
- Putra, F. K. K., Putra, M. K., & Novianti, S. (2023). Taste of asean: Traditional food images from Southeast Asian countries. *Journal of Ethnic Foods*. Doi: 10.1186/s42779-023-00189-0.
- Quaranta, G., & Salvia, C. (2011). Survival and sustainability. *Survival and Sustainability*, 3, 187-194.
- Rakhra, V., Galappaththy, S. L., Bulchandani, S., & Cabandugama, P. K. (2020). Obesity and the Western diet: How we got here. *Missouri Medicine*, 117, 536-538.
- Rani, P., & Tyagi, R. (2023). Impact of social media on the health of the rural youth: A sociological study. *International Journal of Social Sciences Review*, 11(2), 247-251.
- Rašković, M., Ding, Z., Hirose, M., Žabkar, V., Fam, K., & Asia, E. (2020). Segmenting young-adult consumers in East Asia and Central and Eastern Europe: The role of consumer ethnocentrism and decision-making styles. *Journal of Business Research*, 108, 496-507.
- Rice, E. L., & Klein, W. M. P. (2019). Interactions among perceived norms and attitudes about health-related behaviors in US adolescents. *Health Psychology*, 38(3), 268-275. Doi: 10.1037/hea0000722.
- Rini, L., Schouteten, J. J., Faber, I., Bom Frøst, M., J. A. Perez-Cueto, F., & De Steur, H. (2024). Social media and food consumer behavior: A systematic review. *Trends in Food Science & Technology*, 143, 104290. Doi: 10.1016/j.tifs.2023.104290.
- Romieu, I. (2019). Dietary factors and cancer. In P. Boffetta & P. Hainaut (Eds.), *Encyclopedia of Cancer* (3rd ed., pp. 501-511). Academic Press.

- Rounsefell, K., Gibson, S., McLean, S., Blair, M., Molenaar, A., Brennan, L., Truby, H., & McCaffrey, T. A. (2020). Social media, body image and food choices in healthy young adults: A mixed methods systematic review. *Nutrition & Dietetics*, 77(1), 19-40. Doi: 10.1111/1747-0080.12581.
- Ruppenthal, T., & Ruckert-John, J. (2025). Food shopping and eating habits of young adults. *British Food Journal*, 127(6): 2233-2252. Doi: 10.1108/BFJ-11-2024-1185.
- Sanda, R. K. B. (2014). Sensing nostalgia through traditional food: An insight from Croatia. *British Food Journal*, 116(11), 1672-1691. Doi: 10.1108/BFJ-02-2014-0089.
- Sharps, M., & Robinson, E. (2017). Perceived eating norms and children's eating behaviour: An informational social influence account. *Appetite*, 113, 41-50. Doi: 10.1016/j.appet.2017.02.015.
- Shope, M. M., Prows, S. D., Racine, S. E., & Culbert, K. M. (2020). Examining associations between emotion-based rash action and dysregulated eating symptoms in men and women. *Eating Behaviors*, 37, 101379. Doi: 10.1016/j.eatbeh.2020.101379.
- Sidani, J. E., Shensa, A., Hoffman, B., Hanmer, J., & Primack, B. A. (2016). The association between social media use and eating concerns among US young adults. *Journal of the Academy of Nutrition and Dietetics*, 116(9), 1465-472. Doi: 10.1016/j.jand.2016.03.021.
- Sweerts, S. J., & Romo, L. (2020). Food impulsivity and eating disorders: From neuropsychology to clinical psychology. *Annales Médico-Psychologiques*, 178(3), 314-317.
- Thaichon, P., & Quach, T. N. (2021). Online marketing communications and childhood's intention to consume unhealthy food. *Australasian Marketing Journal*, 24(1), 79-86. Doi: 10.1016/j.ausmj.2016.01.007.
- United Nations. (n.d.). (2025). Youth definition. *UN Department of Economic and Social Affairs*. -- www.un.org/esa/socdev/documents/youth/fact-sheets/youth-definition.pdf.
- Ventola, C. L. (2014). Social media and health care professionals: Benefits, risks, and best practices. *P&T*, 39(7), 491-520.
- Ventura, V., Cavaliere, A., & Iannò, B. (2021). Socialfood: Virtuous or vicious? A systematic review. *Trends in Food Science & Technology*, 110(4), 674-686. Doi: 10.1016/j.tifs.2021.02.018.
- Vițelar, A. (2019). Like me: Generation Z and the use of social media for personal branding. *Management Dynamics in the Knowledge Economy*, 7(2), 257-268.
- Volpato, G., & Ellena, R. (2023). The relational and dynamic nature of biocultural diversity: Foods and gastronomic knowledge in multi-ethnic migrants' settlements in Naivasha, Kenya. *Food, Culture & Society*, 26, 643-665.
- Vermeir, I., & Roose, G. (2020). Visual Design Cues Impacting Food Choice: A Review and Future Research Agenda. *Foods*, 9(10), 1495. Doi: 10.3390/foods9101495.
- Vyncke, B., Garcia-Huidobro, J., & Oliver, R. (2023). Impulsive eating behaviours and digital food environments in youth markets. *Food Quality and Preference*, 107, 104776.
- Watkins, M. W. (2018). Exploratory factor analysis: A guide to best practice. *Journal of Black Psychology*, 44(3), 219-246. Doi: 10.1177/0095798418771807.

- Wheeler, M. (2020). Generation Z demanding 'different' in the future of food. *Macadamia Food Magazine*. -- <https://foodmag.com.au/tag/macadamia/>.
- Zoltán, P., László, V., Qiongyu, W., & Jiang, M. J. (2024). Analyzing Generation Z communication attitudes, values, and norms. *Acta Periodica (Edutus)*, 30, 4-19.
- Zhang, X.Y.; Chao, C.T.; Chiu, Y.T.; Chen, H.S. (2024). Study of the Correlation between Streaming Video Platform Content on Food Production Processes and the Behavioral Intentions of Generation Z. *Foods*, 13, 1537. Doi: 10.3390/foods13101537.

Appendix A

Table A.1 - Exploratory Factor Analysis

Rotated Component Matrix	Component					
	Cronbach's Alpha	F1	F2	F3	F4	F5
Convenience (Adapted from Chen <i>et al.</i> , 2024)	.990					
I choose foods that save me time		.962				
I prefer foods that are quick to prepare		.957				
I buy foods that are easily accessible and affordable in supermarkets		.955				
I consume semi-prepared foods because they are easy to carry to school/work		.951				
Impulsive Eating (Adapted from Vermeir & Roose, 2020)	.991					
The visual appearance of food prompts me to eat even when I had not planned to do so			.978			
When I see a food I like, I pay little attention to its healthiness			.980			
Foods I enjoy trigger positive emotions			.978			
Foods with an appealing texture motivate me to purchase or try them			.979			
Traditional Food (Adapted from Espinoza-Ortega, 2021)	.982					
I perceive local and traditional products as healthier than other products				.971		
I believe local products provide greater nutritional value				.964		
I consider traditional meals prepared by local products to have superior taste				.960		
I make an effort to consume local products whenever possible				.971		
Social Media (Adapted from Chung, 2021; Zhang <i>et al.</i> , 2024)	.991					
My food choices are shaped by content I encounter online					.950	
Recommendations from web influencers affect my food choices					.955	

Rotated Component Matrix	Component				
	Cronbach's Alpha	F1	F2	F3	F4 F5
My food consumption is influenced by global food industry promotions disseminated through online media					.935
Food Choice (Adapted from Ilieva <i>et al.</i> , 2025)	.997				
The foods I consume are mostly foods that are well - known worldwide					.940
The foods I consume are easy to prepare.					.940
The foods I consume are mostly convenience foods					.938

Copyright © FrancoAngeli

This work is released under Creative Commons Attribution - Non-Commercial –
No Derivatives License. For terms and conditions of usage please see: <http://creativecommons.org>

Economia agro-alimentare / Food Economy

An International Journal on Agricultural and Food Systems

Vol. 28, Iss. 2, Art. 2, pp. 41-68 - ISSN 1972-4802

DOI: 10.3280/ecag2026oa21169



Behavioural Determinants of Adaptation and Maladaptation in Coastal Farming: Evidence from Indonesia

**Renie Oelviani^{*a}, I Gede Mahatma Yuda Bakti^a,
Deden Dinar Iskandar^b, Purbayu Budi Santosa^b**

^a Research Organisation for Governance, Economy, and Community Welfare,
National Research and Innovation Agency, Indonesia

^b Diponegoro University, Indonesia

Abstract

Smallholder farmers' behavioural responses to climate stress play a crucial role in determining the resilience of agri-food systems. In coastal Indonesia, rising salinity and recurrent flooding pose a significant threat to rice yields, rural livelihoods, and food security. Yet, limited research has explored how farmers actually adapt – or fail to adapt – to these climatic pressures. This study examines the social and psychological mechanisms that underline both adaptation and maladaptation, explaining why similar environmental threats elicit divergent behavioural responses. A dual-pathway behavioural model was developed by integrating four conceptual frameworks: the Theory of Planned Behaviour, Protection Motivation Theory, the Risk-Coping-Social Appraisal model, and the Model of Private Proactive Adaptation to Climate Change. Using survey data from 150 coastal rice farmers in Central Java, the study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) to analyze relationships among attitudes, perceived social norms, adaptive efficacy, perceived vulnerability, and avoidant coping. The results indicate that subjective norms, positive attitudes,

Article info

Type:

Article

Submitted:

02/10/2025

Accepted:

05/05/2026

Available online:

10/06/2026

JEL codes:

Q54, Q12, D91

Keywords:

Climate change
adaptation
Food system
resilience
Behavioural
determinants

* *Corresponding author:* Renie Oelviani - Research Organisation for Governance, Economy, and Community Welfare, National Research and Innovation Agency - Indonesia. E-mail: reni010@brin.go.id.

perceived vulnerability, and adaptive efficacy strongly shape adaptation intentions. Economic constraints and perceived risk severity play less significant roles. Perceived vulnerability increases adaptation when efficacy is high but contributes to disengagement when institutional support is weak. This study enhances our understanding of how farmers adapt their behaviour and suggests that group expectations and local support systems influence coping strategies. The study provides practical guidance for climate adaptation plans, emphasizing the importance of strengthening extension services, building farmers' confidence, and enhancing food system resilience.

Dual-pathway
model
Subjective norms
Smallholder farmers

Managing Editor:
Alessio Cavicchi

Introduction

Communities in coastal agricultural regions are at the forefront of climate change. For millions of smallholder farmers, rising sea levels and increasing salinity are not distant threats, but rather daily realities that erode land, livelihoods, and food security (J. Chen *et al.*, 2022; Hasan & Kumar, 2020). In low- and middle-income countries, the sustainability of resource-based livelihoods is increasingly undermined by saltwater intrusion, land degradation, and socio-economic vulnerability (Aryal *et al.*, 2020; Gopalakrishnan *et al.*, 2019; Santeramo *et al.*, 2021). In Indonesia, this phenomenon presents a significant threat to smallholder rice farming, as salinisation reduces arable land and diminishes productivity (Oelviani, Adiyoga, *et al.*, 2024; Oelviani *et al.*, 2023). While agronomic solutions, such as salt-tolerant rice, offer partial relief, they are insufficient to address the complex and multifaceted threats confronting coastal agriculture (Dam *et al.*, 2019; Hopmans *et al.*, 2021; Surendhar *et al.*, 2021).

Emerging research indicates that farmers' responses to climate risks are shaped by factors beyond technical and economic considerations. Cognitive, emotional, and social influences also inform their decision-making (Faisal *et al.*, 2020; Grothmann & Patt, 2005; Truelove *et al.*, 2015). For instance, risk perceptions, efficacy, social norms, and fatalism may take precedence over objective conditions (van Valkengoed *et al.*, 2024; Zobeidi *et al.*, 2022). Although climate services and policies can facilitate adaptation, persistent barriers remain. Economic insecurity and psychological disengagement often lead to inaction or maladaptive coping strategies (Gifford, 2011; Vieira *et al.*, 2023). Understanding both the behavioural determinants and constraints of adaptation is therefore essential (Fisichelli *et al.*, 2016; Rahman & Hickey, 2019).

Behavioural models provide insight but often address partial processes operating at different analytical levels, leading to fragmented explanations.

The Theory of Planned Behaviour (TPB) frames intentions in terms of attitudes, norms, and control, but does not explicitly incorporate risk perceptions as a core construct (Ajzen, 1985, 1991). Protection Motivation Theory (PMT) encompasses threat and coping appraisals, such as vulnerability and confidence, but gives limited and indirect attention to social and institutional contexts (Luu *et al.*, 2019; Rogers, 1983).

The Risk, Coping, and Social Appraisal (RCSA) model includes social influence but provides a more limited treatment of avoidant and disengagement behaviours. The Model of Private Proactive Adaptation to Climate Change (MPPACC) considers withdrawal and fatalism (D. Chen *et al.*, 2024; Schwaller *et al.*, 2020). However, no single framework fully captures why some adapt while others avoid (Gifford, 2011; Grothmann & Patt, 2005).

This study addresses a theoretical gap by introducing and testing a dual-pathway behavioural model. The model defines two main responses to climate stress: proactive adaptation and avoidant maladaptation. It combines key cognitive, emotional, and social factors from TPB, PMT, RCSA, and MPPACC. Proactive adaptation involves deliberate, positive changes. Avoidant maladaptation is a separate pathway shaped by perceived risk, low confidence, social norms, and structural barriers (D. Chen *et al.*, 2024; Rahman & Hickey, 2019; Zhang *et al.*, 2020).

In summary, this research provides both theoretical and practical contributions. It contributes to environmental behavioural theory by integrating parallel adaptation pathways, while helping to clarify how cognitive, emotional, and social mechanisms interact with climate-induced stressors at multiple levels. This study specifically links the behavioural responses of farmers – both adaptive and maladaptive – to institutional and policy frameworks. In Indonesia, agricultural adaptation occurs within a decentralized governance system, where national initiatives provide overarching strategic direction, while local agrarian offices translate these policies into local implementation (Ministry of Environment and Forestry, 2017; Ministry of National Development Planning, 2014). This multi-level coordination directly shapes farmers' access to information, resources, and institutional support. Therefore, analysing behavioural adaptation within these nested policy contexts is essential for understanding how psychological responses contribute to agri-food resilience.

1. Theoretical Background and Research Gap

Before detailing the specific behavioural models, it is essential to establish the core premise of this study for a broader interdisciplinary audience: farmers do not merely react to climate threats based solely on objective

weather data or economic costs. Instead, their decisions are profoundly filtered through psychological and social lenses. For instance, a farmer might face severe flooding but choose not to adapt if they feel powerless to change the situation (low efficacy) or if their community peers are similarly inactive (social norms). To systematically unpack these complex human elements, this study integrates four established frameworks, each capturing a distinct dimension of the decision-making process.

Farmers' responses to climate risks have been analysed through several behavioural frameworks, yet each elucidates only a portion of the decision-making process. The TPB links attitudes, subjective norms, and perceived behavioural control to intentions, but does not explicitly incorporate emotions and risk perceptions as core constructs (Ajzen, 1985, 1991). PMT encompasses threat and coping appraisals – such as vulnerability, severity, and efficacy – treating adaptation primarily as an individual process and giving limited and indirect attention to social and institutional contexts (Luu *et al.*, 2019; Rogers, 1983). The RCSA model foregrounds collective efficacy and shared norms, yet it tends to emphasise rational and constructive responses (Schwaller *et al.*, 2020). In contrast, the MPPACC emphasises maladaptive responses, such as denial and fatalism, while placing less emphasis on enabling social and structural conditions (D. Chen *et al.*, 2024).

Empirical findings generally support this fragmented view. Self-efficacy and response efficacy consistently encourage the adoption of new practices. High perceived costs act as barriers (Riccioli *et al.*, 2023; van Valkengoed *et al.*, 2024; Yang *et al.*, 2024). In collectivist farming communities, subjective norms have a strong influence on intentions. Psychological distress, fatalism, and disengagement often lead to maladaptation (Gifford, 2011; Vieira *et al.*, 2023). Cross-national studies demonstrate that norms and efficacy are robust predictors across various contexts. However, the interaction between these factors and vulnerability to produce maladaptive outcomes remains poorly understood (Fisichelli *et al.*, 2016; Li *et al.*, 2021; Mitter *et al.*, 2019).

In sum, previous research addresses partial processes operating at different analytical levels. While some models account for heterogeneity in responses, they often provide incomplete or partial explanations as to why similar risks prompt some farmers to adapt while leading others to disengage. Furthermore, in many instances within existing models, maladaptation is not explicitly addressed at all, rather than being conceptualised as a coexisting outcome alongside adaptation. This reveals a research gap: there is limited integration across frameworks to explain both adaptive and maladaptive pathways in climate-vulnerable farming systems.

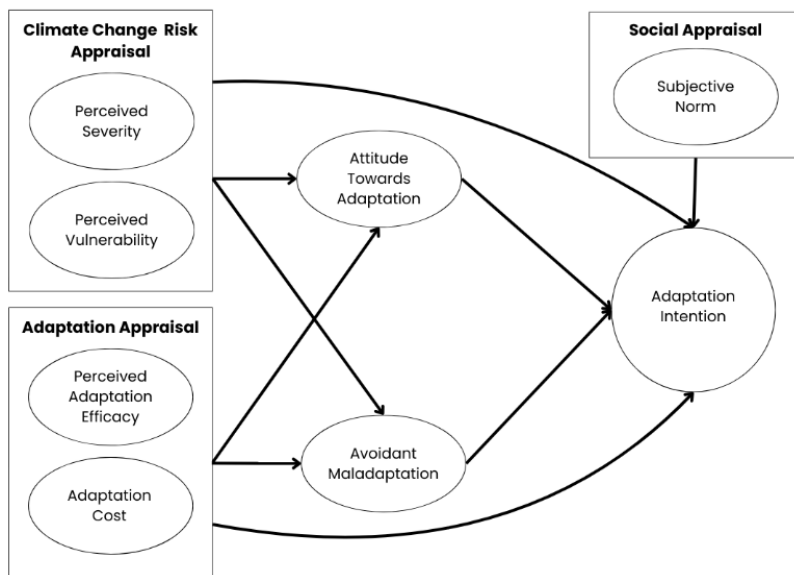
Conceptual Model Overview

To address these gaps, this study creates a dual-pathway behavioural framework. It combines ideas from the TPB, PMT, the RCSA model, and the MPPACC. The model brings these perspectives into three main domains (Ajzen, 1985; D. Chen *et al.*, 2024; Rogers, 1983; Schwaller *et al.*, 2020). Climate risk appraisal encompasses perceived severity and vulnerability, which can motivate adaptation or, if overwhelming, lead to withdrawal (D. Chen *et al.*, 2024; van Valkengoed *et al.*, 2024). Adaptation appraisal considers efficacy and costs. Confidence in one's coping ability encourages action, while a high perceived cost discourages it. Social appraisal examines subjective norms (Etse & Adu-Aboagye, 2025; Williams *et al.*, 2020; Yang *et al.*, 2024). This domain is critical in collectivist farming communities, where adaptation decisions are made within peer and leadership networks (Wang *et al.*, 2023; Zobeidi *et al.*, 2022).

These domains shape intentions in two main ways. Positive attitudes, efficacy, and supportive norms drive proactive adaptation (van Valkengoed *et al.*, 2024; Zhang *et al.*, 2020). Avoidant maladaptation manifests as disengagement, denial, or persistence in ineffective practices (Gifford, 2011; Vieira *et al.*, 2023). The model views maladaptation as a distinct pathway, rather than simply the absence of adaptation. This approach provides a conceptual refinement of behavioural theory. It helps explain how vulnerability, low efficacy, and contextual conditions may lead to defensive responses (Fisichelli *et al.*, 2016; Rahman & Hickey, 2019).

This dual-pathway framework suggests that both constructive and maladaptive processes can coincide. It offers a more comprehensive perspective on climate-related decision-making. It may inform interventions aimed at enhancing efficacy, leveraging community norms, and mitigating psychological barriers. The relationships between constructs are illustrated in Figure 1.

Figure 1 - Conceptual Model of Adaptation Intention



Hypotheses Development

This study develops hypotheses based on a model with two pathways: behavioural determinants of adaptation and barriers to farmers' intentions. Key enablers are adaptation efficacy, subjective norms, and attitudes. Constraints include maladaptive tendencies and perceived costs. Presenting these as opposing paths clarifies what motivates adaptation and what leads to withdrawal.

Subjective norms are expected to increase adaptation intention, reflecting collective decision-making in agricultural communities. Peer groups, leadership, and cooperatives shape individual responses to climate threats (Ajzen, 1991; Hounnou *et al.*, 2024; Zobeidi *et al.*, 2022).

- H1: Subjective Norms positively influence Adaptation Intention.

Similarly, an individual's attitude toward adaptation predicts intention and is shown in the perceived desirability of adaptive practices. Positive attitudes consistently correlate with a greater willingness to act (Arya & Kumar, 2023; Chang *et al.*, 2022).

- H2: Attitude towards Adaptation positively influences Adaptation Intention.

Avoidant maladaptation refers to psychological disengagement or passive coping strategies in response to climate risk. Fatalism, uncertainty, or emotional fatigue can cause inaction despite recognition of threats (Magnan, 2022; Valois *et al.*, 2020).

- H3: Avoidant Maladaptation negatively influences Adaptation Intention.

Perceived severity reflects individuals' beliefs about the seriousness of climate threats. Moderate severity motivates adaptation (Hale *et al.*, 2024; Yiridomoh *et al.*, 2022). Extremely high severity, however, may lead to fear-based paralysis. Severity thus affects both adaptive and maladaptive responses.

- H4: Perceived Severity positively influences Adaptation Intention.
- H5: Perceived Severity positively influences Attitude towards Adaptation.
- H6: Perceived Severity positively influences Avoidant Maladaptation.

Perceived vulnerability refers to a sense of exposure to climate-related hazards. Greater exposure can increase adaptation intentions and positive attitudes (Dang *et al.*, 2017; Nelson *et al.*, 2023; Valois *et al.*, 2020). However, with low efficacy or high constraints, vulnerability may lead to avoidance (Fisichelli *et al.*, 2016; Grothmann & Patt, 2005; Werg *et al.*, 2020).

- H7: Perceived Vulnerability positively influences Adaptation Intention.
- H8: Perceived Vulnerability positively influences Attitude towards Adaptation.
- H9: Perceived Vulnerability positively influences Avoidant Maladaptation.

Perceived adaptation efficacy is confidence in one's ability to respond. High efficacy drives action and reduces avoidance (Attems *et al.*, 2020; Shi *et al.*, 2019; Truelove *et al.*, 2015; van Valkengoed *et al.*, 2024).

- H10: Perceived Adaptation Efficacy positively influences Adaptation Intention.
- H11: Perceived Adaptation Efficacy positively influences Attitude towards Adaptation.
- H12: Perceived Adaptation Efficacy negatively influences Avoidant Maladaptation.

Perceived adaptation cost includes financial, cognitive, and social factors. Some see these as investments, while others view them as barriers that can lead to disengagement (Ehsan *et al.*, 2022; Riccioli *et al.*, 2023; Yazdanpanah *et al.*, 2024).

- H13: Perceived Adaptation Cost positively influences Adaptation Intention.
- H14: Perceived Adaptation Cost positively influences Attitude towards Adaptation.
- H15: Perceived Adaptation Cost positively influences Avoidant Maladaptation.

These hypotheses show that climate adaptation behaviour is complex. They help study how psychosocial, cognitive, and contextual factors support adaptation or lead to avoidant maladaptation.

2. Materials and methods

This study examines smallholder rice farmers in Pemalang and Kendal, two coastal districts in Central Java, exposed to climate-related vulnerabilities. Both regions face recurrent tidal flooding, saltwater intrusion, coastal erosion, and seasonal droughts. These hazards pose a threat to food security and livelihoods. In Pemalang, over 7,000 hectares are regularly inundated. Kendal has lost more than 190 hectares of shoreline in the past decade. Salinity intrusion now affects nearly 10% of Kendal's farmland (Oelviani, Adiyoga, *et al.*, 2024; Oelviani, Susilowati, *et al.*, 2024).

Farmers rely on a traditional rice-rice-fallow system. The adoption of improved or salt-tolerant varieties remains limited due to restricted access and poor suitability under stressed conditions. Many households depend on informal networks for adaptation knowledge. These constraints compound ecological pressures, intensifying both economic and psychological stress.

Pemalang and Kendal are hotspots of ecological stress and behavioural constraints in Southeast Asia's coastal farming systems. Their dual vulnerability makes them suitable for testing a behavioural framework that integrates adaptive and maladaptive responses. This has broader implications for climate-vulnerable communities in the Global South.

Conceptual Model Overview

This study examined eight latent variables reflecting both adaptive and maladaptive responses to climate change (Ajzen, 1991; Grothmann & Patt, 2005; Luu *et al.*, 2019). Subjective norms, attitudes, and adaptation intentions were derived from the TPB. Protection Motivation Theory (PMT) and the MPPACC informed perceptions of severity, vulnerability, efficacy, and adaptation costs (D. Chen *et al.*, 2024; Rogers, 1983). Avoidant maladaptation was assessed through indicators of psychological disengagement, fatalism, and passive coping, highlighting strategies especially pertinent in climate-vulnerable contexts (Gifford, 2011; Vieira *et al.*, 2023).

A total of 36 validated items from established scales were adapted to the study context, with each indicator mapped to its respective theoretical construct. Measures of severity, vulnerability, efficacy, and cost were sourced from established PMT and MPPACC scales (Grothmann & Patt, 2005; van Valkengoed *et al.*, 2024). Subjective norms and adaptation intentions were adapted from Ajzen (1991) and recent climate adaptation studies (Faisal *et al.*, 2020). All items employed a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), thereby facilitating systematic assessment of cognitive, affective, and social factors. It is important to clarify that these

Likert-scale items are designed to measure self-reported perceptions and behavioural orientations (i.e., intentions), rather than actual observed adaptive or maladaptive behaviours in the field. Instrument development adhered to established validation procedures to ensure both content relevance and cultural appropriateness. Minor refinements were introduced following a pilot assessment, thereby enhancing clarity and strengthening the robustness of subsequent data collection. The operationalisation of these constructs and their references is summarised in Table 1.

Table 1 - Constructs, Indicators, and Supporting References for the Theoretical Framework

Constructs	Indicators	References
Perceived severity (PSV)	• PSV1 • PSV2 • PSV3 • PSV4 • PSV5	Yiridomoh <i>et al.</i> (2022), Manh <i>et al.</i> (2023), Begum <i>et al.</i> (2022), Hale <i>et al.</i> (2024)
Perceived vulnerability (PVL)	• PVL1 • PVL2 • PVL3 • PVL4	Dang <i>et al.</i> (2017), Demski <i>et al.</i> (2017), Lane <i>et al.</i> (2018), Nelson <i>et al.</i> (2023), Mugisho & Nfuamba (2023)
Perceived adaptation efficacy (PAE)	• PAE1 • PAE2 • PAE3 • PAE4	Attems <i>et al.</i> (2020), Bourret Soto & Guillon (2024), Truelove <i>et al.</i> (2015), Van Valkengoed <i>et al.</i> (2024), Niles <i>et al.</i> (2016)
Perceived adaptation cost (PAC)	• PAC1 • PAC2 • PAC3 • PAC4 • PAC5	Ehsan <i>et al.</i> (2022), Yazdanpanah <i>et al.</i> (2024), Nabara <i>et al.</i> (2020), Riccioli <i>et al.</i> (2023)
Avoidant maladaptation (AVM)	• AVM1 • AVM2 • AVM3 • AVM4	Chi <i>et al.</i> (2021), Magnan (2022) Rahman & Hickey (2019), Ghanian <i>et al.</i> (2020) Naufal <i>et al.</i> (2023)
Attitude (ATT)	• ATT1 • ATT2 • ATT3 • ATT4 • ATT5	Ajzen (1991), Tanyanyiwa & Muhwati (2021), Singh <i>et al.</i> (2020), Arya & Kumar (2023), Chang <i>et al.</i> (2022)

Constructs	Indicators	References
Subjective norm (SBN)	• SBN1 • SBN2 • SBN3 • SBN4 • SBN5	Ajzen (1991), Schwaller <i>et al.</i> (2020), Zobeidi <i>et al.</i> (2022), Hounnou <i>et al.</i> (2024)
Adaptation intention (ADI)	• ADI1 • ADI2 • ADI3 • ADI4	Ajzen (1991), Mitter <i>et al.</i> (2019), Manh <i>et al.</i> (2023), Niles <i>et al.</i> (2016)

Sample, Data Collection, and Analysis

A survey was conducted involving 150 smallholder rice farmers in Kendal and Pemalang, two coastal districts in Central Java, exposed to salinity intrusion, tidal flooding, and drought. Respondents were purposively selected to represent those most affected: active rice farmers cultivating land within a five-kilometre radius of the coastline, each with a minimum of ten years’ farming experience. Eligible villages were identified in collaboration with local agricultural offices and farmer groups, ensuring variation in landholding and resource access despite the non-random sampling design.

The sample was predominantly male (91%) and comprised individuals over 50 years of age (72%), with low educational attainment (43% had not completed primary school) and modest incomes (65% earned less than IDR 5 million per month). More than half had over 25 years of farming experience, consistent with regional patterns of smallholder agriculture in South and Southeast Asia (Aryal *et al.*, 2020; Irungu *et al.*, 2024).

Although modest in size, the sample exceeded PLS-SEM requirements. With twelve predictors for the most complex construct, the minimum threshold was 120, and 150 respondents provided sufficient statistical power (Hair *et al.*, 2021). Data were collected using structured questionnaires, with assistance provided to those with limited literacy. Responses were screened for completeness and normality before analysis. PLS-SEM was conducted in SmartPLS 4.0, with the reliability and validity of the measurement model assessed before subsequently testing structural linkages. Discriminant validity was confirmed using the Fornell-Larcker criterion and HTMT ratios (< 0.90).

To complement the survey, informal discussions with farmers provided contextual insights into adaptation costs and the influence of social norms. While the sample is skewed towards older male farmers with limited

education, this reflects the demographic profile of coastal rice-farming households in Central Java. This limitation is acknowledged, underscoring the need for broader demographic inclusion in future research. The socio-demographic characteristics of respondents are detailed in Table 2.

Table 2 - Respondent's Profile n = 150

Profile	Criteria	Frequency	Percentage
Gender	Man (Male)	137	91.33
	Women (Female)	13	8.67
Age	< 30	1	0.67
	31-40	7	4.67
	41-50	23	15.33
	51-60	62	41.33
	61-70	46	30.67
	> 70	11	7.33
Last education level	No Formal Education	31	20.67
	Incomplete Primary Education	34	22.67
	SD	30	20
	SMP	20	13.33
	SMA	28	18.67
	D4/S1	7	4.67
Family size	< 2	31	20.67
	2-5	106	70.67
	> 5	13	8.67
Monthly income	IDR 1,000,000-2,500,000	39	26
	IDR 3,000,000-500,000,000	59	39.33
	IDR 6,000,000-10,000,000	38	25.33
	IDR > 10,000,000	11	7.33
Farming experience	< 5	3	2
	5-10	7	4.67
	11-15	10	6.67
	16-20	19	10.67
	21-25	34	22.67
	> 25	77	51.33

Agricultural Policy and Local Governance Context

Indonesian agricultural policy strikes a balance between national food security and climate resilience. The Ministry of Agriculture maintains rice self-sufficiency with subsidies, irrigation, and productivity programmes. The National Action Plan for Climate Change Adaptation, climate-smart practices, and Climate Village Programme (ProKlim) guides sectors such as agriculture, focusing on salt-tolerant rice and improved water management (Ministry of Agriculture, 2024; Ministry of National Development Planning, 2014; Ministry of Public Works and Housing (PUPR) *et al.*, 2020). Provincial and district agencies implement these frameworks at the local level.

At the local level, agricultural extension services act as technical advisors by introducing new technologies and providing guidance. Farmer groups (Kelompok Tani-Poktan) function as facilitators of collective action, enabling resource sharing and fostering social learning among members. Both institutions disseminate policy and support adaptation practices. However, limited staffing and operational constraints, especially in coastal districts, often reduce their reach and effectiveness.

Within this policy landscape, farmers' decision-making is shaped by both formal government programmes, led by state agencies, and informal community mechanisms, steered by local leaders and networks. National frameworks, designed by policymakers, offer strategic direction. However, inconsistent institutional support means that adaptation often depends on local norms, peer networks, and community leadership. This study situates behavioural responses within a socio-political context, where collective processes and social expectations, reinforced by both officials and community actors, play a significant role in shaping adaptation outcomes.

3. Results

Measurement and Structural Model Assessment

The measurement model assessment demonstrates robust internal consistency, as well as both convergent and discriminant validity. Specifically, Cronbach's alpha values range from 0.864 to 0.963, which is well above the recommended threshold of 0.70 by Hair *et al.* (2021), indicating excellent reliability. Additionally, Composite Reliability (CR) values are above 0.70 for all constructs, which further confirms internal consistency. However, it is acknowledged that the exceptionally high reliability values for Attitude and Subjective Norm may indicate a degree of item redundancy, suggesting a relatively narrow operationalisation of these specific constructs in the current study.

Average Variance Extracted (AVE) values for all constructs surpass the 0.50 benchmark. For example, Perceived Severity attains an AVE of 0.684. This indicates adequate convergent validity throughout the model. One item within the *Perceived Severity* construct – PSV4 – shows a relatively low outer loading of 0.311, but it is retained on theoretical grounds. This item reflects a dimension of long-term psychological perception of climate risks. It aligns with broader frameworks on climate threat appraisal in vulnerable communities (Hale *et al.*, 2024; Yiridomoh *et al.*, 2022). Empirically, the overall reliability remains strong (Cronbach's $\alpha = 0.864$; CR = 0.908), and the AVE exceeds the required threshold. According to Fornell and Larcker (1981), such indicators may be retained when they enhance construct depth and the overall measurement stays robust. Detailed indicator loadings, reliability, and AVE values are presented in Table 3.

Table 3 - Model Constructs Reliability and Convergent Validity Testing

Variables	Indicators	Outer loading	Cronbach's alpha	Composite reliability	AVE
Perceived severity	PSV1	0.914	0.864	0.908	0.684
	PSV2	0.924			
	PSV3	0.910			
	PSV4	0.311			
	PSV5	0.898			
Perceived vulnerability	PVL1	0.898	0.864	0.908	0.684
	PVL2	0.953			
	PVL3	0.928			
	PVL4	0.912			
Perceived adaptation efficacy	PAE1	0.771	0.861	0.904	0.702
	PAE2	0.870			
	PAE3	0.825			
	PAE4	0.882			
Adaptation cost	PAC1	0.895	0.911	0.934	0.739
	PAC2	0.884			
	PAC3	0.908			
	PAC4	0.875			
	PAC5	0.721			

Variables	Indicators	Outer loading	Cronbach's alpha	Composite reliability	AVE
Avoidant maladaptation	AVM1	0.821	0.904	0.933	0.777
	AVM2	0.913			
	AVM3	0.898			
	AVM4	0.891			
Attitude	ATT1	0.879	0.961	0.970	0.867
	ATT2	0.943			
	ATT3	0.959			
	ATT4	0.945			
	ATT5	0.927			
Subjective norm	SBN1	0.924	0.963	0.972	0.872
	SBN2	0.931			
	SBN3	0.956			
	SBN4	0.935			
	SBN5	0.924			
Adaptation intention	ADI1	0.908	0.905	0.934	0.780
	ADI2	0.923			
	ADI3	0.806			
	ADI4	0.892			

Discriminant validity was checked using two methods: the Fornell-Larcker criterion and the Heterotrait-Monotrait Ratio (HTMT). For each variable, the square root of the average variance extracted (AVE) is greater than the correlations between variables, meeting the Fornell-Larcker requirement. All HTMT values are less than 0.90, supporting discriminant validity (Henseler *et al.*, 2015). Results of discriminant validity are shown in Table 4 and Table 5, respectively.

Overall, the measurement model demonstrates satisfactory reliability and validity and is suitable for studying climate adaptation behaviour among smallholder farmers in vulnerable areas.

Table 4 - Discriminant Validity - Fornell-Larcker criterion

Variables	PAC	ADI	ATT	AVM	PAE	PVL	PSV	SBN
PAC	0.859							
ADI	0.164	0.883						
ATT	0.268	0.690	0.931					
AVM	0.139	-0.059	-0.104	0.881				
PAE	-0.233	0.249	0.061	0.186	0.838			
PSV	0.403	0.447	0.601	0.207	0.038	0.827		
PVL	0.319	0.407	0.446	0.263	-0.008	0.721	0.923	
SBN	0.124	0.639	0.576	-0.158	0.329	0.295	0.129	0.934

Table 5 - Discriminant Validity - Heterotrait-monotrait ratio (HTMT)

Variables	PAC	ADI	ATT	AVM	PAE	PVL	PSV	SBN
PAC								
ADI	0.167							
ATT	0.278	0.738						
AVM	0.163	0.078	0.113					
PAE	0.291	0.300	0.124	0.209				
PSV	0.458	0.507	0.640	0.233	0.102			
PVL	0.349	0.441	0.466	0.284	0.045	0.785		
SBN	0.127	0.683	0.597	0.170	0.370	0.332	0.134	

The structural model exhibited strong explanatory power, accounting for 60.3% of the variance in Adaptation Intention ($R^2 = 0.603$). With a Standardised Root Mean Square Residual (SRMR) of 0.068 (Table 4), the model achieved a satisfactory fit. This value is below the recommended threshold of 0.08 (Hair *et al.*, 2021), indicating an acceptable level of model fit in a PLS-SEM context. However, while the reported R^2 and SRMR values indicate acceptable explanatory power and approximate model fit within a PLS-SEM context, it is important to note that SRMR should not be interpreted as absolute evidence of overall model adequacy in a strict confirmatory sense. Model fit and explanatory power are further summarised in Table 6.

Additionally, the model identified significant predictors of adaptation intention: Subjective Norm ($\beta = 0.334$, $p < 0.001$), Attitude towards Adaptation ($\beta = 0.415$, $p < 0.001$), Perceived Vulnerability ($\beta = 0.240$, $p < 0.01$), and

Perceived Adaptation Efficacy ($\beta = 0.143$, $p < 0.05$), supporting H1, H2, H7, and H10. Furthermore, Perceived Severity significantly and positively influenced Attitude towards Adaptation ($\beta = 0.553$, $p < 0.001$), supporting H5.

In contrast to the above, the only significant predictor of maladaptation was Perceived Vulnerability ($\beta = 0.249$, $p < 0.01$), supporting H9.

Several relationships were non-significant: Perceived Severity on Adaptation Intention ($\beta = -0.071$, $p = 0.478$) and Avoidant Maladaptation ($\beta = -0.030$, $p = 0.789$), leading to the rejection of H4 and H6. Similarly, Avoidant Maladaptation did not significantly influence Adaptation Intention ($\beta = -0.035$, $p = 0.560$), which led to the rejection of H3. Additionally, Perceived Vulnerability did not significantly affect Attitude towards Adaptation ($\beta = 0.030$, $p = 0.786$), rejecting H8.

Perceived Adaptation Cost also showed no significant effects on Adaptation Intention ($\beta = 0.004$, $p = 0.956$), Attitude ($\beta = 0.059$, $p = 0.540$), or Maladaptation ($\beta = 0.118$, $p = 0.311$), leading to the rejection of H13-H15.

The results are summarised in Table 7, while Figure 2 visualises the validated structural paths and their corresponding t-statistics derived from the bootstrapping procedure.

Table 6 - Model Fit and Explained Variance

Indicator	Value	Interpretation
SRMR	0.068	Good fit (< 0.08 threshold)
R ² (Adaptation Intention)	0.603	Substantial; the model explains 60.3% of the variance in adaptation intention.

Note: SRMR = Standardized Root Mean Square Residual; R² = coefficient of determination.

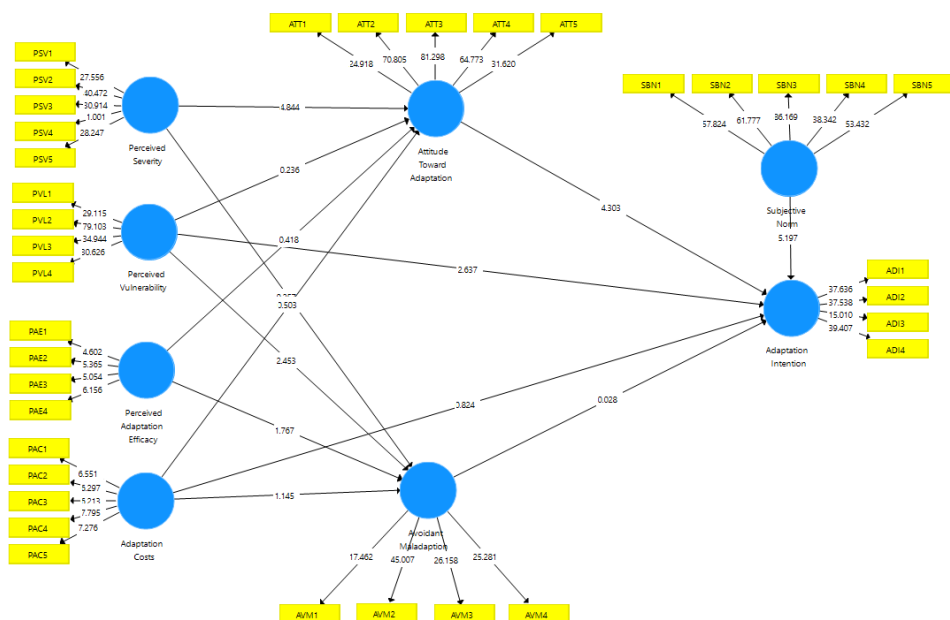
These results suggest that the structural model meets established criteria for both overall fit and explanatory strength, providing a solid foundation for subsequent hypothesis testing and policy implications (Hair *et al.*, 2021).

Table 7 - Summary of Hypothesis Testing

Hypothesis	Path	β -value	t-statistics	p-value	Decisions
H1	SBN $\rightarrow$ ADI	0.334	4.646	0.000	Accepted
H2	ATT $\rightarrow$ ADI	0.415	4.922	0.000	Accepted
H3	AVM $\rightarrow$ ADI	-0.035	0.583	0.560	Rejected
H4	PSV $\rightarrow$ ADI	-0.071	0.711	0.478	Rejected

Hypothesis	Path	β -value	t-statistics	p-value	Decisions
H5	PSV $\rightarrow$ ATT	0.553	4.995	0.000	Accepted
H6	PSV $\rightarrow$ AVM	-0.030	0.268	0.789	Rejected
H7	PVL $\rightarrow$ ADI	0.240	2.870	0.004	Accepted
H8	PVL $\rightarrow$ ATT	0.030	0.272	0.786	Rejected
H9	PVL $\rightarrow$ AVM	0.249	2.645	0.008	Accepted
H10	PAE $\rightarrow$ ADI	0.143	2.316	0.021	Accepted
H11	PAE $\rightarrow$ ATT	0.095	1.150	0.251	Rejected
H12	PAE $\rightarrow$ AVM	0.193	1.697	0.090	Rejected
H13	PAC $\rightarrow$ ADI	0.004	0.055	0.956	Rejected
H14	PAC $\rightarrow$ ATT	0.059	0.613	0.540	Rejected
H15	PAC $\rightarrow$ AVM	0.118	1.014	0.311	Rejected

Figure 2 - Structural Model Assessment (t-statistics)



4. Discussion

Adaptation as a Socially Embedded Process

For coastal farmers in Central Java, adaptation is a social process, not just a reaction to environmental threats. This study suggests that adaptation decisions are more strongly shaped by what the community accepts, expects, and values than by risk or cost. Attitudes and subjective norms are the strongest predictors of adaptation intention, aligning with the Theory of Planned Behaviour. Farmers rarely make decisions alone; they often negotiate with peers, local leaders, and support networks.

Social appraisal – the community’s interpretation of risk – shapes collective farming responses (Selje *et al.*, 2024; Truelove *et al.*, 2015; Vargas *et al.*, 2023). Practices such as *gotong royong* (communal labour) and farmer cooperatives demonstrate how adaptation decisions are influenced by local norms. Both a strategy’s practical effectiveness and its alignment with a sense of “what people like us do” are equally influential (de la Poterie *et al.*, 2018; Wang *et al.*, 2023).

Economic factors, particularly input costs, had a minimal influence on adaptation decisions. In subsistence systems, seeds, water, and labour are seen as necessities, not discretionary expenses. Their essential role in survival may explain why adaptation is seen less as an economic burden and more as a social obligation, particularly with community support. This contrasts with models that focus on cost as the main barrier.

Perceived vulnerability showed a stronger and more consistent link to adaptive behaviour. Farmers directly affected by salinisation were more likely to act if they also felt able to respond (Dang *et al.*, 2017; Nelson *et al.*, 2023). Yet, awareness alone was not enough. Without a sense of efficacy or support, high vulnerability often led to psychological disengagement or resignation. This supports the dual-process model proposed by Grothmann and Patt (2005) and aligns with recent evidence from Southeast Asia and Sub-Saharan Africa (Fisichelli *et al.*, 2016; Lane *et al.*, 2018; Werg *et al.*, 2020). Exposure to chronic stressors, such as flooding or salinity, has become routine, making threats seem less urgent unless practical solutions are in place.

Overall, these findings suggest that adaptation intention is primarily influenced by social factors, including belonging, obligation, and conformity to norms. Social meaning and trust drive collective, value-driven responses, often outweighing economic or risk-based motives.

Avoidant Maladaptation as a Parallel Psychological Pathway

Avoidant maladaptation constitutes a distinct behavioural response to climate stress, rather than simply the absence of adaptation. Farmers frequently undertake practical adaptive actions – such as cultivating salt-tolerant crops – whilst simultaneously disengaging from broader adaptation planning. These findings corroborate the argument that adaptation and avoidance can operate in parallel (Grothmann *et al.*, 2017; Grothmann & Patt, 2005).

Perceived vulnerability plays a dual role: it encourages adaptation when joined with efficacy, but leads to avoidance without confidence or support (Etana *et al.*, 2020; Nelson *et al.*, 2023). In this context, avoidance becomes a rational self-protection against chronic stress and institutional limits (Fisichelli *et al.*, 2016; Magnan, 2022).

Contrary to expectations, perceived severity did not predict maladaptive behaviour. Emotional and structural constraints, rather than abstract threat awareness, were more decisive (Hale *et al.*, 2024; Yiridomoh *et al.*, 2022). This finding provides nuance to models that emphasise risk perception and suggests that action gaps stem from reduced coping resources, rather than a lack of knowledge (Gifford, 2011).

Overall, these findings indicate that addressing maladaptation necessitates more than just information. It demands restoring confidence, boosting efficacy, and enlarging institutional space for agency (Attems *et al.*, 2020; Lenhard *et al.*, 2024).

While the proposed dual-pathway framework offers a conceptual distinction between adaptation and maladaptation, it is important to candidly acknowledge that the maladaptation pathway received limited empirical support in our structural model. Given that maladaptation represents a central component of the framework, this limited support warrants cautious interpretation. In contrast to adaptation intention, which was robustly influenced by multiple cognitive and social factors, avoidant maladaptation was primarily predicted by perceived vulnerability alone. Other hypothesised predictors, including perceived severity and adaptation costs, did not show significant effects.

This partial mismatch between the theoretical framework and empirical findings suggests that maladaptive responses in this coastal context may be less complexly determined than proactive adaptive actions. It also indicates that the current specification of the maladaptation pathway may be incomplete, particularly in capturing emotional, institutional, or contextual determinants beyond perceived vulnerability. Avoidance appears to be triggered when farmers experience heightened vulnerability, regardless of the severity of abstract threats or financial costs.

Future research should incorporate constructs such as emotional coping (e.g., fear, anxiety), institutional trust, and perceived controllability to better capture the range of determinants shaping maladaptive behaviour in climate-vulnerable contexts.

Theoretical Contributions and Dialogue with Existing Literature

This study introduces a dual-pathway model, conceptualising adaptation and avoidant maladaptation as parallel responses to climate risk, shaped by intersecting cognitive, emotional, and social factors. In contrast to conventional models that treat these outcomes as discrete, this framework synthesises four principal theories: the Theory of Planned Behaviour (Ajzen, 1991), Protection Motivation Theory (Rogers, 1983), the Risk-Coping-Social Appraisal model (Truelove *et al.*, 2015), and the Model of Private Proactive Adaptation to Climate Change (D. Chen *et al.*, 2024).

Three main contributions stand out. First, perceived severity has a minimal influence on action, challenging the Protection Motivation Theory's assumption that threat intensity is decisive. Second, perceived vulnerability operates as a dual trigger, prompting either adaptation or avoidance based on efficacy and support (Etana *et al.*, 2020; Grothmann & Patt, 2005). Third, adaptation costs do not affect intention – supporting findings that, in subsistence systems, such costs are absorbed into survival strategies, not regarded as barriers (Riccioli *et al.*, 2023).

This study provides insights from a collectivist, agrarian context, which is often overlooked in Global North literature. Here, perceived efficacy takes on a diminished role. This is not due to cognitive limitations, but rather stems from structural constraints, including limited institutional trust and restricted access to extension services (Truelove *et al.*, 2015).

Maladaptation is not viewed as a failure, but rather as a rational response to chronic constraint. Evidence from Sub-Saharan Africa and Pacific Island states supports this view (Hale *et al.*, 2024; Magnan, 2022). This aligns with the IPCC AR6 suggestion to move from technical solutions to socio-psychological models, which recognise emotion, fatigue, and social norms as key to adaptive capacity.

In summary, this model shows that adaptation and maladaptation should not be seen as opposites. They are interconnected behaviours, shaped by agency, context, and subjective meaning. However, these findings should be interpreted with an understanding of the data's nature. While the construct reliability and validity of the measurement model are statistically satisfactory, the findings rely entirely on self-reported Likert measures. These measures capture farmers' perceptions and behavioural orientations (i.e., intentions)

rather than their directly observed adaptation or maladaptation behaviours in the field. Future research could benefit from integrating observational data to validate these self-reported intentions.

5. Practical and Policy Implications

This study identifies five principal strategies to enhance climate resilience among smallholder farmers. First, address economic constraints through inclusive financial mechanisms such as subsidies and low-interest loans (Ehsan *et al.*, 2022; Williams *et al.*, 2020). Second, integrate psychological and social mechanisms shaping behaviour into adaptation programming, recognising the importance of efficacy, norms, and emotional fatigue (Grothmann & Patt, 2005; Vieira *et al.*, 2023). Third, strengthen social capital through peer-based learning networks, as these foster trust and knowledge exchange (Arya & Kumar, 2023; Zobeidi *et al.*, 2022). Fourth, embed confidence-building elements within adaptation support structures (van Valkengoed *et al.*, 2024). Fifth, tailor institutional support to local contexts by prioritising subjective norms, attitudes, vulnerability, and efficacy (Dang *et al.*, 2017; Mitter *et al.*, 2019).

At farm and community levels, interventions should: (1) Foster collective decision-making and peer knowledge exchange (Selje *et al.*, 2024; Zobeidi *et al.*, 2022) ; (2) Use farmer-to-farmer networks, supported by cooperatives and extension services, to spread climate-smart practices (Arya & Kumar, 2023; Riccioli *et al.*, 2023); (3) Prioritise visual aids, practical demonstrations, and accessible language in training (Begum *et al.*, 2022); and (4) Ensure women and young people are included for sustained, inclusive resilience (Nelson *et al.*, 2023; Yiridomoh *et al.*, 2022).

Policy-makers should: (1) Leverage social cohesion to ease economic barriers (Hounnou *et al.*, 2024; Schwaller *et al.*, 2020); (2) Pair financial supports – subsidised inputs, insurance, and loans – with psychosocial assistance (Hale *et al.*, 2024; Rahman & Hickey, 2019); (3) Align land-use, water, and ecosystem policies for coherence (Oelviani *et al.*, 2023); (4) Apply Integrated Coastal Zone Management and Ecosystem-Based Adaptation to bridge community participation with resilience goals (DasGupta *et al.*, 2018; Selje *et al.*, 2024).

Development programmes and NGOs should: (1) Strengthen community-based organisations as intermediaries between local practices and policy; and (2) Prioritise support for coastal agricultural systems facing salinity stress and limited institutional trust and adaptive capacity (J. Chen *et al.*, 2022; Mudekhere *et al.*, 2023; Oelviani *et al.*, 2023).

Maladaptation is a parallel psychological pathway – not just the absence of adaptation. Farmers may adopt new technologies while still showing avoidant

behaviour. Key recommendations: (1) Anticipate emotional fatigue and risk resignation (Vieira *et al.*, 2023); (2) Use behavioural interventions like participatory dialogues, reframing, and collective incentives for proactive adaptation (Grothmann & Patt, 2005); (3) Anchor these tools locally to genuinely lower vulnerability (Fisichelli *et al.*, 2016; Rahman & Hickey, 2019). Insights have broader relevance: adaptation across the Global South must prioritise social norms, efficacy, and perceived vulnerability, not just cost or technology-based approaches (Arya & Kumar, 2023; van Valkengoed *et al.*, 2024).

These findings support Indonesia's policies to enhance agricultural resilience. Integrating behavioural insights into the National Action Plan for Climate Change Adaptation, climate-smart practices, and the Climate Village Programme can enhance adaptation effectiveness (Ministry of National Development Planning, 2014). Local extension systems and farmer groups, coordinated by Balai Penyuluh Pertanian, are strategic points for applying these insights. Empowering farmers' efficacy and promoting positive social norms through peer learning will accelerate the adoption of adaptive practices and reduce maladaptive coping strategies. Recognising local governance limitations – particularly in coastal, high-salinity areas – is essential for tailored, effective interventions. Aligning behavioural, institutional, and economic incentives will support both household adaptation and long-term resilience in Indonesia's agricultural and food systems.

Conclusion

This study examined the factors shaping climate adaptation and maladaptation among smallholder rice farmers in coastal Central Java, Indonesia. The results indicate that adaptation intentions are primarily influenced by socio-psychological factors, including subjective norms, positive attitudes, perceived vulnerability, and adaptive efficacy. Economic factors, such as adaptation costs and general risk awareness, play a minor role. In this collectivist, agrarian context, community values and expectations have a greater impact on adaptive behaviour than individual financial or risk calculations.

A key contribution of this research is a dual-pathway behavioural model that the study developed and tested. By combining four theoretical frameworks, the study conceptualises maladaptation as a distinct psychological process shaped by disengagement, fatalism, and structural constraints, rather than merely as a lack of adaptation. This framework helps explain how cognitive, emotional, and social factors interact under climate stress, illustrating why farmers facing similar threats often exhibit different behaviours.

However, given that maladaptation is a central component of the proposed dual-pathway framework, the limited empirical support observed here warrants cautious interpretation and underscores the need to refine this pathway in future research.

These findings have relevant implications for Indonesia's agricultural policy. The study suggests that investing in social capital may be a more cost-effective and sustainable approach to enhancing the resilience of the agri-food system than relying solely on financial incentives. Policymakers could utilise these insights by incorporating behavioural factors into national programs, such as the National Action Plan for Climate Change Adaptation (RAN-API), climate-smart practices, and the Climate Village Programme (ProKlim). In particular, improving local extension systems (Balai Penyuluh Pertanian) and farmer networks can enhance efficacy and reinforce positive social norms. This approach could help increase the adoption of adaptive practices and support the long-term sustainability of rural livelihoods.

While this study offers important insights, its conclusions are specific to the context it examines. Future research should test and refine the dual-pathway model across other agro-ecological regions. Researchers can also consider adding variables such as institutional trust and market dynamics. Explicit comparisons between behavioural interventions and traditional economic incentives can further enhance our understanding of how behavioural factors contribute to building climate resilience in agri-food systems.

References

- Ajzen, I. (1985). *The Theory of Planned Behavior*.
- Ajzen, I. (1991). *The Theory of Planned Behavior*.
- Arya, B. & Kumar, H. (2023). An Investigation of Climate Change, Eco-Anxiety and Risk Perception in The Context of Theory of Planned Behaviour. *IOP Conference Series: Earth and Environmental Science*, 1279(1). Doi: 10.1088/1755-1315/1279/1/012020.
- Aryal, J. P., Sapkota, T. B., Rahut, D. B., Krupnik, T. J., Shahrin, S., Jat, M. L. & Stirling, C. M. (2020). Major Climate risks and Adaptation Strategies of Smallholder Farmers in Coastal Bangladesh. *Environmental Management*, 66(1), 105-120. Doi: 10.1007/s00267-020-01291-8.
- Attems, M. S., Schlögl, M., Thaler, T., Rauter, M. & Fuchs, S. (2020). Risk communication and adaptive behaviour in flood-prone areas of Austria: A Qmethodology study on opinions of affected homeowners. *PLoS ONE*, 15(5). Doi: 10.1371/journal.pone.0233551.
- Begum, M., Masud, M. M., Alam, L., Mokhtar, M. Bin & Amir, A. A. (2022). The Adaptation Behaviour of Marine Fishermen towards Climate Change and Food Security: An Application of the Theory of Planned Behaviour and Health Belief Model. *Sustainability (Switzerland)*, 14(21). Doi: 10.3390/su142114001.

- Chang, M. Y., Kuo, H. Y. & Chen, H. S. (2022). Perception of Climate Change and Pro-Environmental Behavioral Intentions of Forest Recreation Area Users – A Case of Taiwan. *Forests*, 13(9). Doi: 10.3390/f13091476.
- Chen, D., Kong, L., Zhang, J., Fan, C., Zhang, Y. & Li, B. (2024). A study on risk perception and adaptive behavior of the Chinese public toward urban heat based on the MPPACC model. *Urban Climate*, 58. Doi: 10.1016/j.uclim.2024.102224.
- Chen, J., Mueller, V., Durand, F., Lisco, E., Zhong, Q., Sherin, V. R. & Saiful Islam, A. K. M. (2022). Salinization of the Bangladesh Delta worsens economic precarity. *Population and Environment*, 44(3-4), 226-247. Doi: 10.1007/s11111-022-00411-2.
- Dam, T. H. T., Amjath-Babu, T. S., Bellingrath-Kimura, S. & Zander, P. (2019). The impact of salinity on paddy production and possible varietal portfolio transition: a Vietnamese case study. *Paddy and Water Environment*, 17(4), 771-782. Doi: 10.1007/s10333-019-00756-9.
- Dang, H. L., L., Nuberg, I. & Bruwer, J. (2017). Vulnerability to climate change and the variations in factors affecting farmers' adaptation. *Climate and Development*, 10(6), 509-519.
- DasGupta, R., Shaw, R. & Basu, M. (2018). Implication and management of coastal salinity for sustainable community livelihood: Case study from the Indian Sundarban Delta. In *Coastal Management: Global Challenges and Innovations* (pp. 251-269). Elsevier. Doi: 10.1016/B978-0-12-810473-6.00013-3.
- de la Poterie, A. T., Burchfield, E. K. & Carrico, A. R. (2018). The implications of group norms for adaptation in collectively managed agricultural systems: Evidence from Sri Lankan paddy farmers. *Ecology and Society*, 23(3). Doi: 10.5751/ES-10175-230321.
- Ehsan, S., Begum, R. A., Abdul Maulud, K. N. & Mia, M. S. (2022). Assessing household perception, autonomous adaptation and economic value of adaptation benefits: Evidence from West Coast of Peninsular Malaysia. *Advances in Climate Change Research*, 13(5), 738-758. Doi: 10.1016/j.accre.2022.06.002.
- Etana, D., Snelder, D. J. R. M., van Wesenbeeck, C. F. A. & de Cock Buning, T. (2020). Dynamics of smallholder farmers' livelihood adaptation decision-making in Central Ethiopia. *Sustainability (Switzerland)*, 12(11). Doi: 10.3390/su12114526.
- Etse, D. & Adu-Aboagye, A. (2025). Effect of green organisational climate on green purchasing: The roles of employee green behavioural intentions and corporate environmental communication. *Sustainable Futures*, 9, 100419. Doi: 10.1016/j.sfsr.2024.100419.
- Faisal, M., Chunping, X., Akhtar, S., Haseeb Raza, M., Tariq, M., Khan, I., Muhammad, & Ajmal, A. & Ajmal, M. A. (2020). Modeling smallholder livestock herders' intentions to adopt climate smart practices: An extended theory of planned behavior. *Environmental Science and Pollution Research*, 27, 39105-39122. Doi: 10.1007/s11356-020-09652-w/Published.
- Fischelli, N. A., Schuurman, G. W. & Hoffman, C. H. (2016). Is 'Resilience' Maladaptive? Towards an Accurate Lexicon for Climate Change Adaptation. *Environmental Management*, 57(4), 753-758. Doi: 10.1007/s00267-015-0650-6.
- Fornell, C. & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, 18(1).

- Gifford, R. (2011). The Dragons of Inaction: Psychological Barriers That Limit Climate Change Mitigation and Adaptation. *American Psychologist*, 66(4), 290-302. Doi: 10.1037/a0023566.
- Gopalakrishnan, T., Hasan, M. K., Haque, A. T. M. S., Jayasinghe, S. L. & Kumar, L. (2019). Sustainability of coastal agriculture under climate change. *Sustainability (Switzerland)*, 11(24), 1-24. Doi: 10.3390/su11247200.
- Grothmann, T. & Patt, A. (2005). Adaptive capacity and human cognition: The process of individual adaptation to climate change. *Global Environmental Change*, 15(3), 199-213. Doi: 10.1016/j.gloenvcha.2005.01.002.
- Grothmann, T., Petzold, M., Ndaki, P., Kakembo, V., Siebenhüner, B., Kleyer, M., Yanda, P. & Ndou, N. (2017). Vulnerability assessment in African villages under conditions of land use and climate change: Case studies from Mkomazi and Keiskamma. *Sustainability (Switzerland)*, 9(6). Doi: 10.3390/su9060976.
- Hair, J. F., Hult, G. T. M., Ringle, C. & Sarstedt, M. (2021). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (3rd ed.). SagePublishing.
- Hale, R. B., Bryant-Moore, K. & Eichenberger, A. (2024). Climate Change and Health Risk Perceptions of Arkansas Small Farmers through the Application of the Health Belief Model. *International Journal of Environmental Research and Public Health*, 21(7). Doi: 10.3390/ijerph21070955.
- Hasan, M. K. & Kumar, L. (2020). Perceived farm-level climatic impacts on coastal agricultural productivity in Bangladesh. *Climatic Change*, 161(4), 617-636. Doi: 10.1007/s10584-020-02708-3.
- Henseler, J., Ringle, C. M. & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115-135. Doi: 10.1007/s11747-014-0403-8.
- Hopmans, J. W., Qureshi, A. S., Kisekka, I., Munns, R., Grattan, S. R., Rengasamy, P., Ben-Gal, A., Assouline, S., Javaux, M., Minhas, P. S., Raats, P. A. C., Skaggs, T. H., Wang, G., De Jong van Lier, Q., Jiao, H., Lavado, R. S., Lazarovitch, N., Li, B. & Taleisnik, E. (2021). Critical knowledge gaps and research priorities in global soil salinity. *Advances in Agronomy*, 169, 1-191. Doi: 10.1016/bs.agron.2021.03.001.
- Hounnou, F. E., Houessou, A. M., Kasim, O. F. & Yabi, J. A. (2024). Cotton farmers' intention to adopt biochar as climate change adaptation and sustainable land management strategy in Benin. *Journal of Cleaner Production*, 438. Doi: 10.1016/j.jclepro.2024.140685.
- Irungu, I. F., Yegon, R. & Muniale, F. M. (2024). Determinants for rainwater harvesting adoption: a case study of smallholder farmers in Murang'a County, Kenya. *Sustainable Water Resources Management*, 10(3). Doi: 10.1007/s40899-024-01104-4.
- Lane, D., Chatrchyan, A., Tobin, D., Thorn, K., Allred, S. & Radhakrishna, R. (2018). Climate change and agriculture in New York and Pennsylvania: Risk perceptions, vulnerability and adaptation among farmers. *Renewable Agriculture and Food Systems*, 33(3), 197-205. Doi: 10.1017/S1742170517000710.
- Lenhard, F., Fernández de la Cruz, L., Wahlund, T., Andersson, E., Åhlén, J., Fuso Nerini, F., Akay, H. & Mataix-Cols, D. (2024). Climate worry: associations with functional impairment, pro-environmental behaviors and perceived need for support. *BMC Psychology*, 12(1). Doi: 10.1186/s40359-024-02244-0.

- Li, W., Yuan, K., Yue, M., Zhang, L. & Huang, F. (2021). Climate change risk perceptions, facilitating conditions and health risk management intentions: Evidence from farmers in rural China. *Climate Risk Management*, 32. Doi: 10.1016/j.crm.2021.100283.
- Luu, T. A., Nguyen, A. T., Trinh, Q. A., Pham, V. T., Le, B. B., Nguyen, D. T., Hoang, Q. N., Pham, H. T. T., Nguyen, T. K., Luu, V. N. & Hens, L. (2019). Farmers' intention to climate change adaptation in agriculture in the Red River Delta Biosphere Reserve (Vietnam): A combination of Structural Equation Modeling (SEM) and Protection Motivation Theory (PMT). *Sustainability (Switzerland)*, 11(10). Doi: 10.3390/su11102993.
- Magnan, A. (2022). *Avoiding maladaptation to climate change: towards guiding principles Description*. -- <https://journals.openedition.org/sapiens/1680>.
- Ministry of Agriculture. (2024). *SIMURP Tahun 2024*.
- Ministry of Environment and Forestry. (2017). *Panduan pelaksanaan Program kampung iklim (ProKlim)*. Kementerian Lingkungan Hidup dan Kehutanan, Direktorat Jenderal Pengendalian Perubahan Iklim. -- https://procurement-notice.undp.org/view_file.cfm?doc_id=318921.
- Ministry of National Development Planning. (2014). *Republic of Indonesia National Action Plan for Climate Change Adaptation (RAN-API) Ministry of National Development Planning/ National Development Planning Agency (BAPPENAS) 2014*. -- <https://ran-api.bappenas.go.id>.
- Ministry of Public Works and Housing (PUPR), Ministry of Agriculture & Ministry of Environment and Forestry. (2020). *Climate-smart agricultural practices in Indonesia: Integrating adaptation and mitigation in coastal and irrigation systems*.
- Mitter, H., Larcher, M., Schönhart, M., Stöttinger, M. & Schmid, E. (2019). Exploring Farmers' Climate Change Perceptions and Adaptation Intentions: Empirical Evidence from Austria. *Environmental Management*, 63(6), 804-821. Doi: 10.1007/s00267-019-01158-7.
- Mudekhere, S. M., Mugalavai, E. M. & Nabiswa, F. M. (2023). Indigenous knowledge factors influencing farmers' uptake of climate change adaptation strategies in Kajiado County, Kenya. *Journal of Water and Climate Change*, 14(7), 2244-2259. Doi: 10.2166/wcc.2023.025.
- Nelson, L. K., Cullen, A. C., Koehn, L. E., Harper, S., Runebaum, J., Bogeberg, M., Strawn, A. & Levin, P. S. (2023). Understanding perceptions of climate vulnerability to inform more effective adaptation in coastal communities. *PLOS Climate*, 2(2), e0000103. Doi: 10.1371/journal.pclm.0000103.
- Oelviani, R., Adiyoga, W., Mahatma Yuda Bakti, I. G., Suhendrata, T., Malik, A., Chanifah, Samijan, Sahara, D., Arif Sutanto, H., Wulanjari, M. E., Utomo, B., Susila, A., Kurnia Jatuningtyas, R. & Sihombing, Y. (2023). Climate Change Driving Salinity an Overview of Vulnerabilities, Adaptations, and Challenges for Indonesian Agriculture. *Weather, Climate, and Society*. Doi: 10.1175/wcas-d-23-0025.1.
- Oelviani, R., Adiyoga, W., Suhendrata, T., Bakti, I. G. M. Y., Sutanto, H. A., Fahmi, D. A., Chanifah, C., Jatuningtyas, R. K., Samijan, S., Malik, A., Sahara, D., Utomo, B., Wulanjari, M. E., Winarni, E., Yardha, Y. & Aristya, V. E. (2024). Effects of soil salinity on rice production and technical efficiency: Evidence from

- the northern coastal region of Central Java, Indonesia. *Case Studies in Chemical and Environmental Engineering*, 10. Doi: 10.1016/j.cscee.2024.101010.
- Oelviani, R., Susilowati, I., Iskandar, D. D., Yuda, I. G. M., Santosa, P. B. & Waridin. (2024). A socio-economic characteristic of coastal agriculture in Kendal Regency: vulnerability, challenge, and opportunity. *Pangan*, 33, 17-30.
- Rahman, H. M. T. & Hickey, G. M. (2019). What does autonomous adaptation to climate change have to teach public policy and planning about avoiding the risks of maladaptation in Bangladesh?. *Frontiers in Environmental Science*, 7, JAN. Frontiers Media S.A. Doi: 10.3389/fenvs.2019.00002.
- Riccioli, F., Espinosa Diaz, S., Di Iacovo, F. & Moruzzo, R. (2023). Exploring the Effect of Perceived Transaction Costs on Farmers' Attitudes toward Participation in Agri-Environment-Climate Measures (AECMs). *Social Sciences*, 12(3). Doi: 10.3390/socsci12030136.
- Rogers, R. W. (1983). Cognitive and physiological processes in fear-based attitude change: A revised theory of protection motivation. In J. Cacioppo & R. Petty (Ed.), *Social psychophysiology* (pp. 153-176).
- Santeramo, F. G., Miljkovic, D. & Lamonaca, E. (2021). Agri-food trade and climate change. *Economia Agro-Alimentare*, 23(1), 1-18. Doi: 10.3280/ECAG1-2021OA11676.
- Schwaller, N. L., Kelmenson, S., BenDor, T. K. & Spurlock, D. (2020). From abstract futures to concrete experiences: How does political ideology interact with threat perception to affect climate adaptation decisions?. *Environmental Science and Policy*, 112, 440-452. Doi: 10.1016/j.envsci.2020.07.001.
- Selje, T., Schmid, L. A. & Heinz, B. (2024). Community-Based Adaptation to Climate Change: Core Issues and Implications for Practical Implementations. *Climate*, 12(10). Multidisciplinary Digital Publishing Institute (MDPI). Doi: 10.3390/cli12100155.
- Shi, X., Sun, L., Chen, X. & Wang, L. (2019). Farmers' perceived efficacy of adaptive behaviors to climate change in the Loess Plateau, China. *Science of the Total Environment*, 697. Doi: 10.1016/j.scitotenv.2019.134217.
- Surendhar, M., Anbuselvam, Y. & Ivin, J. J. S. (2021). Status of rice cultivation under Indian saline lowlands. *Journal of Pharmacognosy and Phytochemistry*, 10(3), 371-376. Doi: 10.22271/phyto.2021.v10.i3e.14102.
- Truelove, H. B., Carrico, A. R. & Thabrew, L. (2015). A socio-psychological model for analyzing climate change adaptation: A case study of Sri Lankan paddy farmers. *Global Environmental Change*, 31, 85-97. Doi: 10.1016/j.gloenvcha.2014.12.010.
- Valois, P., Talbot, D., Bouchard, D., Renaud, J. S., Caron, M., Canuel, M. & Arrambourg, N. (2020). Using the theory of planned behavior to identify key beliefs underlying heat adaptation behaviors in elderly populations. *Population and Environment*, 41(4), 480-506. Doi: 10.1007/s11111-020-00347-5.
- van Valkengoed, A. M., Perlaviciute, G. & Steg, L. (2024). From believing in climate change to adapting to climate change: The role of risk perception and efficacy beliefs. *Risk Analysis*, 44(3), 553-565. Doi: 10.1111/risa.14193.
- Vargas, R. D. S., Caro, M. A. T., Doria, D. D. F., Castañeda, C. E. M. & Calderin, I. D. S. (2023). Socioecological practices and community resilience strategies

- for sustainable agriculture in lower Sinú, Colombia. *Economia Agro-Alimentare*, 25(1), 65-91. Doi: 10.3280/ecag2023oa14631.
- Vieira, J., Castro, S. L. & Souza, A. S. (2023). Psychological barriers moderate the attitude-behavior gap for climate change. *PLoS ONE*, 18(7 July). Doi: 10.1371/journal.pone.0287404.
- Wang, M., Gong, S., Liang, L., Bai, L., Weng, Z. & Tang, J. (2023). Norms triumph over self-interest! The role of perceived values and different norms on sustainable agricultural practices. *Land Use Policy*, 129. Doi: 10.1016/j.landusepol.2023.106619.
- Werg, J. L., Grothmann, T., Spies, M. & Mieg, H. A. (2020). Factors for self-protective behavior against extreme weather events in the Philippines. *Sustainability (Switzerland)*, 12(15). Doi: 10.3390/su12156010.
- Williams, P. A., Ng'ang'a, S. K., Crespo, O. & Abu, M. (2020). Cost and benefit analysis of adopting climate adaptation practices among smallholders: The case of five selected practices in Ghana. *Climate Services*, 20. Doi: 10.1016/j.cliser.2020.100198.
- Yang, Y., Zhang, Y., Zhu, B. X., Zhou, J., Liu, Y., Gao, D. & Sauer, J. (2024). ICT promotes smallholder farmers' perceived self-efficacy and adaptive action to climate change: Empirical research on China's economically developed rural areas. *Climate Services*, 33. Doi: 10.1016/j.cliser.2023.100431.
- Yazdanpanah, Zobeidi, Woosnam, Lohr & Sieber. (2024). Bridging farmers' non-cognitive and self-conscious emotional factors to cognitive determinants of climate change adaptation in southwest Iran. *Climate Development*.
- Yiridomoh, G. Y., Bonye, S. Z., Derbile, E. K. & Owusu, V. (2022). Women farmers' perceived indices of occurrence and severity of observed climate extremes in rural Savannah, Ghana. *Environment, Development and Sustainability*, 24(1), 810-831. Doi: 10.1007/s10668-021-01471-4.
- Zhang, L., Ruiz-Menjivar, J., Luo, B., Liang, Z. & Swisher, M. E. (2020). Predicting climate change mitigation and adaptation behaviors in agricultural production: A comparison of the theory of planned behavior and the Value-Belief-Norm Theory. *Journal of Environmental Psychology*, 68. Doi: 10.1016/j.jenvp.2020.101408.
- Zobeidi, T., Yaghoubi, J. & Yazdanpanah, M. (2022). Exploring the motivational roots of farmers' adaptation to climate change-induced water stress through incentives or norms. *Scientific Reports*, 12(1). Doi: 10.1038/s41598-022-19384-1.

Economia agro-alimentare / Food Economy

An International Journal on Agricultural and Food Systems

Vol. 28, Iss. 2, Art. 4, pp. 69-91 - ISSN 1972-4802

DOI: 10.3280/ecag2026oa22101



Food Access, Spatial Differences, and Social Protection Targeting: Evidence from Central Java

Eka Nurjati^a, Septian Adityawati^{*b}

^a Research Center for Behavioural and Circular Economy, National Research and Innovation Agency, Indonesia

^b Research Center for Macroeconomics and Finance, National Research and Innovation Agency, Indonesia

Abstract

Social protection programs are important policy instruments for addressing food insecurity. This study examines the statistical relationships between food access, area of residence, and social protection participation in Central Java using quantitative and qualitative data. A Partial Least Squares Structural Equation Modeling (PLS-SEM) approach is applied to explore structural associations among these variables. The results indicate that food access is positively associated with social protection participation, suggesting that households experiencing food access constraints are more likely to be linked with such programs. Spatial differences are also observed: urban households appear to face greater food access challenges, while rural households are statistically more likely to be associated with social protection participation. Area of residence further shows a significant indirect association in the relationship between food access and social protection. These findings highlight the importance of improving the alignment between social protection targeting and evolving food access vulnerabilities, particularly in urban areas.

Article info

Type:

Article

Submitted:

19/02/2026

Accepted:

01/06/2026

Available online:

07/07/2026

JEL codes:

I31, I38, D63

Keywords:

Food security

Rural

Urban

Number of families

Strategy

Managing Editor:

Lucia Briamonte

* *Corresponding author:* Septian Adityawati - National Research and Innovation Agency - Jakarta 12710, Indonesia. E-mail: sept009@brin.go.id

Introduction

Food represents a fundamental human necessity; therefore, reinforcing the pillars of food security must become a key policy priority. To support this objective, the Indonesian government has long implemented various social protection initiatives, delivered through both direct cash transfers and indirect forms of assistance (Iping, 2020). Empirical studies indicate that social protection programs contribute significantly and positively to improving household food security (Amrullah *et al.*, 2020; Devereux *et al.*, 2012; Osabohien *et al.*, 2023). Efforts to strengthen food security pillars are closely aligned with the broader goal of eradicating hunger (Sinha & Chattopadhyay, 2024).

The hunger situation in Indonesia can be illustrated by FAO (2023), which reports an upward trend in the prevalence of undernourishment between 2011 and 2021. Meanwhile, The Global Food Security Index (2022) ranks Indonesia 63rd out of 113 countries in terms of overall food security performance. Although several dimensions of food security in Indonesia – such as affordability, availability, sustainability, and adaptation – show an improving trend, the availability pillar has recently weakened. This decline is accompanied by reduced agricultural production stability and a decrease in the sufficiency of food supply.

At the subnational level, Central Java Province is considered more vulnerable to natural hazards than other provinces on Java Island, raising concerns about the resilience of its food security pillars (Pratiwi *et al.*, 2020). Recurrent flooding in the province has led to crop failures and disruptions in food supply. Between 2014 and 2018, floods affected approximately 3.35% of the total cultivated land area, resulting in estimated rice production losses equivalent to 5.24% of actual output (Susanty *et al.*, 2022). Despite the increasing frequency and intensity of such disasters, a comprehensive and specific mitigation framework – particularly one addressing household food security coping strategies – has not yet been fully developed.

Given the persistence of food insecurity risks and the importance of accurate targeting in social protection delivery (Amrullah *et al.*, 2020; Devereux *et al.*, 2012), understanding how observable household conditions are associated with program participation becomes increasingly relevant. Although social protection is widely recognized as a key policy instrument for reducing vulnerability (Iping, 2020; Mehta *et al.*, 2018), evidence also shows that exclusion errors and governance challenges may limit its reach among near-poor and vulnerable groups (Luthfiah *et al.*, 2015). In this context, examining the statistical associations between household food access and social protection participation can provide insights into how program outreach aligns with observable indicators of need, particularly in areas exposed to food security pressures.

Spatial disparities further complicate this relationship. Rural populations, often characterized by higher dependence on agriculture and greater exposure to livelihood shocks, are frequently identified as more vulnerable to food insecurity (Sibhatu & Qaim, 2017). At the same time, regional differences in infrastructure, service access, and administrative capacity may shape the distribution of social assistance. This study analyzes the structural associations between household food access, area of residence, and participation in social protection schemes in Central Java Province. By identifying these relationships, the study contributes empirical evidence on observable characteristics linked to program participation and highlights potential spatial patterns relevant to improving the inclusiveness and targeting orientation of social protection policies.

1. Background

Food security continues to pose a serious challenge for many nations, including those with substantial natural resource endowments. Efforts to strengthen food security systems have become increasingly complex due to climate change and rapid population growth, both of which intensify pressures on food supply and demand. Recent studies emphasize that climate change, economic instability, and global crises simultaneously exacerbate food insecurity, particularly in developing countries, by disrupting agricultural productivity and food access systems (Abdullahi *et al.*, 2024). In addition, climate change is projected to significantly reduce crop yields and increase the risk of global food insecurity in the absence of effective adaptation strategies (Regmi & Paudel, 2024). Recent evidence further suggests that climate change may substantially reduce global agricultural productivity and food production, potentially lowering output by up to 14% by 2050 without adequate mitigation and adaptation measures (Farah *et al.*, 2025; Li *et al.*, 2025). Moreover, the agricultural sector itself contributes considerably to greenhouse gas emissions, highlighting the reciprocal relationship between climate change and food security (Ringeisen *et al.*, 2024).

Empirical evidence from Indonesia demonstrates that food security is influenced by various structural and economic factors, including population density, land availability, staple food production, and food price fluctuations. Widada *et al.* (2017) found that food security conditions are strongly associated with the production of key food commodities – such as rice, maize, soybeans, poultry, and beef – as well as consumer price indices in essential sectors including housing, energy, healthcare, transportation, and financial services. Furthermore, multidimensional approaches, such as the

Food Insecurity Multidimensional Index, indicate that food insecurity extends beyond caloric adequacy and also encompasses dimensions related to food access, utilization, and stability.

In addition to macro-level and production-related determinants, an expanding body of literature underscores the importance of household-level socioeconomic characteristics in shaping food security outcomes. Research consistently demonstrates that factors such as household income, mothers' educational attainment, family size, the gender and age of the household head, employment status, access to information, participation in social networks, and patterns of food and non-food expenditures significantly affect food security status (Akbar, 2018; Khan *et al.*, 2012; Muhammad & Sidique, 2019; Umaroh & Pangaribowo, 2020). Food price fluctuations are also crucial, as increases in food prices have been shown to raise the prevalence of undernourishment, particularly among low-income households (Warr, 2014). Similarly, Omotesho *et al.* (2006) identify farm size, agricultural income, non-farm income, and household size as major determinants of food security among rural households, with patterns broadly consistent with those observed across households in general.

Given the diverse drivers of food insecurity, social protection has become a key policy tool for reducing vulnerability, especially among disadvantaged groups. Many countries have adopted social protection measures aimed at reinforcing food security systems by assisting poor and food-insecure households, as well as those affected by economic disruptions and environmental shocks. While short-term coping mechanisms such as emergency aid play an important role, the long-term effectiveness of social protection depends on its alignment with sustainable strategies that strengthen the core pillars of food security: availability, affordability, stability, and food quality.

A growing body of empirical evidence confirms the positive contribution of social protection programs to household food security. Lavers (2013) and Hidrobo *et al.* (2018) find that such interventions significantly enhance both the quantity and diversity of food consumption, including higher spending on nutrient-dense foods such as animal-source products. Social protection has also been shown to mitigate food insecurity linked to labor market shocks, including job loss and wage reductions (Loopstra *et al.*, 2016). Moreover, in contexts experiencing rapid urban expansion, social protection policies remain vital for addressing food insecurity and nutritional challenges, while still complementing efforts to strengthen rural food systems (Brzeska *et al.*, 2015).

Beyond supporting consumption, social protection interventions can produce wider economic benefits by promoting agricultural production and contributing to poverty alleviation. Evidence indicates that transfers and related programs can ease liquidity constraints, encourage farm investment, and enhance the productive capacity of beneficiary households (Dyngeland

et al., 2020; Tirivayi *et al.*, 2016). Nevertheless, program effectiveness is highly dependent on accurate targeting and suitability to local conditions, particularly in areas vulnerable to climate-related risks.

To strengthen the conceptual foundation of this study, the analysis integrates the food security framework, vulnerability theory, and targeting theory in social protection. The food security framework conceptualizes food security as a multidimensional construct encompassing availability, access, utilization, and stability, with household-level outcomes primarily shaped by economic access and livelihood conditions. Vulnerability theory further emphasizes that food insecurity arises not only from current deprivation but also from exposure to risks and limited coping capacity. Residential location, particularly the rural–urban divide, may influence vulnerability through differences in labor markets, infrastructure, market access, and public services, thereby shaping both food access and household risk profiles.

Targeting theory provides an additional lens for understanding social protection participation. Social protection programs are designed to prioritize vulnerable households using observable indicators of deprivation; however, program receipt is also influenced by administrative capacity, eligibility criteria, and geographic targeting mechanisms. Therefore, the relationship between food access, residential location, and social protection participation reflects both household vulnerability and institutional processes. This study does not seek to establish causality but instead models the structural associations among these variables within a unified analytical framework.

2. Methods

Research Design and Data Sources

This study applies a quantitative approach supported by qualitative insights from a literature review. The quantitative analysis uses secondary data from the 2021 National Socioeconomic Survey (Susenas) conducted by Statistics Indonesia (BPS), covering 29,497 households in Central Java Province. The survey provides nationally representative household-level information on socio-economic conditions, including indicators related to food access, demographic characteristics, and participation in social protection programs.

The literature review complements the quantitative findings by providing contextual understanding and supporting the interpretation of empirical results, particularly in relation to social protection targeting and food security vulnerability. Building on this analytical framework, the study employs a structured empirical approach to ensure data quality and robustness prior to estimation. Accordingly, data cleaning procedures were conducted prior to

analysis, including the removal of incomplete observations and consistency checks across key variables to ensure data reliability.

Variables and Measurement

The main variables included in the model are household food access, area of residence (urban-rural classification), number of household members, and participation in social protection programs. These variables are selected to represent observable household characteristics and spatial context that may be statistically associated with program participation.

Food access is used as an indicator reflecting household-level conditions related to food security, while area of residence captures spatial differences that may influence both vulnerability and access to social assistance. Social protection participation serves as the key endogenous variable in the structural model.

The indicators of food access are based on the Food Insecurity Experience Scale (FIES), an internationally recognized framework developed by the Food and Agriculture Organization (FAO) for measuring household-level food insecurity. All variables were operationalized according to the coding framework provided by Statistics Indonesia (BPS), ensuring consistency with national statistical standards.

Analytical Approach

To examine the structural associations among variables, this study employs Partial Least Squares Structural Equation Modeling (PLS-SEM). PLS-SEM is an exploratory, prediction-oriented technique suitable for analyzing complex relationships among multiple variables, particularly when the objective is to identify statistically significant associations rather than to test well-established causal theories. The large sample size (29,497 households) exceeds the minimum recommended thresholds for PLS-SEM applications (Hair *et al.*, 2014), thereby ensuring sufficient statistical power for model estimation.

The analysis follows a two-step approach, consisting of the evaluation of the measurement model (outer model) and the structural model (inner model). The measurement model is assessed through indicator loadings, composite reliability, and average variance extracted (AVE) to ensure reliability and convergent validity, while discriminant validity is evaluated using the Fornell-Larcker criterion.

The structural model is examined using path coefficients and the coefficient of determination (R^2). Statistical significance is assessed through bootstrapping with 5,000 resamples, following Hair *et al.* (2014), to obtain

robust and stable estimates. Given the cross-sectional nature of the data, the analysis focuses on statistical associations rather than causal inference, and this limitation is explicitly considered in the interpretation of the results.

Given the cross-sectional nature of the data, the model seeks to identify structural patterns linking household food access, spatial characteristics, and participation in social protection programs. This approach is considered appropriate for social policy contexts where outcomes are influenced by multiple observed and unobserved factors.

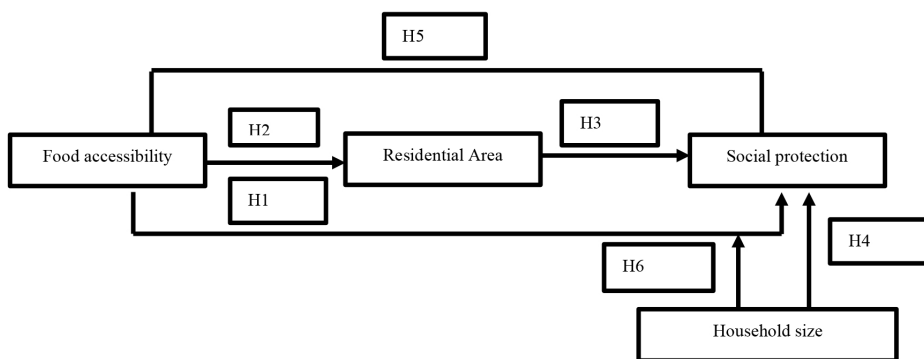
Social protection programs are frequently linked to efforts to reduce food insecurity and vulnerability. The literature suggests that food-related deprivation is often used as an observable indicator to identify households in need of assistance (Devereux *et al.*, 2012). Inadequate food access is also associated with broader welfare disadvantages, which may shape the likelihood of households being included in social protection schemes (Ullmann *et al.*, 2019). Therefore, examining the statistical association between food access and participation in social protection programs can provide insights into how observable household conditions align with program outreach.

Spatial context represents another important dimension. Rural households are often characterized by higher exposure to livelihood risks, limited infrastructure, and greater vulnerability to food insecurity (Fintel & Pienaar, 2016; Garrett & Ruel, 1999). However, variations in administrative capacity and service delivery between rural and urban areas may also influence access to social assistance (Stavropoulou *et al.*, 2017). Household demographic characteristics, particularly family size, are likewise associated with economic pressure and food needs (Rahman, 2013; Sabates-Wheeler & Devereux, 2018). All constructs in the model are treated as reflective constructs in the PLS-SEM framework. These factors may be statistically related to the likelihood of participating in social protection programs. Based on the literature review, the hypotheses to be built in this study are:

- H1:** *Household food access is significantly associated with participation in social protection programs.*
- H2:** *Household food access is significantly associated with area of residence (urban-rural).*
- H3:** *Area of residence is significantly associated with participation in social protection programs.*
- H4:** *Household size is significantly associated with participation in social protection programs.*
- H5:** *Area of residence is associated with the relationship between food access and social protection participation.*
- H6:** *Household size is associated with the relationship between food access and social protection participation.*

Figure 1 is the model to be analyzed using PLS-SEM. The research model has four constructs, each with indicators are listed in Table 1.

Figure 1 - Research Model



3. Results

The distribution of respondents in Table 1 is presented based on constructs and indicators. The majority of respondents were not families receiving social protection programs. Furthermore, most respondents are not families vulnerable to food access. However, 11.67% of people claim to worry that they will not have enough food. The number of respondents living in urban areas is similar to rural areas, with 52.82% living in urban areas, while the rest live in rural areas. Furthermore, the maximum number of families living in one house is seven, with the majority filled with one family, 73.42%.

Table 1 - Distribution of respondents

Construct	Indicator	Symbol	Information	n	Percentage (%)
Social Protection	Do you accept Family Welfare Card (Kartu Keluarga Sejahtera/ KKS)?	A11	Did not receive	24,656	83.59
			Received	4,841	16.41
	Have you ever been a recipient of the Family Hope Program (Family Hope Program/Program Keluarga Harapan/PKH)?	A12	Did not receive	24,605	83.42
			Received	4,892	16.58
	Have you ever received Non-Cash Food Assistance (Non-Cash Food Assistance Program/Bantuan Pangan Non Tunai/BPNT)?	A14	Did not receive	21,516	72.94
			Received	7,981	27.06

Construct	Indicator	Symbol	Information	n	Percentage (%)
Food Accessibility	Over the past year, is it worried that there will not be enough food?	A21	No	26,054	88.33
			Yes	3,443	11.67
	Over the past year, has there been a time when you have not been able to eat healthy and nutritious food?	A22	No	28,089	95.23
			Yes	1,408	4.77
	Over the past year, has it only eaten a small amount of food?	A23	No	28,127	95.36
			Yes	1,370	4.64
	Over the past year, has it eaten less than it should?	A25	No	28,585	96.91
			Yes	912	3.09
Residential Area	Urban/rural classification	X11	Urban	15,579	52.82
			Rural	13,918	47.18
Household size	How many families live in the census building/house	X21	1	21,657	73.42
			2	6,226	21.11
			3	1,021	3.46
			4	359	1.22
			5	151	0.51
			6	56	0.19
			7	27	0.09

Measurement model assessment

Evaluation of measurement models is carried out based on three criteria, namely through testing of convergent validity, testing of discriminant validity, and testing of reliability. The initial stage carried out in testing data to determine the level of accuracy with reflexive indicators can be seen from the correlation between the indicator's value and its construct. An indicator is considered reliable if it has a correlation value or loading factor above 0.7. Table 2 shows that the loading factor value of each indicator is above 0.7. In addition to the loading factor value, convergent validity is seen from the AVE value above 0.5. Likewise, Cronbach's Alpha and Composite values are each above 0.7. Furthermore, reliability indicators are also seen from the VIF value, which is below 5. Based on the test results, the model meets the criteria so that the model built is reliable or valid.

Table 2 - Reliability and validity lower order construct of social protection

Construct	Code Indicator	Loading factor	Cronbach's Alpha	Rho A	Composite Reliability	Average Variance Extracted (AVE)	VIF
Social protection	A11	0,802	0,751	0,765	0,857	0,666	1,544
	A12	0,795					1,452
	A14	0,851					1,531
Food accessibility	A21	0,801	0,824	0,854	0,881	0,649	1,428
	A22	0,822					1,966
	A23	0,856					2,478
	A25	0,739					1,815
Region of residence	X11	1,000	1,000	1,000	1,000	1,000	1,000
Number of household members	X21	1,000	1,000	1,000	1,000	1,000	1,000
Food access * number of household members		0,985	1,000	1,000	1,000	1,000	1,000

Because there is no convergent validity problem, the next step is to test discriminant validity by comparing the cr value of the AVE square root with the correlation value between constructs. Table 3 shows that the square root value of AVE is greater than the correlation of each construct, so it can be concluded that there is no discriminant validity problem. Another method that can be used to test discriminant validity is to identify the cross-loading table. Table 4 shows that the cross-loading value is more than 0.7 in one construct, so it has no discriminant validity problems. Furthermore, Table 5 shows that the Heterotrait-Monotrait Ratio (HTMT) value is no greater than 0.9, so it can be concluded that there is no multicollinearity problem in the data.

The R^2 value reported in Table 6 is 0.022, indicating that the exogenous variables included in the model (food access, area of residence, and number of households within a dwelling) explain a relatively small proportion of the variance in social protection participation. This modest explanatory power is not unexpected in social policy research, where program participation is typically shaped by a broad set of administrative, institutional, and eligibility-related factors that are not fully observable in household survey data. Accordingly, the low R^2 does not undermine the validity of the structural

relationships identified in the model, but rather suggests that observed household characteristics capture only a limited dimension of the broader targeting and implementation mechanisms of social protection programs.

In addition, model fit is assessed using the Standardized Root Mean Square Residual (SRMR), which yields a value of 0.066. This is below the commonly accepted threshold of 0.08, indicating an acceptable level of fit between the observed and model-implied correlations.

Table 3 - Root value of AVE square between constructs

	Moderating Effect 1	Food access	Number of household members	Social protection	Region of residence
Moderating Effect 1	1,000				
Food access	-0,033	0,806			
Number of household members	-0,003	-0,005	1,000		
Social protection	0,001	0,081	0,033	0,816	
Region of residence	-0,008	-0,016	-0,012	0,118	1,000

Table 4 - The cross-loading value of each indicator

	Moderating Effect 1	Food access	Number of household members	Social protection	Region of residence
A11	-0,003	0,072	0,017	0,802	0,076
A12	0,010	0,062	0,030	0,795	0,090
A14	-0,003	0,065	0,031	0,851	0,118
A21	-0,016	0,801	-0,002	0,085	-0,006
A22	-0,035	0,822	-0,007	0,062	-0,004
A23	-0,034	0,856	-0,006	0,061	-0,019
A25	-0,024	0,739	0,000	0,038	-0,033
X11	-0,008	-0,016	-0,012	0,118	1,000
X21	-0,003	-0,005	1,000	0,033	-0,012
Food access * number of household members	1,000	-0,033	-0,003	0,001	-0,008

Table 5 - Heterotrait-Monotrait Ratio (HTMT)

	Moderating Effect 1	Food access	Number of household members	Social protection	Region of residence
Moderating Effect 1					
Food access	0,037				
Number of household members	0,003	0,005			
Social protection	0,008	0,097	0,037		
Region of residence	0,008	0,021	0,012	0,134	

Table 6 - Variance of latent variable

	R Square	R Square Adjusted	SRMR
Social protection	0,022	0,022	0,066

Path correlation

The assessment of the structural model is based on the direction of the path coefficients and their statistical significance. A hypothesis is considered supported when the sign of the relationship is consistent with the proposed direction and the associated t-value exceeds the critical threshold ($t > 1.96$) with a p-value below 0.05.

As presented in Table 7, the results indicate that H1, H3, and H4 are statistically supported, while H2 is not supported. Food access, area of residence, and the number of household members are each positively associated with social protection participation. These findings suggest that households with better food access, those located in certain residential areas, and those with more household members are statistically more likely to be linked with social protection programs.

In contrast, the relationship hypothesized in H2 between food access and area of residence is not statistically supported. This implies that differences in food access between rural and urban areas are not sufficiently captured by the model. Nevertheless, the descriptive pattern observed in the data indicates that urban households may experience particular constraints in food access, which warrants further investigation using more detailed socio-economic and spatial variables.

Table 7 - Correlation Between Variables

Hypothesis	Relationship	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
H1	Food access → social protection	0,083	0,083	0,006	12,812	0,000
H2	Food access → region of residence	-0,016	-0,016	0,006	2,639	0,009
H3	Region of residence → social protection	0,120	0,121	0,006	21,529	0,000
H4	Number of household members → social protection	0,035	0,035	0,006	5,723	0,000

Mediation analysis

The results presented in Table 7 indicate that the total association between food access and social protection participation is positive and statistically significant. After including the mediating variable (area of residence), the direct association between food access and social protection remains positive and significant. However, the indirect association through area of residence is negative and statistically significant. This pattern suggests that area of residence is statistically linked to the relationship between food access and social protection in a way that differs in direction from the direct association. In other words, the spatial context appears to be related to how food access corresponds with social protection participation. Nevertheless, because the indirect association operates in the opposite direction to that hypothesized, H5 is not supported. These findings should be interpreted as indicative of structural associations rather than causal mediation, given the cross-sectional design of the study.

H5: *The region of residence plays a positive and significant role in mediating the relationship between food access and social protection*

Table 8 - Hypothesis testing on mediation

Total Effect (food access - social protection)		Direct Effect (food access - social protection)		Indirect Effect (food access - region of residence - social protection)	
Original Sample (O)	P Values	Original Sample (O)	P Values	Original Sample (O)	P Values
0,081	0,000	0,083	0,000	-0,002	0,007

Moderating analysis

The results presented in Table 8 show that the interaction term representing household size has a positive coefficient in the relationship between food access and social protection participation; however, this association is not statistically significant ($p > 0.05$). This indicates that variation in family size is not statistically associated with differences in the relationship between food access and social protection within the sample. Although the direction of the coefficient is positive, the lack of statistical significance means that H6 is not supported. These findings should be interpreted as evidence of a non-significant statistical interaction rather than proof that family size plays no role at all, particularly given the cross-sectional nature of the data and the possibility of unobserved socio-economic factors.

H6: *Household size plays a positive and significant role in moderating the relationship between food access and social protection*

Table 9 - Hypothesis testing on moderation

Relationship	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Food access * number of household members → social protection	0,005	0,006	0,007	0,740	0,460

4. Discussion

The results reveal notable spatial differences in the observed associations. Households in rural areas are statistically more likely to be linked with social protection participation, whereas food access constraints are more

pronounced among urban households. These patterns are consistent with previous studies highlighting higher and emerging food insecurity risks in urban settings due to rapid urbanization, declining agricultural land, and environmental pressures (Opitz *et al.*, 2016; Piontak & Schulman, 2014; Ramsey *et al.*, 2012). From a food systems perspective, these dynamics reflect how spatial governance and distributional structures shape food access outcomes (Au-Yong-Oliveira *et al.*, 2025).

Food security is inherently multidimensional, encompassing availability, access, utilization, and stability (FAO, 2023). While this study focuses on food access due to data constraints, the utilization dimension remains critical, as dietary quality and nutritional diversity may differ significantly across spatial contexts (FAO, 2023; Jones *et al.*, 2013). Urban households, despite better market access, may exhibit higher consumption of processed and energy-dense foods, whereas rural households are more likely to rely on staple-based diets with limited diversity (Fanzo *et al.*, 2020; Popkin *et al.*, 2020; Sibhatu & Qaim, 2017). These differences underscore the importance of incorporating food utilization into broader food security assessments.

The stronger association between rural residence and social protection participation may reflect long-standing policy orientations that prioritize rural poverty (Midgley & Piachaud, 2013). Eligibility criteria often rely on observable indicators such as land ownership and agricultural livelihoods, which are more prevalent in rural settings, thereby improving targeting accuracy in these areas (Kidd & Pathways, 2017; World Bank Group, 2018). In contrast, urban poverty tends to be more heterogeneous and less visible, often characterized by informal employment and higher living costs, which are less effectively captured by conventional targeting mechanisms (Gentilini *et al.*, 2020).

Administrative and institutional constraints may further reinforce this disparity. Rural areas often benefit from community-based governance structures that facilitate beneficiary identification and program delivery, whereas urban areas face greater population mobility, density, and weaker social cohesion, complicating targeting processes (International Labour Organization, 2021; Sabates-Wheeler *et al.*, 2020). These factors contribute to a structural bias in social protection systems that may inadvertently favor rural households, even as urban food insecurity continues to rise (World Bank, 2020).

Household size is also positively associated with social protection participation, suggesting that larger households are more likely to be included in assistance programs. This finding aligns with evidence that larger households face higher dependency ratios, greater food expenditure burdens, and increased vulnerability to food insecurity (Nurdiani & Widjojoko, 2016;

Sinaga *et al.*, 2013; Syamola & Nurwahyuni, 2019). This pattern may reflect the use of household size as an implicit proxy for vulnerability in targeting mechanisms, although the cross-sectional nature of the data prevents confirmation of whether this is an intentional design feature or an emergent outcome.

Environmental shocks, such as flooding, represent an additional dimension of vulnerability that may not be fully captured in static targeting systems. Existing evidence suggests that rigid eligibility criteria and outdated beneficiary databases can limit the responsiveness of social protection programs to shock-induced food insecurity (FAO, 2023; World Bank, 2020). Consequently, households experiencing temporary vulnerability may not be immediately reached by assistance programs. Strengthening adaptive and shock-responsive social protection systems – through flexible targeting, dynamic beneficiary updating, and integration with disaster risk management frameworks – could enhance program responsiveness in disaster-prone regions such as Central Java (Hallegatte & Rozenberg, 2017; Smith & Bowen, 2020).

Finally, the mediation results suggest that spatial context plays a role in shaping the relationship between food access and social protection participation. However, given the cross-sectional nature of the data, causal mediation cannot be inferred. Overall, the observed mismatch between urban food vulnerability and social protection participation points to potential governance and targeting limitations that warrant further policy attention.

Although household size did not show a statistically significant moderating effect, socio-demographic characteristics remain important in understanding vulnerability. Previous studies consistently document associations between household size and food security conditions (Esturk & Oren, 2013; Muche *et al.*, 2014). Beyond economic factors, cultural and behavioral dimensions related to food acquisition and preparation also play a role in shaping food security outcomes (Alonso *et al.*, 2018).

From a policy perspective, the findings highlight the need to recalibrate social protection targeting frameworks to reflect better the evolving geography of food vulnerability, particularly in urban areas. Urban food insecurity is increasingly driven by structural economic constraints such as labor informality, income volatility, rising cost of living, and housing affordability pressures, which are often not adequately captured by conventional proxy indicators used in targeting systems (Gentilini *et al.*, 2020; World Bank, 2020). This suggests that reliance on traditional poverty markers may systematically underestimate urban vulnerability and contribute to exclusion errors. Strengthening targeting accuracy, therefore, requires the incorporation of more dynamic and urban-relevant indicators that

reflect real-time economic precarity, alongside improvements in beneficiary data updating mechanisms (Kidd & Athias, 2020). These adjustments would enhance the responsiveness of social protection systems to shifting vulnerability patterns and improve their effectiveness in rapidly urbanizing contexts.

The findings highlight the importance of aligning food access vulnerability with social protection targeting, particularly in urban contexts. Strengthening beneficiary data systems, enhancing benefit adequacy, and improving monitoring and updating mechanisms are critical to reducing both exclusion and inclusion errors. In addition, food security strategies should not be limited to availability and access, but also incorporate food quality and dietary diversity dimensions. Broader agricultural policies that support diversified production systems (Ceballos *et al.*, 2020) and improved input accessibility (Salazar *et al.*, 2016) remain relevant for ensuring food supply stability. These considerations are consistent with integrated food systems approaches that link social protection, agricultural sustainability, and supply chain resilience (Au-Yong-Oliveira *et al.*, 2025).

This study has several limitations. First, the use of cross-sectional data limits the ability to draw causal inferences among variables. Second, reliance on secondary survey data may not fully capture dynamic household behavior or unobserved institutional factors influencing social protection targeting. Third, potential endogeneity may arise from the simultaneous relationship between food access and social protection participation. Future research could address these limitations by employing longitudinal data and more robust econometric strategies.

Despite these limitations, the study contributes to the literature by integrating food access, spatial heterogeneity, and social protection participation within a unified empirical framework. While previous studies often examine these dimensions separately, this research highlights their interdependent nature, particularly in developing country contexts. The findings suggest that policy interventions should move beyond uniform targeting approaches and incorporate spatial and socio-demographic heterogeneity to improve program effectiveness. In particular, urban food vulnerability warrants greater policy attention, given the emerging mismatch between food access constraints and social protection coverage.

Overall, the findings should not be interpreted solely as household-level relationships, but also as reflections of broader governance structures that shape how vulnerability is defined, measured, and addressed within social protection systems.

Conclusion

This study examines the statistical relationships between food access, area of residence, household size, and social protection participation. The results show that food access and household size are positively associated with social protection participation, while area of residence is also significantly associated within the structural model. These findings indicate that observable household and spatial characteristics are related to patterns of social protection participation, although they explain only a small portion of the overall variation.

The analysis further highlights spatial differences in food access conditions. Food access constraints appear more pronounced among urban households, whereas rural households are statistically more likely to be linked with social protection participation. The mediation results suggest that area of residence is statistically connected to how food access relates to social protection participation, but this should be interpreted as a structural association rather than causal mediation due to the cross-sectional design. Household size, while positively associated with participation, does not significantly alter the relationship between food access and social protection.

From a policy perspective, these findings underline the importance of improving the alignment between food access vulnerability and social protection targeting, particularly in urban areas where food insecurity risks may be less visible. Strengthening beneficiary data systems, improving monitoring, and ensuring that assistance supports food quality and dietary diversity are important considerations. However, given the limited explanatory power of the model and the cross-sectional nature of the data, these implications should be viewed as indicative, and further research using more comprehensive and longitudinal data is needed.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article

Declaration of Conflicting Interests

During the preparation of this article, the author(s) used ChatGPT to assist with improving the clarity and language of the manuscript. After using this tool, the author(s) carefully reviewed and edited the content as needed and takes full responsibility for the final content of the publication.

Declaration of Generative AI Use

During the preparation of this article, the author(s) used ChatGPT to After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author only on reasonable request.

References

- Abdullahi, A. M., Kalengyo, R. B., & Warsame, A. A. (2024). The unmet demand of food security in East Africa: review of the triple challenges of climate change, economic crises, and conflicts. *Discover Sustainability*, 5(1). Doi: 10.1007/s43621-024-00381-5.
- Akbar, W. K. (2018). Socio-Economic Dependence of Peasant to Local Collector on Rice Farming System. *Jurnal Ilmu Sosial Mamangan*, 7(1), 23-31. Doi: 10.22202/mamangan.2508.
- Alonso, E. B., Cockx, L., & Swinnen, J. (2018). Culture and food security. *Global Food Security*, 17(February), 113-127. Doi: 10.1016/j.gfs.2018.02.002.
- Amrullah, E. R., Pullaila, A., Hidayah, I., & Rusyiana, A. (2020). Dampak Bantuan Langsung Tunai Terhadap Ketahanan Pangan Rumah Tangga Di Indonesia (Impacts of Direct Cash Transfer on Household Food Security in Indonesia). *Jurnal Agro Ekonomi*, 38(2), 77-90. Doi: 10.21082/jae.v38n1.2020.77-90.
- Au-Yong-Oliveira, M., Marinho, C., Chkoniya, V., Vieira, E. S., & Filipe, S. (2025). Sustainable Food Supply Chains in Maritime Ports: A Review Across Management, Economic, and Social Dimensions. *Economia Agro-Alimentare*, 27(2), 7-34. Doi: 10.3280/ecag2025oa19420.
- Brzeska, J., Das, M., & Fan, S. (2015). Social protection for poor, vulnerable and disadvantaged groups. *China Agricultural Economic Review*, 7(4), 668-687. Doi: 10.1108/CAER-09-2015-0123.
- Devereux, S., Eide, W. B., Hoddinott, J., Lustig, N., & Subbarao, K. (2012). Social Protection for Food Security. *Zero Draft Consultation*, March, 1-99.
- Dyngeland, C., Oldekop, J. A., & Evans, K. L. (2020). Assessing multidimensional sustainability: Lessons from Brazil's social protection programs. *Proceedings of the National Academy of Sciences of the United States of America*, 117(34), 20511-20519. Doi: 10.1073/pnas.1920998117.
- Esturk, O., & Oren, M. N. (2013). Impact of Household Socio-Economic Factors on Food Security: Case of Adana. *Pakistan Journal of Nutrition*, 13(January), 1-6. Doi: 10.3923/pjn.2014.1.6.

- Fanzo, J., Haddad, L., McLaren, R., Marshall, Q., Davis, C., Herforth, A., Jones, A., Beal, T., Tschirley, D., Bellows, A., Miachon, L., Gu, Y., Bloem, M., & Kapuria, A. (2020). The Food Systems Dashboard is a new tool to inform better food policy. *Nature Food*, 1(5), 243-246. Doi: 10.1038/s43016-020-0077-y.
- FAO (2023). World Food and Agriculture – Statistical Yearbook 2023. In *World Food and Agriculture – Statistical Yearbook 2023*. Doi: 10.4060/cc8166en.
- Farah, A. A., Mohamed, M. A., Musse, O. S. H., & Nor, B. A. (2025). The multifaceted impact of climate change on agricultural productivity: a systematic literature review of SCOPUS-indexed studies (2015-2024). *Discover Sustainability*, 6(1). Doi: 10.1007/s43621-025-01229-2.
- Fintel, V. D., & Pienaar, L. (2016). Small-Scale Farming and Food Security: The Enabling Role of Cash Transfers in South Africa's Former Homelands. *SSRN Electronic Journal*, 10377. Doi: 10.2139/ssrn.2879784.
- Garrett, J. L., & Ruel, M. T. (1999). Are determinants of rural and urban food security and nutritional status different? Some insights from Mozambique. *World Development*, 27(11), 1955-1975. Doi: 10.1016/S0305-750X(99)00091-1.
- Gentilini, U., Almenfi, M., Orton, I., & Dale, P. (2020). *Social Protection and Jobs Responses to COVID-19 : A Real-Time Review of Country Measures*, 5.
- Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review*, 26(2), 106-121. Doi: 10.1108/EBR-10-2013-0128.
- Hallegatte, S., & Rozenberg, J. (2017). Climate change through a poverty lens. *Nature Climate Change*, 7, 250-256.
- Hidrobo, M., Hoddinott, J., Kumar, N., & Olivier, M. (2018). Social Protection, Food Security, and Asset Formation. *World Development*, 101, 88-103. Doi: 10.1016/j.worlddev.2017.08.014.
- International Labour Organization. (2021). *World Social Protection Report 2020-22: Social Protection at the Crossroads – in Pursuit of a Better Future*. -- www.ilo.org/publns.
- Iping, B. (2020). Perlindungan Sosial melalui Kebijakan Program Bantuan Langsung Tunai (BLT) di Era Pandemi COVID-19: Tinjauan Perspektif Ekonomi dan Sosial. *Jurnal Manajemen Pendidikan Dan Ilmu Sosial*, 1(2), 516-526. Doi: 10.38035/JMPIS.
- Jones, A. D., Ngunjiri, F. M., Pelto, G., & Young, S. L. (2013). What are we assessing when we measure food security? A compendium and review of current metrics. *Advances in Nutrition*, 4(5), 481-505. Doi: 10.3945/an.113.004119.
- Khan, R. E. A., Azid, T., & Toseef, M. U. (2012). Determinants of food security in rural areas of Pakistan. *International Journal of Social Economics*, 39(12), 951-964. Doi: 10.1108/03068291211269082.
- Kidd, S., & Athias, D. (2020). *Hit and Miss: An Assessment of Targeting Effectiveness in Social Protection with Additional Analysis*.
- Kidd, S., & Pathways, D. (2017). Social exclusion and access to social protection schemes. *Journal of Development Effectiveness*, 00(00), 1-33. Doi: 10.1080/19439342.2017.1305982.

- Lavers, T. (2013). Food security and social protection in highland Ethiopia: Linking the Productive Safety Net to the land question. *Journal of Modern African Studies*, 51(3), 459-485. Doi: 10.1017/S0022278X13000402.
- Li, C., Camac, J., Robinson, A., & Kompas, T. (2025). Predicting changes in agricultural yields under climate change scenarios and their implications for global food security. *Scientific Reports*, 15(1). Doi: 10.1038/s41598-025-87047-y.
- Loopstra, R., Reeves, A., Mckee, M., & Stuckler, D. (2016). Food insecurity and social protection in Europe: Quasi-natural experiment of Europe 's great recessions 2004-2012. *Preventive Medicine*, 89, 44-50. Doi: 10.1016/j.ypmed.2016.05.010.
- Luthfiah, U., Setiawan, E., & Lucia, S. S. (2015). Ketidaktepatan Sasaran Jamkesmas Berdasarkan Kriteria Miskin Pendataan Program Perlindungan Sosial. *Kesmas*, 9(4), 362-368. Doi: 10.21109/kesmas.v9i4.750.
- Mehta, A. K., Bhide, S., Kumar, A., & Shah, A. (2018). Poverty, chronic poverty and poverty dynamics: Policy imperatives. In *Poverty, Chronic Poverty and Poverty Dynamics: Policy Imperatives*. Doi: 10.1007/978-981-13-0677-8.
- Midgley, J., & Piachaud, D. (2013). *Social protection, economic growth and social change: goals, issues and trajectories in China, India, Brazil and South Africa*. Edward Elgar.
- Muche, M., Endalew, B., & Koricho, T. (2014). Determinants of Household Food Security among Southwest Ethiopia Rural Households. *Food Science and Technology*, 2(7), 93-100. Doi: 10.13189/fst.2014.020701.
- Muhammad, N. A., & Sidique, S. F. Bin. (2019). Determinants of Food Security Among Households in Nigeria. *Pakistan Journal of Nutrition*, 18(11), 1042-1052. Doi: 10.3923/pjn.2019.1042.1052.
- Nurdiani, U., & Widjojoko, T. (2016). The Factors that Influence the Food Security of Poor Households In Urban Areas of Banyumas District. *Agrin*, 20(2), 169-178.
- Omotesho, O. A., Adewumi, M. O., Muhammad-Lawal, A., & Ayinde, O. E. (2006). Determinants of Food Security Among The Rural Farming Households in Kwara State, Nigeria. *African Journal of General Agriculture African Studies on Population and Health*, 2(1), 7-15. -- <http://www.asopah.org>.
- Opitz, I., Berges, R., Piorr, A., & Krikser, T. (2016). Contributing to food security in urban areas: differences between urban agriculture and peri-urban agriculture in the Global North. *Agriculture and Human Values*, 33(2), 341-358. Doi: 10.1007/s10460-015-9610-2.
- Osabohien, R., Karakara, A. A. wakeel, Ashraf, J., & Al-Faryan, M. A. S. (2023). Green Environment-Social Protection Interaction and Food Security in Africa. *Environmental Management*, 71(4), 835-846. Doi: 10.1007/s00267-022-01737-1.
- Piontak, J. R., & Schulman, M. D. (2014). Food Insecurity in Rural America. *Contexts*, 13(3), 75-77. Doi: 10.1177/1536504214545766.
- Popkin, B. M., Corvalan, C., & Grummer-Strawn, L. M. (2020). Dynamics of the double burden of malnutrition and the changing nutrition reality. *The Lancet*, 395(10217), 65-74. Doi: 10.1016/S0140-6736(19)32497-3.
- Pratiwi, E. P. A., Ramadhani, E. L., Nurrochmad, F., & Legono, D. (2020). The Impacts of Flood and Drought on Food Security in Central Java. *Journal of the Civil Engineering Forum*, 6(1), 69. Doi: 10.22146/jcef.51872.

- Rahman, M. A. (2013). Household Characteristics And Poverty: A Logistic Regression Analysis. *The Journal of Developing Areas*, 47(1), 303-317. Doi: 10.1353/jda.2013.0001.
- Ramsey, R., Giskes, K., Turrell, G., & Gallegos, D. (2012). Food insecurity among adults residing in disadvantaged urban areas: Potential health and dietary consequences. *Public Health Nutrition*, 15(2), 227-237. Doi: 10.1017/S1368980011001996.
- Regmi, S., & Paudel, B. (2024). Climate-smart agriculture: A review of sustainability, resilience, and food security. *Archives of Agriculture and Environmental Science*, 9(4), 832-839. Doi: 10.26832/24566632.2024.0904028.
- Ringeisen, B. R., de Azevedo Souza, C., Njuguna, E. W., & Ronald, P. C. (2024). We need to act now to ensure global food security, and reduce agricultural greenhouse gas emissions. *Bulletin of the Atomic Scientists*, 80(3), 162-167. Doi: 10.1080/00963402.2024.2339081.
- Sabates-Wheeler, R., & Devereux, S. (2018). Social Protection and the World Food Programme. In *Institute of Development Studies, Occasional Paper No 25* (Issue January).
- Sabates-Wheeler, R., Wilmink, N., Abdulai, A. G., de Groot, R., & Spadafora, T. (2020). Linking Social Rights to Active Citizenship for the Most Vulnerable: the Role of Rights and Accountability in the 'Making' and 'Shaping' of Social Protection. *European Journal of Development Research*, 32(1), 129-151. Doi: 10.1057/s41287-019-00223-5.
- Salazar, L., Aramburu, J., González-Flores, M., & Winters, P. (2016). Sowing for food security: A case study of smallholder farmers in Bolivia. *Food Policy*, 65, 32-52. Doi: 10.1016/j.foodpol.2016.10.003.
- Sibhatu, K. T., & Qaim, M. (2017). Rural food security, subsistence agriculture, and seasonality. *PLoS ONE*, 12(10), 1-15. Doi: 10.1371/journal.pone.0186406.
- Sinaga, A. R. R., Supriana, T., & Lubis, S. N. (2013). Ketahanan Pangan pada Keluarga Miskin di Desa Bandar Klippa Kecamatan Percut Sei Tuan Kabupaten Deli Serdang. *Journal of Agriculture and Agribusiness Socioeconomics*, Juni, 1-15.
- Sinha, A., & Chattopadhyay, A. (2024). Utilization of maternal and child health care services in North and South India: does spousal violence matter?. *International Journal of Population Studies*, 2(2), 107. Doi: 10.18063/ijps.2016.02.001.
- Smith, G. R., & Bowen, T. V. (2020). *Adaptive Social Protection: The Delivery Chain and Shock Response*.
- Stavropoulou, M., Holmes, R., & Jones, N. (2017). Harnessing informal institutions to strengthen social protection for the rural poor. *Global Food Security*, 12, 73-79. Doi: 10.1016/j.gfs.2016.08.005.
- Susanty, A., Susanto, N., Denny, H., Prabowo, Y., Permadi, R. A. S., & Fauziyah, A. (2022). Designing the Interventions to Mitigate the Barriers of Coordination in Handling Food Security: Insight from Central Java Province. *Journal of Food Quality*, 2022. Doi: 10.1155/2022/6843474.
- Syamola, D., & Nurwahyuni, A. (2019). Determinan Ketahanan Pangan Rumah Tangga di Daerah Pedesaan di Indonesia (Analisis Data Susenas Tahun 2017) Determinants of Household Food Security in Rural Areas in Indonesia (Susenas Data Analysis, 2017). *Jurnal MKMI*, 15(1), 46-54.

- Global Food Security Index (GFSI) (2022). In *The Economist Intelligence Unit*. -- <https://impact.economist.com/sustainability/project/food-security-index/#global-overview>.
- Tirivayi, N., Knowles, M., & Davis, B. (2016). The interaction between social protection and agriculture: A review of evidence. *Global Food Security*, 10, 52-62. Doi: 10.1016/j.gfs.2016.08.004.
- Ullmann, H., Weeks, J. D., & Madans, J. H. (2019). *Children Living in Households That Experienced Food Insecurity: United States, 2019-2020 Key findings Data from the National Health Interview Survey*. -- <https://www.cdc.gov/nchs/products/index.htm>.
- Umaroh, H., & Pangaribowo, E. H. (2020). Determinants of rural household food security in Indonesia: the case of protein-based food consumption. *IOP Conference Series: Earth and Environmental Science*. Doi: 10.1088/1755-1315/451/1/012038.
- Warr, P. (2014). Food insecurity and its determinants. *Australian Journal of Agricultural and Resource Economics*, 58, 519-537. Doi: 10.1111/1467-8489.12073.
- Widada, A. W., Masyhuri, M., & Mulyo, J. H. (2017). Determinant Factors of Food Security in Indonesia. *Agro Ekonomi*, 28(2), 205. Doi: 10.22146/jae.26245.
- World Bank (2020). *Spending for Better Results*.
- World Bank Group (2018). *The State of Social Safety Nets*.

Copyright © FrancoAngeli

This work is released under Creative Commons Attribution - Non-Commercial –
No Derivatives License. For terms and conditions of usage please see: <http://creativecommons.org>



Gendered Labor Allocation in Smallholder Vegetable Production and Marketing: Evidence from Farming Households in Cebu, Philippines

Rosalyn P. Alburo^a, Lorelie Q. Escabal^b, Roberto C. Cutillar^a,
Tylo Junior L. van Steenhuyse^{*a}, Hemres M. Alburo^a

^a Cebu Technological University - Argao Campus, Philippines

^b Cebu Technological University - Barili Campus, Philippines

Abstract

This study examined sex-based differences in respondent-reported participation in smallholder vegetable production and marketing in Cebu, Philippines. Data were collected from 745 farmers in three upland vegetable-growing communities through structured household interviews. Descriptive statistics, Pearson's chi-square tests, Cramér's V, Phi coefficients, adjusted residuals, and Welch's t-test were used to assess breadwinner identification, educational attainment, farming experience, and participation in ten production and marketing activities. Breadwinner identification and educational attainment differed significantly by respondent sex, while farming experience did not. Male respondents reported higher participation in all activities, with the largest differences in pesticide spraying, harvesting, transport to market, and product selling. All chi-square findings remained significant after Bonferroni correction. Because one respondent was interviewed per household, the results represent between-group differences rather than paired spousal labor allocation. The findings provide task-specific evidence for extension interventions on pesticide safety, market access, and women's access to technical and market-related knowledge.

Article info

Type:

Article

Submitted:

16/04/2026

Accepted:

17/07/2026

Available online:

07/09/2026

JEL codes:

Q12, Q13, J16

Keywords:

Household labor
allocation
Smallholder
vegetable
farming
Gender roles
Market participation
Philippines

* *Corresponding author:* Tylo Junior L. van Steenhuyse - Biodiversity, Environment and Natural Resources Research Center (BENRC), Cebu Technological University - Argao Campus, Philippines. E-mail: benrc.argao@ctu.edu.ph

Introduction

Agriculture remains a vital source of livelihood in many developing countries, where rural households depend on farming for both food and income (Arrubla-Hoyos *et al.*, 2022). In smallholder production systems, household labor plays a central role in sustaining farm operations, crop management, and marketing activities. Men and women both contribute substantially to agricultural production, processing, and market participation, yet their roles are not always equally recognized or valued (Asadullah & Kambhampati, 2021; Dunne *et al.*, 2021; Food and Agriculture Organization [FAO], 2023). Differences in access to resources, control over farm income, and participation in decision making continue to shape how labor is allocated within agricultural households (Lambrecht *et al.*, 2018; Pierotti *et al.*, 2022).

In many farming communities, men are more commonly associated with physically demanding, input-related, and market-facing activities, whereas women are more frequently involved in routine crop management and supporting household and farm tasks (Akter *et al.*, 2017; Devkota & Pyakuryal, 2017; Mamaril & Lu, 2019). Such divisions of labor are important because they may influence productivity, exposure to risk, market participation, and the recognition of household economic contribution (Briones, 2018; FAO, 2023). Philippine studies have likewise shown that women contribute substantially to agricultural production but are often less visible in the formal recognition of farm leadership and economic roles (Basconcillo, 2019; Bertuso, 2019; Rosimo *et al.*, 2019).

These issues are especially relevant in vegetable farming, where labor requirements extend across land preparation, crop establishment, maintenance, pesticide application, harvesting, transport, and sale of produce. The way these tasks are distributed within farming households can affect not only production practices but also participation in local markets and access to farm-related knowledge and resources. Understanding who performs these activities is therefore important for analyzing labor organization in smallholder agrifood systems and for informing agricultural support interventions (Tatlonghari *et al.*, 2019; Verzosa *et al.*, 2021).

Vegetable production is an important agricultural activity in the Philippines and contributes to both household food supply and local market economies. Cabbage, pechay, and spring onion are commonly grown in upland areas under labor-intensive smallholder systems. Cebu is one of the recognized vegetable-producing areas in the country, particularly for cabbage, and supplies several provinces in the Visayas region (Philippine Statistics Authority, 2026). Yet empirical evidence on how labor is allocated across specific production and marketing tasks within vegetable farming households in Cebu remains limited. Previous work conducted in the same vegetable-

farming context in Cebu showed that the COVID-19 shock prompted institutional and local government responses aimed at sustaining vegetable production and farmer support in the area (Albuero *et al.*, 2025).

Building on this context, this study addresses three questions: (1) How do male and female respondents differ in household breadwinner roles, educational attainment, and farming experience? (2) How does participation in specific vegetable production and marketing activities vary by respondent sex? (3) Do male and female respondents differ in accumulated farming experience, and how should this difference, or its absence, be considered when interpreting participation patterns? The study therefore examines gendered labor allocation within smallholder vegetable farming households in Cebu, Philippines, and contributes a task-specific account of labor differentiation across the production and marketing chain, with implications for gender-sensitive extension and rural development. The study's contribution lies not in establishing the general existence of gender differentiation in agriculture, which is already well documented, but in providing task-by-task evidence across successive stages of an upland vegetable production and marketing chain. By estimating the magnitude of male–female differences across ten discrete activities, the analysis identifies where gendered participation is most pronounced within a labor-intensive vegetable system that remains underrepresented in the Philippine literature.

1. Theoretical framing and research questions

This study is informed by an intrahousehold perspective on farm labor allocation. Rather than treating the household as a single decision-making unit, bargaining and collective approaches emphasize that who controls resources, income, and mobility can shape who performs particular tasks and whose work is recognized (Doss, 2013; Duflo & Udry, 2004; Fiala & He, 2016). In agricultural settings, these processes often interact with gender norms that associate men with purchased inputs, mobility, risk-taking, and market exchange, while women are concentrated in routine but indispensable maintenance tasks (FAO, 2023; Lambrecht *et al.*, 2018; Pierotti *et al.*, 2022). Observed labor differences should therefore be interpreted not only as divisions of work, but also as expressions of authority, visibility, and access to productive resources.

From this perspective, three task dimensions are especially relevant in vegetable farming: physical demand, exposure to risk, and degree of market or input control. Tasks such as pesticide spraying, harvesting, transport, and selling are not only labor activities; they may also be attached to control over purchased inputs, cash income, and interaction with markets. By contrast,

transplanting, irrigation, and weeding are highly recurrent activities that are essential to production but often less visible in formal accounts of farm leadership. Based on the literature, gender gaps would be expected to be largest in activities involving hazard, mobility, and market exchange, and smaller, though still present, in routine crop management.

This issue is particularly relevant in labor-intensive vegetable production. Crops such as cabbage, pechay, and spring onion require repeated and varied operations from planting to marketing, and these activities may expose household members to different levels of physical effort, mobility demands, and production risks. Tasks such as pesticide application, harvesting, transport, and product selling may place certain household members in more visible or strategic positions within the farm economy, while routine maintenance tasks may remain less recognized despite their importance to production. Examining these patterns helps clarify how labor is organized in smallholder vegetable systems and how household participation relates to wider questions of livelihood, market engagement, and access to agricultural support (Asadullah & Kambhampati, 2021; Briones, 2018; Dunne *et al.*, 2021; FAO, 2023).

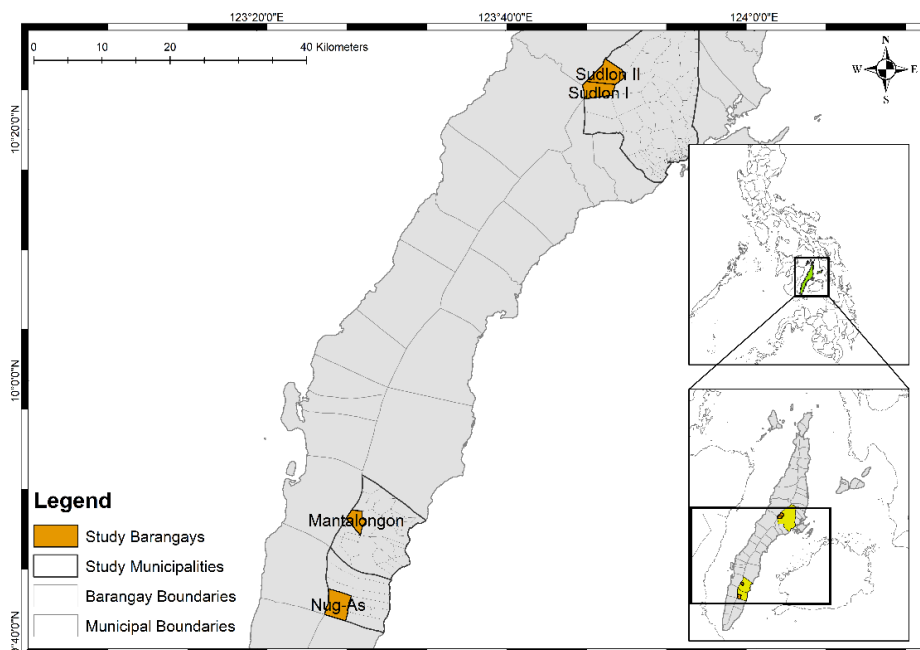
Guided by this framework, the study examines whether reported participation differs by respondent sex across specific production and marketing tasks, and whether these differences appear more consistent with gendered household role differentiation than with unequal farming experience. It also compares breadwinner roles and educational attainment in order to situate task participation within the broader social and economic organization of farming households.

2. Materials and methods

2.1. Study area

The study was conducted in Cebu Province in the Central Visayas region of the Philippines, an important vegetable-producing area supplying markets in several Visayan islands. As of December 2025, Cebu Province, as part of the Central Visayas Region, remained one of the leading cabbage-producing regions in the country (PSA, 2026). The analysis focused on three upland vegetable-growing communities selected purposively on the basis of their production of cabbage (*Brassica oleracea*), pechay (*Brassica rapa*), and spring onion (*Allium fistulosum*): Barangay Nug-As in Alcoy, Barangay Mantalongon in Dalaguete, and Barangays Sudlon I and Sudlon II in Cebu City. These areas are located at elevations of approximately 600 to 800 meters above sea level and are characterized by intensive smallholder vegetable production. The location of the study sites is shown in Figure 1.

Figure 1 - Map of Cebu, Philippines showing the study sites located in the mountain barangays of Alcoy, Dalaguete, and Cebu City



Source: Authors' elaboration in ArcGIS based on secondary spatial data.

2.2. Sampling and respondents

The study sites were selected purposively because they are established upland communities with active production of cabbage, pechay, and spring onion. The initial recruitment target was guided by available estimates of the number of vegetable farmers in the selected communities. Respondent recruitment used a non-probability purposive and convenience-based procedure. Field teams approached eligible farmers identified through guidance from local officials and through direct household visits within the farming communities. Farmers were eligible if they had cultivated cabbage, pechay, or spring onion during the previous 12 months and voluntarily agreed to participate.

A total of 745 eligible farmers were interviewed, comprising 211 respondents from Nug-As, 247 from Mantalongon, and 287 from Sudlon I and Sudlon II. The preferred respondent was the husband or wife involved in farm management. When neither was available, the eldest household

member engaged in farming activities was invited to participate. Because households were not selected through a probability-based random procedure and participation depended on accessibility, availability, and consent, the sample should not be interpreted as statistically representative of all farmers in Cebu. The findings apply primarily to the surveyed respondents and to comparable upland vegetable-farming communities.

2.3. Data collection and ethical considerations

Primary data were collected through face-to-face household interviews using a structured questionnaire developed and validated by the research team. Prior to data collection, ethical clearance was obtained from the authors' University Research Ethics (Humans) Committee, and permission was secured from the relevant municipal and city authorities, followed by courtesy visits to barangay officials. Consistent with good practice for non-interventional survey research, respondents were informed of the purpose of the study, the voluntary nature of their participation, the intended use of the data, and the treatment of their responses as confidential and anonymized in reporting. No personal identifiers were included in the analysis or presentation of results. The questionnaire gathered information on respondents' socioeconomic characteristics, farming experience, household breadwinner roles, educational attainment, and participation in selected agricultural activities related to vegetable production, harvesting, and marketing. Participation was voluntary, informed consent was obtained from all respondents, and all data were anonymized prior to analysis.

2.4. Analytical framework and variables

The analysis examines sex-based differences in respondents' reported participation in selected vegetable production and marketing activities. In this study, gendered labor allocation is operationalized as differences between male and female respondents in their self-reported participation in selected vegetable production and marketing activities. It is therefore a between-group measure of reported participation and not a paired observation of how husbands and wives divided labor within the same household.

Respondent sex is the primary grouping variable, and participation in selected production and marketing activities constitutes the main outcome set. Breadwinner role, educational attainment, and farming experience are treated as contextual variables because they help distinguish whether gendered participation patterns are associated with household role recognition,

schooling, or accumulated practical experience. The selected activities were chosen to cover successive stages of the vegetable chain: land preparation, crop establishment, crop maintenance, chemical application, harvesting, transport, and selling; this is so that routine tasks can be compared with market-facing and higher-risk tasks.

Primary data consist of responses from the household survey administered in the study sites. Secondary data from the Philippine Statistics Authority are used only to contextualize the role of Cebu in vegetable production and are not combined with the survey data in the inferential tests. Because the study sites were selected purposively from active vegetable-producing communities, the findings are analytically focused on smallholder vegetable households in these sites rather than statistically representative of all farms in Cebu or the Philippines.

Because the data are cross-sectional and based on self-reported participation from one household respondent, the analysis is designed to identify patterned associations rather than causal effects. The results therefore indicate reported participation and its recognition within households, not directly observed time use or a complete measure of intrahousehold labor allocation. This distinction is important because husbands and wives may differ in how they report authority and work contributions. For this reason, effect sizes are interpreted substantively and the conclusions are framed cautiously.

2.5. Data analysis

The study examined labor participation in selected vegetable production and marketing activities using respondent sex as the main grouping variable. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' socioeconomic characteristics.

To examine whether participation in selected agricultural activities differed significantly between male and female respondents, Pearson's chi-square test of independence was applied. Effect sizes for significant associations were measured using the Phi coefficient (ϕ) for 2×2 contingency tables and Cramér's V for larger contingency tables. These measures were used to assess not only whether associations were statistically significant, but also the magnitude of the observed differences. Because 12 chi-square tests were conducted across the breadwinner, educational-attainment, and activity-participation analyses, sensitivity to multiple testing was assessed using a Bonferroni correction. The adjusted significance threshold was $\alpha = 0.00417$. Unadjusted p-values are reported in the tables for readability, but all reported

associations remained statistically significant after correction. Differences in years of vegetable farming experience between male and female respondents were examined using Welch's independent-samples t-test, which does not assume equal population variances. This analysis assessed whether male and female respondents differed in accumulated vegetable-farming experience.

Data were analyzed using Microsoft Excel. Welch's independent-samples t-test was conducted using the Data Analysis ToolPak, while contingency tables, Pearson's chi-square tests, effect sizes, adjusted residuals, and the Bonferroni sensitivity assessment were calculated or verified using spreadsheet computation.

3. Results

3.1. Socioeconomic characteristics of vegetable farmer respondents

The socioeconomic characteristics of the respondents are presented in Table 1. Of the 745 vegetable farmers interviewed, 53.4% were male and 46.6% were female, indicating that both men and women were substantially involved in smallholder vegetable production in the study areas. The respondents had a mean age of 44.68 ± 13.79 years, with the largest shares belonging to the 30-39 years (24.8%) and 40-49 years (26.0%) age groups. Farmers aged 50 years and above also accounted for a considerable proportion of the sample. Overall, this age structure suggests that vegetable production in the selected communities is largely carried out by economically active adults with long-standing involvement in farm and household activities.

The data also show a generally modest educational profile. More than half of the respondents (52.1%) had elementary education, 36.4% had reached high school, and only 9.0% had attained college education, while very few had no formal education (2.6%). This pattern is consistent with observations in earlier agricultural studies showing that lower educational attainment may constrain access to improved practices, information, and other farm-related opportunities (Lambrecht *et al.*, 2018; Mamaril & Lu, 2019). In smallholder production systems, such educational patterns may shape how farm households engage with production decisions, markets, and technical support.

With respect to household economic roles, 60.5% of respondents identified the husband as the primary household breadwinner, whereas 27.7% reported shared breadwinning between spouses. Only 8.1% identified the wife as the primary breadwinner and 3.8% identified a son or daughter. This distribution suggests that while male economic leadership remains the dominant pattern in the study areas, a substantial proportion of households also rely on shared

spousal income generation. Such a pattern is broadly in line with findings that women contribute significantly to rural household livelihoods even when men are more frequently recognized as principal providers (Asadullah & Kambhampati, 2021; Dunne *et al.*, 2021).

Table 1 - Socioeconomic characteristics of vegetable farmer respondents

Variable	Category	Percentage (n=745)
Sex	Male	53.4
	Female	46.6
Age (years)	Mean $\pm$ SD	44.68 $\pm$ 13.79
	<30	14.9
	30-39	24.8
	40-49	26.0
	50-59	17.3
	$\geq$ 60	16.9
Educational attainment	No formal education	2.6
	Elementary	52.1
	High school	36.4
	College	9.0
Primary household breadwinner	Husband	60.5
	Wife	8.1
	Both spouses	27.7
	Son/Daughter	3.8
Years of experience	Mean $\pm$ SD	18.62 $\pm$ 13.05
	<5 years	12.9
	5-10 years	23.6
	11-20 years	30.6
	>20 years	32.9

Note: SD = standard deviation; years of experience represent the maximum number of years reported for cultivating cabbage, pechay, or spring onion.

Source: Authors' elaboration based on household survey data.

Respondents also had considerable farming experience. Mean years of experience reached 18.62 $\pm$ 13.05, and most respondents had been engaged in cultivating cabbage, pechay, or spring onion for more than 10

years. In particular, 30.6% reported 11-20 years of experience and 32.9% reported more than 20 years. This indicates that vegetable production in the study communities is largely undertaken by experienced farmers. Taken together, the age, education, breadwinner, and experience profiles suggest that labor allocation in these households occurs within established smallholder production systems where both economic responsibility and farm participation are embedded in long-term household arrangements. The implications of these characteristics for gendered labor participation are examined in the succeeding sections.

3.2. Household breadwinner roles by gender

The distribution of household breadwinner roles by respondent gender is presented in Table 2. Results show a significant association between respondent gender and the identified household breadwinner ($\chi^2(3) = 72.16$, $p < 0.001$), with a moderate strength of association as indicated by Cramér's $V = 0.31$. This suggests that male and female respondents differed meaningfully in how household economic responsibility was identified.

Among male respondents, 73.9% identified the husband as the primary household breadwinner, compared with 45.2% among female respondents. In contrast, shared breadwinning between spouses was reported by 39.2% of female respondents but only 17.6% of male respondents. Female respondents also more frequently identified the wife as the primary household breadwinner (12.4%) than did male respondents (4.3%). The proportion identifying a son or daughter as the breadwinner was low in both groups. Furthermore, examination of adjusted residuals showed that the association was primarily driven by male respondents identifying the husband as breadwinner more frequently than expected (adjusted residual = 7.97), while female respondents identified the wife or both spouses more frequently than expected (adjusted residuals = 4.06 and 6.58, respectively). Identification of a son or daughter as breadwinner contributed little to the overall association.

These results suggest that although male economic leadership remains dominant in many vegetable farming households, women tend to view household income generation as more shared between spouses. This pattern is consistent with broader observations that women's contributions to rural household livelihoods are often substantial but may be less visibly recognized in household and economic decision-making (Asadullah & Kambhampati, 2021; Dunne *et al.*, 2021; FAO, 2023). In the context of smallholder vegetable production, this finding is relevant because household perceptions of breadwinning may influence how labor, income, and decision-making responsibilities are organized within the farm household. The relatively

high proportion of households reporting shared breadwinning suggests that vegetable production and marketing are embedded not only in individual labor roles but also in joint household livelihood strategies.

Table 2 - Distribution of household breadwinner roles by respondent gender (n=745)

Breadwinner	Male (%)	Female (%)
Husband	73.9	45.2
Wife	4.3	12.4
Both spouses	17.6	39.2
Son/Daughter	4.3	3.2

$\chi^2(3) = 72.16$, $p < 0.001$, Cramér's $V = 0.31$.

Source: Authors' elaboration based on household survey data.

3.3. Educational attainment and farming experience of farmers by gender

The distribution of educational attainment by respondent gender is presented in Table 3. The results indicate a significant association between gender and educational attainment ($\chi^2(3) = 15.39$, $p = 0.002$), although the strength of the association was small, as shown by Cramér's $V = 0.14$. In both groups, the largest proportion of respondents had elementary education, accounting for 53.5% among males and 50.4% among females. Female respondents were more represented in the high school category (42.1%) than male respondents (31.4%), whereas male respondents had a higher proportion of college education (11.8%) than female respondents (5.8%). The proportion of respondents with no formal education was low for both sexes. Adjusted residuals indicated that the educational association was mainly attributable to the higher-than-expected representation of female respondents in the high-school category and male respondents in the college category.

These results suggest that the educational profile of vegetable farmers in the study areas remains generally modest, with most respondents concentrated at the elementary and high school levels. Although the association between gender and educational attainment was statistically significant, the small effect size indicates that the difference was not substantial. This pattern is consistent with earlier observations that lower levels of formal education may constrain farmers' access to information, improved practices, and other farm-related opportunities, while gendered labor roles in agriculture are shaped not only by schooling but also by

household responsibilities and access to productive resources (FAO, 2023; Lambrecht *et al.*, 2018; Mamaril & Lu, 2019).

Table 3 - Distribution of educational attainment by respondent gender (n=745)

Educational attainment	Male (%)	Female (%)
No formal education	3.3	1.7
Elementary	53.5	50.4
High school	31.4	42.1
College	11.8	5.8

$\chi^2(3) = 15.39$, $p = 0.002$, Cramér's $V = 0.14$.

Source: Authors' elaboration based on household survey data.

The comparison of farming experience between male and female respondents is presented in Table 4. Results of Welch's independent samples *t*-test revealed no significant difference in years of vegetable farming experience between male and female farmers ($t(734.88) = -0.17$, $p = 0.867$). All 745 observations were included in the analysis, comprising 398 male and 347 female respondents. The fractional degrees of freedom resulted from the Welch–Satterthwaite unequal-variance adjustment. Male respondents had a mean farming experience of 18.54 ± 13.25 years, while female respondents had a mean of 18.70 ± 12.83 years. This indicates that male and female farmers had broadly comparable levels of experience in cultivating cabbage, pechay, or spring onion.

The absence of a statistically significant difference indicates that male and female respondents had comparable accumulated experience in cultivating the target vegetables. Farming experience therefore does not appear to account for the observed between-group participation differences. This is consistent with recent studies showing that the livelihood assets of farming households are linked to farm performance, suggesting that labor allocation should likewise be interpreted within the wider socioeconomic structure of the household (Hariyati *et al.*, 2025). In the context of household labor allocation, this is important because it indicates that the differences observed later in production and marketing activities are less likely to be explained by unequal familiarity with vegetable farming and more likely to reflect established household labor arrangements and socially defined roles within smallholder farming households (FAO, 2023; Mamaril & Lu, 2019).

Table 4 - Comparison of farming experience between male and female farmers (n = 745)

Gender	n	Mean years $\pm$ SD
Male	398	18.54 $\pm$ 13.25
Female	347	18.70 $\pm$ 12.83

Welch's $t(734.88) = -0.17$, $p = 0.867$, SD = standard deviation.

Source: Authors' elaboration based on household survey data.

3.4. Labor participation in vegetable production and marketing by gender

Gender differences in participation in selected agricultural activities are presented in Table 5; while Figure 2 shows the corresponding male–female differences in percentage points. The differences were calculated as the percentage of male respondents reporting participation minus the percentage of female respondents reporting participation; positive values therefore indicate higher reported participation among male respondents. The results indicate that all ten selected activities were significantly associated with respondent gender ($p < 0.001$), showing that male and female farmers did not participate equally across the vegetable production and marketing chain. In all activities, male respondents reported higher participation than female respondents, although the strength of association varied considerably. The substantive meaning of these differences depends not only on whether they are statistically significant, but also on where the widest gaps occur across the production and marketing chain. All ten activity-level associations remained significant after application of the conservative Bonferroni-adjusted threshold of $\alpha = 0.00417$. The substantive conclusions were therefore unchanged after accounting for multiple testing.

In land preparation and crop establishment, male participation was consistently higher than female participation. Manual tillage involved 58.9% of male respondents and 25.6% of female respondents ($\chi^2 = 82.93$, $\phi = 0.33$), while seed selection and transplanting of seedlings likewise showed significant differences, with male participation reaching 50.0% and 76.1%, respectively, compared with 25.1% and 47.6% among female respondents. These results indicate that male respondents reported higher participation in physically demanding and early-stage crop establishment activities. Similar patterns have been observed in earlier studies in rice, taro, and pineapple production, where men were more strongly associated with labor-intensive field operations, while women participated in more supportive or complementary roles (Basconcillo, 2019; Bertuso, 2019; Ezaki *et al.*, 2022; Lambrecht, 2016; Mamaril & Lu, 2019).

A similar trend was observed in crop maintenance activities. Manual irrigation, manual weeding, and foliar fertilizer application were all significantly more common among male respondents than among female respondents. However, the effect sizes for these activities were smaller than those observed for later-stage operations, suggesting that women remained substantially involved in routine crop management even when men still predominated. This pattern is consistent with previous findings that women often participate actively in maintenance activities such as watering and weeding, although men frequently retain stronger control over field management and input application, particularly in more commercialized farming systems (Bertuso, 2019; Ezaki *et al.*, 2022; Mensah *et al.*, 2018; Rosimo *et al.*, 2019).

The strongest gender disparity was observed in pesticide spraying, where 85.8% of male respondents participated compared with only 17.5% of female respondents ($\chi^2 = 348.75$, $\phi = 0.68$). As shown in Figure 2, pesticide spraying had by far the widest participation gap among all activities. This suggests that chemical pest management is overwhelmingly undertaken by men in the study communities. Comparable observations have been reported in other farming systems, where pesticide application is commonly assigned to men because it is perceived as hazardous, technically demanding, or closely linked to control over farm inputs (Ezaki *et al.*, 2022; Mamaril & Lu, 2019; Rosimo *et al.*, 2019). In household production terms, this concentration of chemical handling in male labor may also indicate unequal control over technically sensitive or higher-risk tasks within the farm enterprise.

Gender disparities also remained substantial in harvesting and marketing. Harvesting involved 83.0% of male respondents and 43.5% of female respondents ($\chi^2 = 125.77$, $\phi = 0.41$), while transporting vegetables to market and product selling likewise showed moderate gender differences. Figure 2 further shows that harvesting, transport, and selling were among the activities with the widest participation gaps after pesticide spraying. These findings suggest that male respondents reported higher participation in tasks requiring physical effort, mobility, and direct market interaction. The observed participation patterns may also be shaped by structural conditions beyond individual household preferences. Distance to markets, transport availability, local buyer arrangements, access to vehicles, and the organization of input and output channels can influence which household member undertakes mobility-intensive or cash-related activities. Migration or temporary off-farm employment may further alter the labor available to a household and redistribute production responsibilities. These factors may interact with gender norms and bargaining power by affecting who has access to transport, technical information, purchased inputs, and market income. Similar patterns have been documented in studies showing that men are

more likely to dominate harvesting, transport, and market-facing roles, while women participate more where marketing occurs nearer the household or in less mobility-intensive settings (Bertuso, 2019; Ezaki *et al.*, 2022; Ferguson *et al.*, 2020; Rosimo *et al.*, 2019). A related Cebu study on vegetable marketing during the COVID-19 period likewise showed that transport, market access, and selling arrangements were central to the functioning of local vegetable chains, underscoring the importance of identifying which household members perform these market-facing roles (Alburo *et al.*, 2024).

Interpreted through an intrahousehold lens, the largest gender gaps are concentrated in tasks that combine hazard, mobility, and market or input control. Pesticide spraying requires handling purchased inputs and exposure to health risks; harvesting, transport, and selling connect the farm directly to output realization and cash income. The concentration of men in these activities is therefore consistent not only with physical task differentiation, but also with gendered authority over risky, visible, and market-linked functions of the farm enterprise. By contrast, women's substantial participation in transplanting, irrigation, and weeding indicates concentration in regular and indispensable maintenance work. The pattern is consistent with gendered differences in reported task participation rather than with a difference in accumulated farming experience. Direct conclusions about within-household role allocation would require paired spouse interviews or time-use observations.

In this article, the term complementary is used descriptively rather than normatively. It indicates that male and female respondents reported different participation patterns across tasks of the production and marketing process, not that these arrangements are necessarily efficient, equitable, or freely chosen. In settings where access to income, mobility, and input decisions is uneven, complementarity may coexist with constraint and unequal recognition. This distinction matters for interpreting gender specialization without romanticizing it. The findings are consistent with the theoretical expectation that gender norms and bargaining conditions shape not only the amount of agricultural labor performed but also the type and visibility of tasks undertaken. Activities connected to hazardous inputs, mobility, and cash realization may carry greater authority or economic visibility, while frequent maintenance activities may remain less visible despite being essential to production. Nevertheless, the study did not directly measure bargaining power, control over income, ownership of productive resources, or decision-making authority. The results therefore support the relevance of these theoretical concepts but do not independently verify the mechanisms through which they operate.

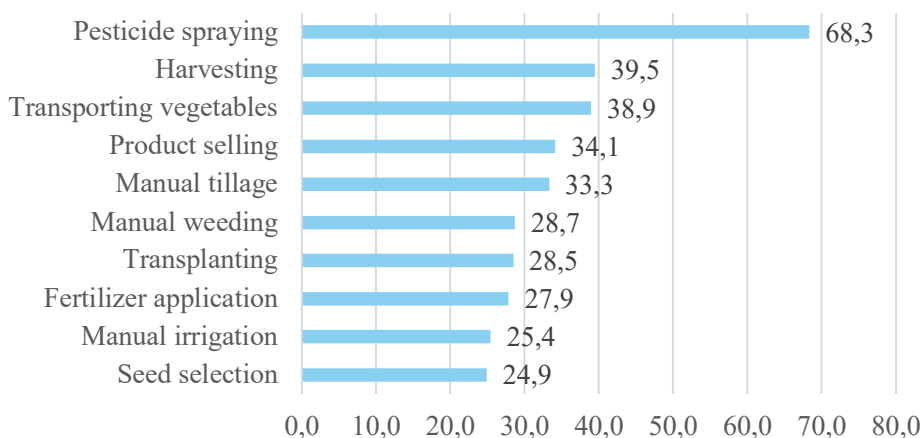
Table 5 - Differences in participation in selected agricultural activities by respondent gender (n = 745)

Activity	Male (%)	Female (%)	χ^2	df	p-value	ϕ
Manual tillage	58.9	25.6	82.93	1	p < 0.001	0.33
Seed selection	50.0	25.1	48.70	1	p < 0.001	0.26
Transplanting of seedlings	76.1	47.6	64.83	1	p < 0.001	0.29
Manual irrigation	61.5	36.1	48.35	1	p < 0.001	0.25
Manual weeding	86.7	58.0	78.32	1	p < 0.001	0.32
Foliar fertilizer application	51.9	24.0	60.51	1	p < 0.001	0.28
Pesticide spraying	85.8	17.5	348.75	1	p < 0.001	0.68
Harvesting	83.0	43.5	125.77	1	p < 0.001	0.41
Transporting vegetables to market	55.5	16.6	119.22	1	p < 0.001	0.40
Product selling	67.6	33.5	86.62	1	p < 0.001	0.34

Note: χ^2 = Pearson's chi-square statistic; df = degrees of freedom; ϕ = Phi coefficient (effect size).

Source: Authors' elaboration based on household survey data.

Figure 2 - Male-female difference in respondent-reported participation across selected agricultural activities (in percentage points)



Note: Values represent male participation percentage minus female participation percentage and are expressed in percentage points. Positive values indicate higher reported participation among male respondents.

Source: Authors' elaboration based on household survey data.

These comparisons are between male and female respondents and should not be interpreted as paired measures of labor division between spouses. The results identify sex-based differences in self-reported participation across the sample, but they do not establish how tasks were divided between two members of the same household.

Conclusions

The study found systematic sex-based differences in respondent-reported participation across ten vegetable production and marketing activities. Male and female respondents had comparable farming experience, but male respondents reported substantially greater participation in pesticide spraying, harvesting, transport, and product selling. Female respondents also participated considerably in transplanting, irrigation, weeding, and other routine crop-maintenance activities. Reported breadwinner identification differed by respondent sex, indicating that perceptions of household economic responsibility were also gendered.

These findings describe between-group patterns among male and female respondents rather than a paired division of labor between spouses within the same households. The main contribution of the study is the task-by-task mapping of reported participation across successive stages of an upland vegetable value chain. The concentration of the largest differences in hazardous, mobility-intensive, and market-facing activities is consistent with theoretical explanations involving gender norms, resource access, and bargaining conditions.

The policy implication is that gender-sensitive agricultural support should be matched to the task structure of household labor. Extension on pesticide safety, post-harvest handling, transport logistics, and market participation should explicitly consider the higher reported participation of male respondents in those activities while also addressing women's access to related knowledge and decision-making. At the same time, interventions aimed at seedling establishment, irrigation, and crop maintenance should treat women as core agricultural actors rather than auxiliary labor. Labor-saving technologies and safer-input practices may be particularly valuable where routine maintenance burdens and market access reported participation differs across respondent groups.

Future research should use paired spouse interviews, repeated or longitudinal household observations, and time-use records to measure directly how labor is divided within households. Studies should also collect information on land and asset ownership, income control, decision-making authority, migration, transport access, buyer relationships, and value-chain participation in order to test how gender norms, bargaining power, and structural market conditions influence agricultural work.

Acknowledgements

The authors gratefully acknowledge the financial support provided by the Department of Science and Technology – Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD), through its Socio-Economics Research Division (SERD), for the conduct of this study.

Conflict of Interest

The authors declare no conflict of interest.

Declaration of Generative AI Use

During the preparation of this article, the authors used ChatGPT (OpenAI) to support language improvement, wording refinement, and organization of parts of the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

References

- Akter, S., Rutsaert, P., Luis, J., Htwe, N. M., San, S. S., Raharjo, B., & Pustika, A. (2017). Women's empowerment and gender equity in agriculture: A different perspective from Southeast Asia. *Food Policy*, 69, 270-279. Doi: 10.1016/j.foodpol.2017.05.003.
- Alburo, R. P., Alburo, H. M., Cutillar, R., van Steenhuyse, T. J., & Escabal, L. Q. (2024). Marketing strategies of farmers and middlemen on selected locally produced vegetables during the Covid-19 pandemic. *Library Progress International*, 44(3), 23632-23644. Doi: 10.48165/bapas.2024.44.2.1.
- Alburo, R. P., Alburo, H. M., Escabal, L. Q., Cutillar, R. C., van Steenhuyse, T. J., & Cutillas, A. L. (2025). Empowering agriculture: A comprehensive study of LGU initiatives for vegetable farmers in Cebu, Philippines amidst COVID-19. *Economia Agro-Alimentare/Food Economy - Open Access*, 27(3). Doi: 10.3280/ecag2025oa19869.
- Arrubla-Hoyos, W., Ojeda-Beltrán, A., Solano-Barliza, A., Rambauth-Ibarra, G., Barrios-Ulloa, A., Cama-Pinto, D., Arrabal-Campos, F. M., Martínez-Lao, J. A., Cama-Pinto, A., & Manzano-Agugliaro, F. (2022). Precision agriculture and sensor systems applications in Colombia through 5G networks. *Sensors*, 22(19), 7295. Doi: 10.3390/s22197295.

- Asadullah, M. N., & Kambhampati, U. (2021). Feminization of farming, food security and female empowerment. *Global Food Security*, 29, 100532. Doi: 10.1016/j.gfs.2021.100532.
- Basconcillo, J. A. (2019). Gender and climate change adaptation: A case study of flood-prone rice-farming villages in Bulacan, Philippines. In T. R. Paris & M. F. Rola-Rubzen (Eds.), *Gender dimension of climate change research in agriculture: Case studies in Southeast Asia* (pp. 51-68). Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA); CGIAR Research Program on Climate Change, Agriculture, and Food Security (CCAFS). -- <https://cgspace.cgiar.org/server/api/core/bitstreams/e41f2f24-9186-41c2-b2cc-577414d3fbfe/content>.
- Bertuso, A. (2019). Gender, climate change, and root and tuber crops: A case study in Eastern Visayas, Philippines. In T. R. Paris & M. F. Rola-Rubzen (Eds.), *Gender dimension of climate change research in agriculture: Case studies in Southeast Asia* (pp. 69-90). Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA); CGIAR Research Program on Climate Change, Agriculture, and Food Security (CCAFS). -- <https://cgspace.cgiar.org/server/api/core/bitstreams/e41f2f24-9186-41c2-b2cc-577414d3fbfe/content>.
- Briones, R. M. (2018). *The wage gap between male and female agricultural workers: Analysis and implications for gender and development policy* (Discussion Paper Series 2018-15). Philippine Institute for Development Studies (PIDS). Doi: 10.62986/dp2018.15.
- Devkota, D., & Pyakuryal, K. N. (2017). Changed gender roles and rural agricultural system. *Journal of Agriculture and Forestry University*, 1, 35-47.
- Doss, C. (2013). Intrahousehold bargaining and resource allocation in developing countries. *The World Bank Research Observer*, 28(1), 52-78. Doi: 10.1093/wbro/lkt001.
- Duflo, E., & Udry, C. (2004). *Intrahousehold resource allocation in Cote d'Ivoire: Social norms, separate accounts and consumption choices* (NBER Working Papers No. 10498). National Bureau of Economic Research, Inc. Doi: 10.3386/w10498.
- Dunne, C., Sietto, C., & Wilson, P. (2021). Investigating the economic visibility and contribution of UK women in agriculture through a systematic review of international literature. *Journal of Rural Studies*, 86, 330-345. Doi: 10.1016/j.jrurstud.2021.06.012.
- Ezaki, A. P. L., Vargas, D., Vallejo, C. A., Rafael, P., Hail, P., & Dollente, J. (2022). Role of queen pineapple farmers' cooperative in addressing gender-divide needs in the Philippines rural communities amidst pandemic (COVID-19). *Journal of Positive School Psychology*, 6(8), 2386-2415.
- FAO (2023). *The status of women in agrifood systems*. FAO. Doi: 10.4060/cc5343en.
- Ferguson, S., Brace-Govan, J., & Martin, D. M. (2020). Gender status bias and the marketplace. *Journal of Business Research*, 107, 211-221. Doi: 10.1016/j.jbusres.2018.11.047.
- Fiala, N., & He, X. (2016). Unitary or noncooperative intrahousehold model? Evidence from couples in Uganda. *The World Bank Economic Review*, 30(Supplement 1), S77-S85. Doi: 10.1093/wber/lhw011.

- Hariyati, Y., Muhtadi, K., Ria, V. Y., Rahman, R. Y., Ibanah, I., Suwasono, S., Setiyono, Subroto, G., Rosyady, M. G., Savitri, D. A., & Suharijadi, D. (2025). The linkage between livelihood assets and technical efficiency of cocoa farmer households in East Java Province, Indonesia. *Economia agro-alimentare/Food Economy - Open Access*, 27(2). Doi: 10.3280/ecag2025oa18223.
- Lambrecht, I. (2016). "As a husband I will love, lead, and provide" gendered access to land in Ghana (No. 01514; IFPRI Discussion Paper, pp. 188-200). International Food Policy Research Institute. Doi: 10.1016/j.worlddev.2016.07.018.
- Lambrecht, I., Schuster, M., Asare Samwini, S., & Pelleriaux, L. (2018). Changing gender roles in agriculture? Evidence from 20 years of data in Ghana. *Agricultural Economics*, 49(6), 691-710. Doi: 10.1111/agec.12453.
- Mamaril, M., & Lu, J. L. (2019). Roll up your sleeves: Why is it important to highlight gender in agriculture? *Journal of International Women's Studies*, 20(3), 139-153.
- Mensah, M., Villamor, G., & Vlek, P. L. G. (2018). Gender specific determinants of inorganic fertilizer adoption in the semi-arid region of Ghana. *West African Journal of Applied Ecology*, 26(SI), 179-192.
- Philippine Statistics Authority (2026). 2025 Q4 major vegetables and root crops quarterly bulletin. Philippine Statistics Authority. -- <https://library.psa.gov.ph/cgi-bin/koha/opac-detail.pl?biblionumber=37668>.
- Pierotti, R. S., Friedson-Ridenour, S., & Olayiwola, O. (2022). Women farm what they can manage: How time constraints affect the quantity and quality of labor for married women's agricultural production in southwestern Nigeria. *World Development*, 152, 105800. Doi: 10.1016/j.worlddev.2021.105800.
- Rosimo, M., Dalusag, J., Gonsalves, J., & Vidallo, R. (2019). Incorporating a gender dimension in a participatory community-based project: A case study in Guinayanang, Quezon Province, Philippines. In: T. R. Paris & M. F. Rola-Rubzen (Eds.), *Gender dimension of climate change research in agriculture: Case studies in Southeast Asia* (pp. 157-180). Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA); CGIAR Research Program on Climate Change, Agriculture, and Food Security (CCAFS). -- <https://cgspace.cgiar.org/server/api/core/bitstreams/e41f2f24-9186-41c2-b2cc-577414d3fbfe/content>.
- Tatlonghari, G., Paris, T., & Villanueva, D. (2019). Gendered vulnerabilities and adaptation to climate change: The experience of rice farmers of Nueva Ecija, Philippines. In: T. R. Paris & M. F. Rola-Rubzen (Eds.), *Gender dimension of climate change research in agriculture: Case studies in Southeast Asia* (pp. 91-104). Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA); CGIAR Research Program on Climate Change, Agriculture, and Food Security (CCAFS). -- <https://cgspace.cgiar.org/server/api/core/bitstreams/e41f2f24-9186-41c2-b2cc-577414d3fbfe/content>.
- Verzosa, F., Cabriole, M. A., Thant, P. S., Phen, B., Itliong, K., Myae, C., Thong, C., Urdelas, F. G., Naung, Y. W., Moe, M. Z., Tola, C., Barbon, W. J., Monville-Oro, E., & Gonsalves, J. (2021). *Pathways to women's empowerment in the promotion of climate smart agriculture in the Philippines, Myanmar, and Cambodia*. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). -- <https://cgspace.cgiar.org/server/api/core/bitstreams/b53d6f71-37e1-473d-9c64-ef71fc50ad3a/content>.

Economia agro-alimentare / Food Economy

An International Journal on Agricultural and Food Systems

Vol. 28, Iss. 2, Art. 6, pp. 113-136 - ISSN 1972-4802

DOI: 10.3280/ecag2026oa22668



The effect of PGI and Organic labelling on consumers' Willingness To Pay: Evidence from an experimental auction

Nour Ouzari^{*,a}, Claudio Bellia^a, Roberta Selvaggi^a, Alessandro Scuderi^a,
Matilde Reitano^a, Gioacchino Pappalardo^a

^a University of Catania, Italy

Abstract

As numerous studies have attempted to explain the variables influencing food-related purchasing decisions, in this article, we explored Italian consumers' preferences and willingness to pay for two different sustainability labels, the EU Organic Farming and the Protected Geographical Indication (PGI), in southern Italy, while highlighting the food values that can guide consumers' choices and affect their willingness to pay. The current study extends the application of an established methodological framework, combining different food values with food labelling, aiming to explore and measure the WTP of consumers for the Pachino cherry tomato. Data collection was conducted using a non-hypothetical experimental auction technique following a two-treatment design. The results showed that different food values influence consumers' purchasing decisions in general, and, more specifically, the factor groupings of origin and naturalness affect their willingness to pay. Consumers in our case study offered almost the same first price for PGI tomatoes and organic tomatoes, which is higher than the price offered for conventional tomatoes. This shows that the willingness to pay is affected by choice criteria based on food values and is considered important by Italian consumers.

Article info

Type:

Article

Submitted:

27/04/2026

Accepted:

24/07/2026

Available online:

09/09/2026

JEL codes:

D12, D44, C92

Keywords:

Food labelling

Organic food

Protected

Geographical

Indication (PGI)

Consumers'

Willingness to

Pay (WTP)

Experimental

auctions

* *Corresponding author:* Nour Ouzari - PhD student - Section of Agri-Food Economics - Department of Agricultural, Food and Environment (Di3A) University of Catania (Italy) - S. Sofia Street 98-100, 95123, Catania. E-mail: nour.ouzari@phd.unict.it

Introduction

In recent decades, there has been a steady increase in the demand for high-quality meals due to many factors, such as health and environmental concerns, as well as the expectations of more aware and discerning consumers (Mancuso *et al.*, 2024). Besides, consumers are increasingly concerned about the transparency and safety of the food they eat, since they are unable to properly understand the intricate dynamics of today's food supply chains (Meyerding *et al.*, 2019). In this regard, the European Union (2021) has created several trademarks, also called EU quality labels. These labels aim to protect, inform, and assist customers in making food choices. They also act as a food control instrument (Dias and Mendes, 2018). Furthermore, they help farmers and producers better sell their products effectively, providing customers with assurances about the provenance of food products, their production methods, and traditional knowledge (De Canio and Martinelli, 2021). Above all, certified goods are made in accordance with a specific code of practice. This attests to the product's 'traditional' status and details its unique features, the borders of its production region, and its manufacturing process (Török *et al.*, 2022).

In particular, the Protected Designations of Origin (PDO) and Protected Geographical Indications (PGI), which are based on a product's association with a specific territory, have been introduced as part of the legal framework for local products (European Community Regulations No. 510/2006), and recognized as key labels of product quality and as tools for protection (Garavaglia and Mariani, 2017; Bellia *et al.*, 2015a). The 'organic' label was also created when the European Parliament and Council introduced quality certifications for organic agri-food products (Regulation (EU) No 2018/848). This legislation states that organic products were created in response to a market in which consumers requested goods produced in a way that promotes animal welfare, environmental preservation, and rural development, while preserving Europe's biodiversity (Sampalean *et al.*, 2021).

However, consumer spending on organic food items in Italy totalled 2.5 billion euros in 2018, accounting for 3% of the total value of the country's agri-food industry (ISMEA, 2019). Based on this evidence, it is not surprising that researchers are looking more closely at factors and drivers that influence food purchasing and choice. However, it is challenging to fully explain the numerous factors that are involved in food-related decisions. Many studies have attempted to overcome this obstacle by identifying the most pertinent purchasing drivers (Baldi *et al.*, 2021; Aprile *et al.*, 2012; Meyerding *et al.*, 2019; Gracia and de-Magistris, 2016; Garavaglia and Mariani, 2017; Sampalean *et al.*, 2021). Indeed, given the current shift in consumer

behaviour and purchasing patterns towards environmentally friendly products, the importance of credible quality cues has grown (Moser, 2016; Prakash *et al.*, 2019). The purchase of a particular product or feature is often seen as a means of achieving a desired end state, which may help to explain why consumers choose one option over another (Lusk, 2011; Lusk and Briggeman, 2009). Notably, values have the ability to influence consumer behaviour in a variety of contexts, including the decision to buy (Gutman, 1982). Previous research has suggested using food values, such as safety or product origin, to reveal solid patterns of consumer desire (Pappalardo and Lusk, 2016).

Within this context, the study aims to provide new insight into the factors that influence consumers' purchasing intentions with regard to two product categories that are widely acknowledged as genuine in the food literature: PGI labelling and organic food items.

Yet, the desire for local and organic products has been rising recently because of their ethical credentials (Aprile *et al.*, 2012). Based on this assumption, it was suitable and interesting to create an explanatory study about a specific food product, to investigate consumer knowledge of and preferences for particular attributes, and to analyse the main factors that influence consumer purchasing motivations, using a non-hypothetical experimental auction technique.

The concrete consumers' buying intentions and willingness to pay (WTP) for local and organic food labels were compared to identify commonalities and variations in the factors influencing customers' purchasing decisions. The current study applies the methodological framework established by Pappalardo and Lusk (2016) to the case of Pachino cherry tomato. Specifically, it combines food values, which provide insight into drivers of food consumption, and food labelling, which guides consumers towards more informed choices, to assess consumers' WTP for this product. This may be advantageous for the scientific literature as well as researchers in the sector.

The main objective of this work is to understand consumer purchasing intentions, as indicated by their WTP for a specific high-quality product identified by a particular brand. As well as to determine if there is a difference in consumers' WTP for tomatoes carrying different labels, taking into consideration the economic barrier other than the environmental one. We addressed two main specific research questions: (RQ1) How do certifications differentially influence WTP for tomatoes? (RQ2) To what extent do food values influence WTP?

1. Literature Review

1.1. General background: informed purchasing decisions based on food labelling

Consumers today are more conscious, selective, and sensitive about the authenticity, quality, and safety of food. They are also extremely interested in understanding how the meals they purchase affect the environment (Ran *et al.*, 2022). However, around 30% of greenhouse gas emissions are caused by the food system, which raises environmental expenses (Poore and Nemecek, 2018). As a result, it is critical that consumers can collect information about environmentally conscious and healthful diets at the point of sale and use it to inform their choice of products (Jürkenbeck, 2023). According to the literature, labelling is a crucial component of different communication techniques and signals (Garavaglia and Mariani, 2017), and consumer knowledge and understanding of label information are critical, as they are the main source of information (Savelli *et al.*, 2021). Indeed, the purpose of sustainability labelling is to assist consumers in finding products that satisfy their demands when they are searching for sustainable substitutes for traditional food items (Weinrich and Spiller, 2016; Ingrassia *et al.*, 2022).

According to the European Commission (2018), the European quality schemes are critical in preserving the legacy of European agriculture by protecting traditional production techniques and preventing imitation or adulteration of regional products. Thus, the EU helps ensure the survival of regional culinary traditions and the knowledge and skills that accompany them by promoting these products. Moreover, European quality schemes serve to increase consumer awareness and trust in the genuineness and quality of food products (Selvaggi *et al.*, 2023).

Research indicates that consumers are impacted by front-of-pack (FOP) labelling while making food purchases (Shangguan *et al.*, 2019). They can now trust and recognise high-quality products thanks to EU quality recognition, which also helps companies avoid free riding and trade on added-value marketplaces (Sampalean *et al.*, 2021). Furthermore, more focus is being placed on identifying the information and certifications related to production sites and specific production methods that consumers use to judge the quality of food products and how those characteristics may affect their decision to buy. Nowadays, a sustainable diet is linked to a number of different labels on the market (Biasini *et al.*, 2021). Nutrition claims on food products, for example, may assist consumers in focusing their choices on the health component.

Yet, the consumption of organic food has increased in recent decades due to consumers' perceptions of food safety and quality. (Hurtado-Barroso *et*

al., 2019). Thus, the use of organic certification labels is an important factor influencing consumers' attitudes towards organic food (Malissiova *et al.*, 2022). In this regard, buyers can use the organic label to demonstrate their commitment to environmental issues to consumers (Jürkenbeck, 2023).

Evidence of organic farming labels shows that consumers see these labels favourably and that organic products are more expensive than conventional ones (Aprile and Punzo, 2022). Also, organic certification is communicated to consumers by product labelling, which might include extra organic certification logos or just a generic label with the prefix "organic". Indeed, research revealed that consumers also associate the organic label with several characteristics, such as the perception that the items are healthier than meals made conventionally (Richetin *et al.*, 2022).

1.2. Findings from the literature on methods of measuring the WTP for different food labels

Using choice experiments, Janssen and Hamm (2012) examined consumers' WTP for various organic labels across six European nations. They revealed significant variations in these WTPs. They also suggested that consumers were willing to pay considerably higher prices for well-known labels. Regardless of their own national level of specialisation in food quality, EU consumers appeared to recognise the organic farming designation more universally (European Commission, 2018).

Furthermore, if a consumer is influenced by ethical concerns when purchasing food items, he or she might favour goods that benefit rural development (PGIs, for example). In this regard, origin labelling schemes are seen as an important instrument that allows consumers to connect a product's origin to its overall quality. In the past ten years, consumers' preference for local food has received significant international attention (Bavorova *et al.*, 2016). However, certified Geographical Indications (GIs) are created in accordance with a code of practice that details the goods' unique characteristics, the manufacturing process, and the boundaries of the production region (Török *et al.*, 2022). Therefore, these labels could significantly contribute to sustainable rural development (Aprile *et al.*, 2012; Bellia *et al.*, 2015c) by offering clear details about the origin and production processes of goods. This empowers customers to make informed decisions and builds confidence in the European food market (Glogoveţan *et al.*, 2023).

However, accounting for the domestic origin of the product provides additional information on the factors that influence customers' purchasing decisions, as consumers may view country-of-origin labelling as an indication of increased product safety and a stronger sense of connection to their

homeland (Aprile and Punzo, 2022). Several studies have opted to measure individual WTP for tomato attributes by estimating the commonly used discrete choice experiments (Baldi *et al.*, 2021; Aprile and Punzo, 2022; Meyerding *et al.*, 2019), examining the impact of retrieved attitude factors on WTP. These studies require a high cognitive effort on the participant's side, as they are mainly based on a hypothetical food product. However, in hypothetical decision situations, participants experience no consequences for their choices (Jürkenbeck, 2023). As a result, when expressing personal opinions, they might reflect biased, subjective, and overestimated attitudes (De Houwer *et al.*, 2013). Other studies in the literature have opted to measure the WTP for food products, focusing on a single attribute using choice experiments (e.g., Menapace *et al.*, 2011; Janssen and Hamm, 2012; Török *et al.*, 2022; Malissiova *et al.*, 2022).

Nevertheless, compared to other methods of studying consumer preferences, such as the previously mentioned choice experiment, contingent valuation, and conjoint analysis, the use of real goods and money in experimental auctions allows a real market environment to be simulated and incentive-compatible conditions to be met. They produce data that closely matches customer preferences (Chen and Chai, 2010). Overall, it is important to note that consumers are willing to pay more for food products bearing sustainability labels than for similar unlabelled products. (Aprile and Punzo, 2021). By assisting in the development of focused labelling strategies and laws, food producers and policymakers can better understand the potential synergies of consumer demand for environmental sustainability labels.

2. Materials and methods

2.1. Data collection

The survey was conducted in Sicily, Italy, between May and October 2022. A specific experimental design involving two treatments was developed using a between-subjects approach, with participants being randomly assigned to one of the two treatments. Data were collected through an experimental auction procedure, with participants recruited with the support of various local trade associations. A random sample of 117 consumers was recruited and invited to attend an experimental laboratory on agreed dates and times for the experimental phase. The experimental procedure comprised three sections: first, participants completed a Best-Worst (BW) questionnaire to rate their food preferences; next, the experimental auction was conducted to determine their WTP for tomatoes; finally, participants completed a socio-demographic questionnaire.

2.2. Best-worst questions

In the first section, participants were asked to complete a sequence of ten BW questions relating to food values in general, not just tomatoes. In this study, BW was used to assess the importance of specific attributes when purchasing food products in general. The list of adopted food values is referred to as Pappalardo and Lusk (2016). Table 1 shows all the food values considered in the experimental design and the descriptions provided to participants for each.

Table 1 - Food values and descriptions

Value	Description
Taste	The extent to which the consumption of the food is appealing to the senses
Price	The price you pay for the food
Safety	Eating the food will not make you sick
Appearance	Food looks appealing and appetizing
Origin	Where the agricultural commodities were grown (local, national, or abroad)
Environmental impact	Effects of food production on the environment
Healthiness	When a product is good for health
Labelled information	Information reported by labels regarding the product's characteristics
Naturalness	The extent to which food was made without modern food technologies (genetic engineering, hormone treatment, and food irradiation)
Convenience	Ease with which food is cooked and/or consumed

The values were randomly aggregated so that each attribute was repeated the same number of times. The 10 food values were divided into sets of 5 attributes, for a total of 10 BW question sets. In each set, the question remained the same: "When buying food, which of the following is the most important and which is the least important?" For each question, only one food value had to be indicated as "Best" and one as "Worst". The scores for each attribute were summed across all participants to produce a total score for each attribute: higher positive scores indicate greater importance, and higher negative scores indicate less importance.

2.3. Auction procedure

After completion of the BW questionnaire, participants took part in a non-hypothetical second-price auction aimed at eliciting their WTP for 500g packs of tomatoes. As the experimental auction mechanism, we chose the Vickrey second-price auction for its proven ability to elicit participants' actual WTP, thanks to its incentive-compatible nature (Vickrey, 1961; Lusk and Briggeman, 2009). This method was commonly adopted in the literature on consumer food preferences because it yields a reliable and quantifiable estimate of individuals' WTP (Pappalardo and Lusk, 2016; Reitano *et al.*, 2024; McCallum *et al.*, 2025). Each participant submitted a bid for each type of tomato, and the highest bidder won the product but paid the second-highest bid. Otherwise, they did not obtain the product and incurred no cost. It is important to note that the winner of a product is required to pay the auction price in real money. All bidders had an equal chance of winning, regardless of their valuations.

Before the start of the auction, the moderator explained the procedure to all participants. Each participant was presented with a 500g pack of tomatoes and was given a chance to examine the product and read its information. During this inspection phase, the moderator read the label aloud. In this study, the participants were asked to bid on three kinds of tomatoes successively in three rounds of the auction. Auction targets were conventional Pachino tomato, Pachino PGI Tomato, and organic Pachino tomato in the three rounds, and participants took part in each round. To account for potential order effects related to the presentation of information across products, a between-subjects treatment design was implemented. Depending on the treatment condition assigned, the sequence in which product information was provided varied. Thus, in Treatment 1, one participant received information in the following sequence: in the first round, generic information on the conventional tomato being auctioned, indicating only the area of origin. In the second round, detailed information on the PGI label of the Pachino tomato, and in the third round, information on the organic Pachino tomato. In Treatment 2, the sequences were inverted in the second and third rounds. Participants were randomly assigned to one of two treatments.

After three rounds of the auction, one round was randomly selected to determine the binding round and product. The moderator notified the winners (the highest bidders) for each group, who then paid the second-highest bid and received the binding product. The other participants were not required to pay anything. At the end of the experimental procedure, each participant received a €10 gadget box as a token of appreciation for their participation in the study.

2.4. Data processing

All statistical analyses were conducted using IBM SPSS Statistics software version 29.0.2.0 (20).

In order to proceed with the elaboration and analysis of the gathered data, we opted for Principal Component Analysis (PCA). Before performing PCA, the perceived importance of each food value was assessed based on participants' responses to the BW scaling. For each attribute, an individual importance score was calculated using the following formula:

$$\text{Average score} = \text{Count}_{\text{best}} - \text{Count}_{\text{worst}}$$

where “Countbest” indicates the number of times an attribute was selected as the most important (“best”), and “Countworst” represents the number of times it was selected as the least important (“worst”). To compute these scores, each time an attribute was chosen as “best,” it was assigned a value of +1, while each time it was identified as “worst,” it was assigned a value of -1. Since each attribute appeared five times throughout the questionnaire, the possible range of resulting scores for each attribute varied from a minimum of -5 to a maximum of +5.

These individual scores were subsequently used as input for the PCA, which is a helpful statistical method for lowering the number of original variables to a smaller set. The PCA creates new variables, or principal components, by identifying the linear correlations between the original variables in order to explain the potential variability of the original data. The sequence of these principal components is such that the largest amount of variability is explained by the first component, followed by the next largest amount by the second, and so on. In summary, PCA is a helpful statistical method for simplifying a data set's interpretation by lowering the number of variables. In addition to producing a smaller set of new variables, referred to as principal components, which represent the same variability in the original data (Moreno-Escobar *et al.*, 2023). Additionally, the PCA approach subjectively increases the weight of some parameters while decreasing the weight of others that have less bearing on output results (Jaouachi, 2012).

PCA nevertheless remains a potent method for extracting structure from input datasets that may have many dimensions. It is easily accomplished by resolving an eigenvalue problem. It entails projecting the incoming data into two primary components, or axes. The majority of the structure in the input data may frequently be summarised by a small number of principal components (Gazzah *et al.*, 2015). However, according to Kagraoka (2016) and Meloun *et al.* (2017), the number of shared elements needs to be determined using a set of standards. In our study, we applied the criterion of explained variance (the chosen factors should explain as large a proportion

of the overall variability as possible) and the principle of eigenvalues (factors with eigenvalues greater than one are considered significant).

We can calculate the factor loadings once the number of factors has been established. One variable may correlate with multiple factors throughout these calculations, which could lead to uncertainty in the results. The rotation is used to optimise the differences between factors. The rotations enable factor loadings, or correlations between variables and factors, to take on a form that makes explanations clearer and more precise (Bucko *et al.*, 2018). In our analysis, Varimax rotation was used to find the best possible explanation of the factors.

Finally, the average WTP was calculated for each kind of tomato using the following formula:

$$\text{Average WTP} = \frac{\Sigma(\text{WTP})}{n}$$

Where: “Average WTP” is the overall average WTP, “WTP” is the value of an individual’s WTP, and “n” is the number of participants.

To further investigate the factors influencing changes in WTP, two multiple linear regression analyses were conducted. The first model was estimated using the principal components extracted from the value-related attributes through principal component analysis (PCA). These components captured the underlying dimensions of consumers’ food-related values, and their inclusion allowed for a more structured assessment of how latent preferences influence WTP. In addition, a second regression model incorporated independent variables representing both socio-demographics and behavioural characteristics. To ensure the final model was interpretable, variables showing significant associations with WTP in the exploratory models were retained, while still capturing the key factors that had been highlighted. Both models aimed to quantify the impact of these variables on WTP, assessing which specific factors had a statistically significant effect on consumers’ WTP across the different tomato types.

3. Results

3.1. Sample characteristics

Table 2 presents summary data of the sample’s demographic attributes. The sample included 117 respondents. The sample’s gender balance was equal, with approximately 53% female respondents. The ages of the participants ranged from 18 to 63 years old, and the most represented age

group was 18-24 (55.6%). As regards educational level, most participants reported having a college degree (37.6%) and a high school diploma (54.7%).

The composition of the participants' households was heterogeneous. However, more than half of the participants (64.1%) came from households consisting of more than three individuals. Nevertheless, triad households consisting of three family members accounted for 21.4% of participants, while nuclear families made up of one more member than the participant accounted for 8.5%.

Table 2 - Sample characteristics

Quota description		n.	%
Age	18-24 y.o.	65	55.6
	25-49 y.o.	42	35.9
	50-63 y.o.	9	7.7
	Over 63 y.o.	1	0.9
Gender	Male	54	46.2
	Female	62	53.0
	Prefer not to say	1	0.9
Marital Status	Married/cohabiting	21	17.9
	Never been married	50	42.7
	Separated/Divorced/Widowed	46	39.3
Education	Middle school	2	1.7
	High school	64	54.7
	College degree	44	37.6
	Post-graduate (PhD, Master's)	7	6.0
Net household income, per year	Under €20.000	41	35.0
	From €20.000 to €39.999	31	26.5
	From €40.000 to €59.999	24	20.5
	From €60.000 to €79.999	12	10.3
	From €80.000 to €99.999	6	5.1
	Over €100.000	3	2.6
Household size	1	7	6.0
	2	10	8.5
	3	25	21.4
	More than 3	75	64.1

Quota description		n.	%
Residential area	Rural	59	50.4
	Urban	58	49.6
Most frequently purchased Tomato packaging	Packaged	56	47.9
	Unpacked	61	52.1
Frequency of tomato purchase	Never	2	1.7
	Rarely	6	5.1
	Sometimes	26	22.2
	Often	59	50.4
	Always	24	20.5
The most common place to buy tomatoes	Supermarket	62	53.0
	Regional market, farmer's market, or other forms	27	23.1
	Specialty shop (fruit and vegetables)	22	18.8
	Mini-market	1	0.9
	Street vendors	5	4.3

Overall, half of the surveyed people (50.4%) indicated that they frequently purchase tomatoes, of which a basically balanced percentage is purchased in bulk (52.1%) and in packaged form (47.9%).

3.2. Best-worst findings

Table 3 reports the descriptive statistics of the importance scores attributed to each food value, as derived from the BW scaling. Among the most positively evaluated attributes, “Safety” (average = 0.95), “Origin” (average = 0.57), and “Healthiness” (average = 0.47) emerged as the top priorities for respondents. Notably, Safety also registered the most extreme minimum value (min = -2.00). Naturalness, although associated with the second-highest minimum importance score (min = -3.00), exhibited the lowest average value among the positively evaluated attributes (0.42). This suggests that while some consumers consistently prioritize natural characteristics, others attach less importance to this dimension, resulting in a more variable overall perception. These results reinforce the idea that certain intrinsic food values drive consumer decision-making in the food context.

Conversely, attributes such as “Convenience”, “Appearance”, and “Environmental impact” received the lowest scores. The low importance assigned to those values suggests that these aspects are perceived as secondary when compared to attributes directly related to personal well-being and intrinsic product characteristics. This interpretation is further supported by the observation that both “Convenience” (max = 4.00) and “Appearance” (max = 3.00) also reported the lowest maximum scores.

Intermediate attributes such as Naturalness (average = 0.42) and Labelled Information (average = 0.44) reported moderately positive mean scores, while Taste (average = -0.05) and Price (average = -0.03) were characterized by values very close to zero, suggesting a relatively neutral evaluation by participants.

Table 3 - Results of BW scaling

	Average	Std. Dev.	Min	Max
Labelled information	0.44	2.01	-5.00	5.00
Healthiness	0.47	2.00	-4.00	5.00
Environmental impact	-0.54	1.75	-5.00	5.00
Taste	-0.05	1.43	-4.00	5.00
Naturalness	0.42	1.49	-3.00	5.00
Convenience	-1.66	2.01	-5.00	4.00
Price	-0.03	2.14	-5.00	5.00
Safety	0.95	1.74	-2.00	5.00
Appearance	-0.55	1.67	-5.00	3.00
Origin	0.57	1.94	-5.00	5.00

3.3. Elements influencing consumer purchasing behaviour

To calculate the number of factors, we employed PCA, eigenvalues, and explained variance. The PCA enabled us to group the purchasing components into four factors, which explain 65.66% of the total variance (Table 4). This result, obtained through the BW questions, has enabled us to identify the various elements that influence the purchasing behaviour of the respondents based on food values.

Based on eigenvalues greater than 1.0, four factors were selected as the outcome of the initial analysis. However, as the factor loadings were unclear, we rotated the factors using the Varimax method to make the results easier to understand and interpret. The results are shown in Table 5 below.

Table 4 - Total variance explained by the PCA

Explained total variance									
Components	Initial eigenvalues			Load Sums of Extraction Squares			Load sums of rotation squares		
	Total	% of variance	% cumulative	Total	% of variance	% cumulative	Total	% of variance	% cumulative
1	2.477	24.767	24.767	2.477	24.767	24.767	1.838	18.383	18.383
2	1.745	17.451	42.218	1.745	17.451	42.218	1.766	17.657	36.041
3	1.313	13.129	55.347	1.313	13.129	55.347	1.504	15.037	51.077
4	1.032	10.318	65.665	1.032	10.318	65.665	1.459	14.587	65.665
5	0.984	9.837	75.502						
6	0.744	7.437	82.938						
7	0.666	6.657	89.596						
8	0.577	5.772	95.367						
9	0.463	4.628	99.995						
10	0.000	0.005	100.000						
Extraction method: Principal component analysis									

The first factor reflects consumers' tendency to pay attention to the "labelled information" (0.150) on the tomatoes they buy, as well as "healthiness" (0.835) and "safety" (0.683). This suggests that consumers who value health-related attributes may also critically evaluate label content. This factor contributed the most to explaining the total variance with 24.77%. The second factor essentially includes taste, convenience, price, and appearance. This factor explains around 17.45% of the total variance and shows strong positive associations with "taste" (0.743) and moderate loadings for "convenience" (0.294), "price" (0.168), and "appearance" (0.132). This component addresses people's desire to check that the product they intend to purchase is good. Factor 3 is defined by strong loadings on "naturalness" (0.810) and "origin" (0.397). This factor explains 13.13% of the total variance explained and reflects a preference for products perceived as authentic, minimally processed, and locally sourced. In the fourth factor, the most important purchase criteria presented is the "environmental impact" (0.919), suggesting the emergence of a distinct segment of environmentally conscious consumers for whom sustainability is a decisive criterion in food choices. This factor explains 10.32% of the total variance. Based on these outcomes, we can conclude that the growing attention paid to product labelling, health, and safety confirms that consumers today prioritise these aspects when making purchases.

Table 5 - Component matrix after rotation

	Components			
	1	2	3	4
Labelled information	0.150	-0.774	-0.154	-0.177
Healthiness	0.835	0.110	-0.073	0.074
Environmental impact	-0.070	0.041	0.017	0.919
Taste	0.007	0.743	0.001	-0.256
Naturalness	0.045	0.217	0.810	0.254
Convenience	-0.437	0.294	-0.660	0.135
Price	-0.443	0.168	-0.155	-0.522
Safety	0.683	-0.021	0.335	0.007
Appearance	-0.365	0.132	-0.298	-0.393
Origin	-0.352	-0.650	0.397	0.045
Rotation method: Varimax with Kaiser normalisation				

Overall, the PCA results reveal four meaningful dimensions that shape consumers' purchasing behaviour: attention to health and label information, preference for sensory and practical features, concern for naturalness and product origin, and environmental awareness. These findings underline the complexity of consumer decision-making and the coexistence of utilitarian, hedonic, and ethical motivations.

3.4. Consumers' WTP for tomatoes

The consumers' WTP for the three types of labelled tomatoes, presented in Table 6, shows that the consumers' mean bid values for the conventional, PGI, and Organic types were €1.55, €2.00, and €2.01, respectively. To assess statistically significant differences across labelling schemes, we conducted paired sample t-tests on WTP differences (Δ WTP) between treatments.

Table 6 - Consumers' bid for a differently labelled tomato

	Average WTP (€)	Standard error	95% Confidence Interval
Conventional	1.55	0.084	1.39-1.72
PGI	2.00	0.110	1.79-2.22
Organic	2.01	0.109	1.79-2.23

Table 7 - Pairwise WTP differences (Δ WTP) based on paired *t*-tests

Comparison	Δ WTP (€)	p-value
PGI-Conventional	0.45	< 0.001***
Organic-Conventional	0.46	< 0.001***
Organic-PGI	0.01	0.9202

Note: The null hypothesis is mean difference = 0, and the probability is $(|T| > |t|)$.
The symbol *** denotes significance at the 1 per cent level.

Results show that consumers are willing to pay a statistically significant premium for both certified products compared to the conventional product. In particular, the average WTP premium is €0.45 for PGI relative to the conventional product ($p < 0.001$) and €0.46 for organic tomatoes relative to the conventional product ($p < 0.001$). These results indicate that certification schemes significantly increase consumers' WTP compared to the baseline product. In contrast, no statistically significant difference was found between PGI and organic tomatoes ($\Delta = €0.01$, $p = 0.92$), which suggests that consumers do not differentiate between these two types of certifications in monetary terms in the context of this study.

To investigate the factors influencing consumers' WTP for conventional, PGI, and organic tomatoes, multiple linear regressions were estimated.

The specification of the regression model is as follows:

$$WTP_i = \beta_0 + \beta_1 \times PC1_i + \beta_2 \times PC2_i + \beta_3 \times PC3_i + \beta_4 \times PC4_i \\ + \beta_5 \times Gender_i + \beta_6 \times Age_i + \beta_7 \times Marital\ Status_i \\ + \beta_8 \times Rural\ Residency_i + \beta_9 \times Tomato\ packaging_i + \varepsilon_i$$

Where WTP_i , the dependent variable, represents the WTP of individual i for a specific tomato type (conventional, PGI, or organic); β_0 denotes the intercept; β_n are the coefficients associated with the four principal components extracted from the food value dimensions and socio-demographic and behavioural characteristics; ε_i is the error term.

Table 8 summarizes the estimated coefficients and significance levels for each variable.

Table 8 - Regression analysis of factors influencing WTP

Variable	Conventional	PGI	Organic
PC1	-0.112	0.004	0.052
PC2	-0.217**	-0.182*	-0.150
PC3	0.024	0.150	0.302**
PC4	0.038	0.056	0.089
Gender	-0.120	-0.276	-0.179
Age	-0.018**	-0.009	0.001
Marital Status	-0.435***	-0.364*	-0.316*
Rural residence	0.158	0.154	0.322
Tomato packaging	0.299*	0.355*	0.187

Notes: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively.

Model statistics:

- Conventional: R-squared: 0.178; Adjusted R-squared: 0.108
- PGI: R-squared: 0.137; Adjusted R-squared: 0.064
- Organic: R-squared: 0.214; Adjusted R-squared: 0.148

The results indicate that among the components, PC2 exhibits a statistically significant negative effect on WTP for conventional tomatoes ($p < 0.05$) and a weaker (marginally significant) effect for PGI products. This suggests that consumers who place greater emphasis on attributes such as taste, convenience, price, and appearance tend to exhibit lower willingness to pay for labelled products, potentially reflecting a stronger orientation toward immediate product attributes rather than credence characteristics. Conversely, PC3 shows a positive and statistically significant effect on WTP for organic tomatoes ($p < 0.05$), indicating that consumers who value naturalness and origin are more likely to pay a premium for organic products. No significant effects emerge for PC1 and PC4 across the three product categories.

Turning to socio-demographic variables, marital status consistently shows a negative and statistically significant association with WTP across all models, with stronger significance levels for conventional and PGI products. This indicates that individuals in certain household structures may exhibit more price-sensitive behaviour. There is a negative effect of age on WTP for conventional tomatoes ($p < 0.05$), suggesting that older consumers are less willing to pay a premium for standard products. No significant effect is observed for labelled alternatives. The variable capturing purchasing habits (i.e., tomato packaging) shows a positive and marginally significant effect for both conventional and PGI tomatoes. This suggests that consumers'

purchasing routines are associated with a higher stated willingness to pay in these categories. No statistically significant effects are observed for gender and rural residency, although the latter displays a positive (but non-significant) coefficient in all specifications.

The regression model explains approximately 17.7% of the variance for conventional tomatoes, 13.7% for PGI, and 21.4% for organic products. These relatively low R-squared values highlight the inherent complexity of consumer preferences and indicate that additional unobserved factors may play a critical role in shaping WTP. Ozili (2023) points out that, in the social sciences, a low R-squared is acceptable if the explanatory variables are statistically significant. Although our results show limited explanatory power, they meet this condition.

4. Discussion and conclusions

Food labelling schemes play an essential role in guiding consumers' purchasing decisions by indicating certain product features that cannot be determined at the time of selection or after consumption. Specifically, sustainability labels enable consumers to consider certain environmental factors when choosing food that suits their tastes.

Furthermore, organic foods and PGI items differ since they use distinct production techniques, yet they both have the same “image” as genuine, ethical, and high-quality goods. This is something that has become increasingly acknowledged by the market, not only by academic research. For example, food retailers are identifying the food macro categories under investigation as premium brands, especially when it comes to their private labelling regulations. Customers do, in fact, increasingly view them as genuine, high-quality food products, but they are also more likely to “feel” that they can support sustainable production and consumption practices (Aprile *et al.*, 2012).

Based on these assumptions, the present research first developed a BW questionnaire and then used experimental auctions to investigate the effect of labels such as ‘organic’ and ‘PGI’ on consumer preferences and WTP for a specific fresh food product: the Pachino cherry tomato (Bellia *et al.*, 2015b). However, as they are becoming more interested in regional and locally produced goods, as well as organic produce, it was important to examine their purchasing motivations further and establish whether there are any similarities or differences.

It is undeniable that tomatoes are cherished products in Italy, representing its food culture and way of life; nonetheless, Italy is a major exporter of tomatoes worldwide (FAOSTAT, 2017). Given this, it was important to

understand the purchasing habits of this food item, which, as shown in the results, is a basic product in all households (50% of respondents said they OFTEN buy tomatoes, while 20% said they ALWAYS buy them). Especially when this product is no longer conventional and is certified, it is more appreciated by consumers.

Indeed, Italians are generally willing to pay the highest premium for the quality of origin from Southern Europe. Conversely, they are not satisfied with tomatoes that are imported from outside of Europe (Baldi *et al.*, 2021). They believe that a tomato from Southern Europe is more socially sustainable, even if it is grown with high water use in a region that may experience water scarcity and is likely to fall into the local food trap (Born and Purcell, 2006; Baldi *et al.*, 2019).

Our study showed that consumers significantly preferred PGI- and organic-certified tomatoes, despite the similar price, suggesting that they attach the same level of importance to them as they do to tomatoes from conventional farming. Therefore, to determine whether this assumed similarity is justified, a reading of the factors influencing consumer purchasing behaviour for these food products in light of sustainable development is necessary. As part of our investigation, we tried to compare consumers' intentions to purchase organic and PGI-labelled Pachino cherry tomato, and examine the influence of certain food values on attitude-intention.

As the results of the PCA demonstrate, consumers generally prioritise the factor that encompasses these three elements (labelling, healthiness, and safety) when choosing food. So, when it comes to a particular product, especially tomatoes, they tend to base their choices mainly on these values. The overall findings of this study show that consumers are more likely to buy food products when sustainability labels are present. Consistent with our objectives, the study confirmed that the presence of informed labels increases consumers' WTP. More specifically, the components of the third factor, 'Naturalness and origin', are considered to affect not only consumers' choice of food, but also their willingness to pay. This confirms that consumers in Italy are willing to pay more for fresh tomatoes locally grown and therefore rich in symbolic origin features.

Unlike other studies, which have found that consumers may value PGI or local certification more than organic certification (Meyerding *et al.*, 2019; Gracia and de-Magistris, 2016; Garavaglia and Mariani, 2017; Sampalean *et al.*, 2021) or vice versa (McLeod *et al.*, 2023; Menapace *et al.*, 2011; Panico *et al.*, 2014), our study found that consumers assigned the same weight to both labels and offered almost the same premium price for both organic and PGI-certified tomatoes compared to the conventional ones. This is to say that consumers' WTP was positively impacted by awareness of food safety and certification. WTP was higher for the labelled Pachino tomato than the

conventional one for consumers who were highly concerned about food safety or knowledgeable about certification.

Consumers in this study indicated that safety, labelled information, and healthiness were the most important food qualities, with taste in second place. These results are consistent with earlier studies on food values, which found that taste and safety are among the most crucial factors for buyers (Bazzani *et al.*, 2018; Cerroni *et al.*, 2021). The correlation between food values and food labels among consumers confirmed the idea that additional information is helpful, as evidenced by the rise in label preference share following the addition of the label's definition.

However, the importance of buying packaged tomatoes appears to affect consumers' WTP, as the participants in our study revealed that they consider certain characteristics to be important when purchasing food, specifically the healthiness and safety of products as guaranteed by food labels.

These findings pave the way for new methods of analysing food consumption patterns, which could be useful for creating sustainable marketplaces that adhere to green regulations. These outcomes are possible if marketers and policymakers have a thorough understanding of how various consumer categories will respond to certain policy situations. This is particularly true when measures are to be taken in the food industry.

It is noted that there are three main limitations of our study. Firstly, a limited geographical area, as our study was held at a regional scale, covering only a part of southern Italy. Another limitation concerns the demographic composition of our sample, which was heavily weighted towards younger consumers (55.6% of participants aged 18–24). This age imbalance, combined with the geographical limitations of the sample, restricts our ability to generalise the results to the national level and to all Italian consumers. Furthermore, we only compared consumers' WTP for two kinds of labels, which are PGI and Organic. In fact, there are many EU and national labels in the Italian market. WTP for tomatoes carrying other labels needs to be researched further.

References

- Aprile, M. C., Caputo, V., & Nayga Jr, R. M. (2012). Consumers' valuation of food quality labels: the case of the European geographic indication and organic farming labels. *International Journal of Consumer Studies*, 36(2), 158-165. Doi: 10.1111/j.1470-6431.2011.01092.x.
- Aprile, M.C., & Punzo, G. (2022). How environmental sustainability labels affect food choices: Assessing consumer preferences in southern Italy. *Journal of Cleaner Production*, 332, 130046. Doi: 10.1016/j.jclepro.2021.130046.

- Baldi, L., Bertoni, D., Migliore, G., & Peri, M. (2019). How alternative food networks work in a metropolitan area? An analysis of Solidarity Purchase Groups in Northern Italy. *Agricultural and Food Economics*, 7(1), 20. Doi: 10.1186/s40100-019-0139-3.
- Baldi, L., Trentinaglia, M.T., Mancuso, & T., Peri, M. (2021). Attitude toward environmental protection and toward nature: how do they shape consumer behaviour for a sustainable tomato?. *Food Quality and Preferences*, 90, 104175. Doi: 10.1016/j.foodqual.2021.104175.
- Bavorova, M., Unay Gailhard, I., & Lehberger, M., (2016). Who buys from farmers' markets and farm shops: a case of Germany. *International Journal of Consumer Studies*, 40(1), 107e114. Doi: 10.1111/ijcs.12220.
- Bazzani, C., Gustavsen, G. W., Nayga, R. M., & Rickertsen, K. (2018). A comparative study of food values between the United States and Norway. *European Review of Agricultural Economics*, 45(2), 239-272. Doi: 10.1093/erae/jbx033.
- Bellia, C., Adernò, C., & Allegra, V. (2015a). Economic Sustainability of A Niche Supply Chain: The Case of Maletto Strawberry. *Quality - Access to Success*, 16(S1), 47-56.
- Bellia, C., & Safonte, F. (2015b). Agri-food products and branding which distinguishes quality. Economic dimension of branded products such as pdo/ pgi under EU legislation and value-enhancement strategies. *Economia agro-alimentare/Food Economy*, 1, 81-105. Doi: 10.3280/ECAG2015-001005.
- Bellia, C., Bonfiglio, G., & Adernò, C. (2015c). Food Poverty and Solidarity Networks in Italy. *Rivista di Studi sulla Sostenibilità*, 2, 95-112. Doi: 10.3280/RISS2015-002009.
- Biasini, B., Rosi, A., Giopp, F., Turgut, R., Scazzina, F., & Menozzi, D. (2021). Understanding, promoting and predicting sustainable diets: a systematic review. *Trends in Food Science & Technology*, 111, 191-207. Doi: 10.1016/j.tifs.2021.02.062.
- Born, B., & Purcell, M. (2006). Avoiding the local trap: Scale and food systems in planning research. *Journal of Planning Education and Research*, 26(2), 195-207. Doi: 10.1177/0739456x06291389.
- Bucko, J., Kakalejčík, L., & Ferencová, M. (2018). Online shopping: Factors that affect consumer purchasing behaviour. *Cogent Business & Management*, 5(1), 1535751. Doi: 10.1080/23311975.2018.1535751.
- Cerroni, S., Nayga, J. R. M., Pappalardo, G., & Yang, W. (2021). Malleability of food values amid the COVID-19 pandemic. *European Review of Agricultural Economics*. Doi: 10.1093/erae/jbab025.
- Chen, T. B., & Chai, L. T. (2010). Attitude towards the environment and green products: Consumers' perspective. *Management Science and Engineering*,
- De Canio, F., & Martinelli, E. (2021). EU quality label vs organic food products: A multigroup structural equation modeling to assess consumers' intention to buy in light of sustainable motives. *Food Research International*, 139, 109846. Doi: 10.1016/j.foodres.2020.109846.
- De Houwer, J., Gawronski, B., & Barnes-Holmes, D. (2013). A functional-cognitive framework for attitude research. *European Review of Social Psychology*, 24(1), 252-287. Doi: 10.1080/10463283.2014.892320.

- Dias, C., & Mendes, L. (2018). Protected Designation of Origin (PDO), Protected Geographical Indication (PGI) and Traditional Speciality Guaranteed (TSG): A bibliometric analysis. *Food Research International*, 103, 492-508. Doi: 10.1016/j.foodres.2017.09.059.
- European Commission (2018). Special Eurobarometer 473: Europeans, Agriculture and the CAP. Survey requested by the European Commission, Directorate General for Agriculture and Rural Development and co-ordinated by the Directorate-General for Communication.
- European Union (2021). The EU's organic food market: facts and rules (infographic). -- <https://www.europarl.europa.eu/news/en/headlines/society/20180404STO00909> Retrieved on 18th April 2022.
- Garavaglia, C., & Mariani, P. (2017). How Much Do Consumers Value Protected Designation of Origin Certifications? Estimates of willingness to Pay for PDO Dry-Cured Ham in Italy. *Agribusiness*, 33(3), 403-423. Doi: 10.1002/agr.21494.
- Gazzah, M., Jaouachi, B., Schacher, L., Adolphe, D. C., & Sakli, F. (2015). Study of the influential inputs on the bagged denim fabric behaviors using the principal component analysis method. *International Journal of Clothing Science and Technology*, 27(6), 922-939. Doi: 10.1108/IJCST-10-2014-0123.
- Glogoveţan, A. L., Dabija, D. C., & Pocol, C. B. (2023). *Consumer awareness and search trends for agrifood products certified with European Quality Schemes: PDO, PGI, and TSG - An analysis through Google Trends*. Romania: University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca; Babeş-Bolyai University Cluj-Napoca. Doi: 10.15835/buasvmcn-fst:2023.0009.
- Gracia, A., & de-Magistris, T. (2016). Consumer preferences for food labelling: What ranks first? *Food Control*, 61, 39-46. Doi: 10.1016/j.foodcont.2015.09.023.
- Gutman, J. (1982). A means-end chain model based on consumer categorization processes. *Journal of Marketing*, 46, 60-72.
- Hurtado-Barroso, S., Tresserra-Rimbau, A., Vallverdú-Queralt, A., & Lamuela-Raventós, R. M. (2019). Organic food and the impact on human health. *Critical Reviews in Food Science and Nutrition*, 59(4), 704-714. Doi: 10.1080/10408398.2017.1394815.
- Ingrassia, M., Altamore, L., Bellia, C., Lo Grasso, G., Silva, P., Bacarella, S., Columba, P., & Chironi, S. (2022). Visitor's Motivational Framework and Wine Routes' Contribution to Sustainable Agriculture and Tourism. *Sustainability*, 14(12082), 6686. Doi: 10.3390/su141912082.
- ISMEA (2019). Anticipazioni «BIO IN CIFRE 2019». I consumi degli italiani. *Osservatorio Sana 2019*, 6 settembre.
- Janssen, M., & Hamm, U. (2012). Product labelling in the market for organic food: Consumer preferences and willingness-to-pay for different organic certification logos. *Food Quality and Preference*, 25(1), 9-22. Doi: 10.1016/j.foodqual.2011.12.004.
- Jaouachi, B. (2012). Evaluation of spliced open end yarn performances using fuzzy method. *Journal of Natural Fibers*, 9(4), 290-309. Doi: 10.1080/15440478.2012.702962.
- Jürkenbeck, K. (2023). The effect of information among established and new sustainability labelling on consumers' preference and willingness to pay. *Cleaner and Responsible Consumption*, 10, 100131. Doi: 10.1016/j.clrc.2023.100131.

- Kagraoka, Y. (2016). Common dynamic factors in driving commodity prices: Implications of a generalized dynamic factor model. *Economic Modelling*, 52, 609-617. Doi: 10.1016/j.econmod.2015.10.005.
- Lusk, J. (2011). External validity of the food values scale. *Food Quality and Preference*, 22, 452-462. Doi: 10.1016/j.foodqual.2011.02.009.
- Lusk, J., & Briggeman, B. C. (2009). Food values. *American Journal of Agricultural Economics*, 91(1), 184-196. Doi: 10.1111/j.1467-8276.2008.01175.x.
- Malissiova, E., Tsokana, K., Soultani, G., Alexandraki, M., Katsioulis, A., & Manouras, A. (2022). Organic food: A Study of consumer perception and preferences in Greece. *Applied Food Research*, 2(1), 100129. Doi: 10.1016/j.afres.2022.100129.
- Mancuso, T., de Cianni, R., di Vita, G. A., Spada, E., Brun, F., Spadaro, D. C., & Zanchini, R. (2024). Understanding Italian consumers' perceptions of tomato agricultural innovation: Exploring the nexus between sustainability, health and consumer beliefs. *Journal of Cleaner Production*, 435, 140528. Doi: 10.1016/j.jclepro.2023.140528.
- McCallum, C. S., Cerroni, S., Derbyshire, D., Hutchinson, W.G., & Nayga, R.M. (2025). Bidding behaviour in experimental auctions under risk and uncertainty. *Theory and Decision*. Doi: 10.1007/s11238-024-10005-z.
- Meloun, M., Militký, J., & Hill, M. (2017). Statistická analýza vícerozměrných dat v příkladech. Univerzita Karlova v Praze. *Nakladatelství Karolinum*.
- Menapace, L., Colson, G., Grebitus, C., & Facendola, M. (2011). Consumers' preferences for geographical origin labels: evidence from the Canadian olive oil market. *European Review of Agricultural Economics*, 38(2), 193-212. Doi: 10.1093/erae/jbq051.
- Meyerding, S. G. H., Trajer, N., & Lehberger, M. (2019). What is local food? The case of consumer preferences for local food labeling of tomatoes in Germany. *Journal of Cleaner Production*, 207, 30-43. Doi: 10.1016/j.jclepro.2018.09.224.
- Moreno-Escobar, J. J., Pérez-Franco, V. de J., Coria-Páez, A. L., Morales-Matamoros, O., Aguilar-del-Villar, E. Y., & Castillo-Perez, M. D. (2023). Multivariate Data Analysis of Consumer Behavior of Functional Products: A Neuroscience and Neuromarketing Approach to Improve Decision-Making. *Computación y Sistemas*, 27(4). Doi: 10.13053/cys-27-4-4690.
- Moser, A. K. (2016). Consumers' purchasing decisions regarding environmentally friendly products: An empirical analysis of German consumers. *Journal of Retailing and Consumer Services*, 31, 389-397. Doi: 10.1016/j.jretconser.2016.05.006.
- Ozili, P. K. (2023). The acceptable R-Square in empirical modelling for social science research. In *Social Research Methodology and Publishing Results: A Guide to Non-Native English Speakers*, 134-143. Doi: 10.4018/978-1-6684-6859-3.ch009.
- Panico, T., del Giudice, T., & Caracciolo, F. (2014). Quality dimensions and consumer preferences: A choice experiment in the Italian extra-virgin olive oil market. *Agricultural Economic Review*, 15, 100-112. Doi: 10.22004/ag.econ.253685.
- Pappalardo, G., & Lusk, J. L. (2016). The role of beliefs in purchasing process of functional foods. *Food Quality and Preference*, 53, 151-158. Doi: 10.1016/j.foodqual.2016.06.009.

- Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. *Science*, 360, 987-992. Doi: 10.1126/science.aag0216.
- Prakash, G., Choudhary, S., Kumar, A., Garza-Reyes, J. A., Khan, S. A. R., & Panda, T. K. (2019). Do altruistic and egoistic values influence consumers' attitudes and purchase intentions towards eco-friendly packaged products? An empirical investigation. *Journal of Retailing and Consumer Services*, 50, 163-169. Doi: 10.1016/j.jretconser.2019.05.011.
- Ran, Y., Nilsson Lewis, A., Dawkins, E., Grah, R., Vanhuyse, F., Engström, E., & Lambe, F. (2022). Information as an enabler of sustainable food choices: a behavioural approach to understanding consumer decision-making. *Sustainable Production and Consumption*, 31, 642-656. Doi: 10.1016/j.spc.2022.03.026.
- Reitano, M., Selvaggi, R., Chinnici, G., Pappalardo, G., Yagi, K., & Pecorino, B. (2024). Athletes preferences and willingness to pay for innovative High-Protein functional foods. *Appetite*, 203, 107687. Doi: 10.1016/j.appet.2024.107687.
- Richetin, J., Caputo, V., Demartini, E., Conner, M., & Perugini, M. (2022). Organic food labels bias food healthiness perceptions: estimating healthiness equivalence using a Discrete Choice Experiment. *Appetite*, 172, 105970. Doi: 10.1016/j.appet.2022.105970.
- Sampalean, N.I., Rama, D., & Visentin, G. (2021). An investigation into Italian consumers' awareness, perception, knowledge of European Union quality certifications, and consumption of agri-food products carrying those certifications. *Bio-Based and Applied Economics*, 10(1), 35-49. Doi: 10.36253/bae-9909.
- Savelli, E., Bravi, L., Francioni, B., Murmura, F., & Pencarelli, T. (2021). PDO labels and food preferences: results from a sensory analysis. *British Food Journal*, 123(3), 1170-1189. Doi: 10.1108/BFJ-05-2020-0435.
- Selvaggi R., Zarbà C., Pappalardo G., Pecorino B., & Chinnici G. (2023). Italian consumers' awareness, preferences and attitudes about Sicilian blood oranges (Arancia Rossa di Sicilia PGI). *Journal of Agriculture and Food Research*, 11, 100486. Doi: 10.1016/j.jafr.2022.100486.
- Shangguan, S., Afshin, A., Shulkin, M., Ma, W., Marsden, D., Smith, J., Saheb-Kashaf, M., Shi, P., Micha, R., Imamura, F., & Mozaffarian, D. (2019). A meta-analysis of food labelling effects on consumer diet behaviours and industry practices. *American Journal of Preventive Medicine*, 56, 300-314. Doi: 10.1016/j.amepre.2018.09.024.
- Török, Á., Gorton, M., Yeh, C., Czine, P., & Balogh, P. (2022). Understanding Consumers' Preferences for Protected Geographical Indications: A Choice Experiment with Hungarian Sausage Consumers. *Foods*, 11, 997. Doi: 10.3390/foods11070997.
- Vickrey, W. (1961). Counter speculation, Auctions, and Competitive Sealed Tenders. *The Journal of Finance*, 16(1), 8-37.
- Weinrich, R., & Spiller, A. (2016). Developing food labelling strategies: multi-level labelling. *Journal of Cleaner Production*, 137, 1138-1148. Doi: 10.1016/j.jclepro.2016.07.156.



Employment Trends at Large Food and Beverage Companies in Italy 2019-2023

Maria Emilia Garbelli*,^a

^a Università degli studi di Milano Bicocca, Italy

Abstract

This study examines the labour adjustment dynamics of large Italian food and beverage processing (FBP) firms over 2019-2023, a window encompassing the COVID-19 pandemic, the subsequent supply-chain disruptions, and the inflationary shock of 2022-2023. Drawing on firm-level data from the AIDA (Bureau van Dijk) database, the analysis is based on a balanced panel of 98 firms that have continuously remained above the 250-employee threshold for 490 firm-year observations. Three connected research questions are addressed: sectoral heterogeneity in employment growth (RQ1); the within-firm link between lagged profitability (EBITDA) and subsequent employment growth (RQ2); and the within-firm elasticity of unit labour cost (ULC) to firm size (RQ3). The empirical strategy combines fixed-effects panel regression with sector and time controls and is supported by a battery of robustness checks. Aggregate employment grew moderately (+ 6.1%), with firm-level adjustment concentrated in a narrow band; the predicted emergence of sectoral differentiation during the recovery phase is not statistically supported. The relationship between lagged profitability and subsequent employment growth is statistically and economically null, a result consistent with a labour adjustment framework in which adjustment costs, institutional rigidities, and labour hoarding decouple short-run hiring from short-run profit fluctuations. The within-firm elasticity

Article info

Type:

Article

Submitted:

29/04/2025

Accepted:

02/09/2026

Available online:

01/10/2026

JEL codes:

J21, L66, C23

Keywords:

Labour adjustment
Food and beverage
industry
Unit labour cost
Firm-level panel
data
COVID-19

Managing editor:

Nicola Cantore

* *Corresponding author:* Maria Emilia Garbelli - Senior Lecturer - DEMS – department of economics, management and statistics - Università degli Studi di Milano Bicocca, Italy - E-mail: mariaemilia.garbelli@unimib.it

of ULC to firm size is negative and statistically significant, with a composition probe indicating that the result is consistent with the presence of genuine scale economies as a contributing channel. The findings document firm-level adjustment dynamics within a specific and policy-relevant segment of Italian manufacturing during a period of compounded shocks.

1. Introduction

An open empirical question in labour economics and industrial organisation is how large firms in essential manufacturing sectors adjust their workforce in periods of compounded shocks. For example, the COVID-19 pandemic, followed by the geopolitical and inflationary shocks of 2022-2023, generated a sequence of disruptions with firm-level consequences for employment, labour costs, and the profitability-hiring link. They remain imperfectly documented, particularly within sub-segments of manufacturing classified as essential and operational throughout the lockdown period.

The Italian food and beverage processing (FBP) sector provides a useful context for examining these dynamics. According to ISTAT (2024) data for 2022, the sector comprises approximately 52,400 active firms employing around 468,000 workers, and accounts for 13.7% of firms, 11% of employment, 12.2% of turnover, and 8.4% of value added in Italian manufacturing. It was designated as essential during the 2020 national lockdown, when most other manufacturing activities were suspended (Cerqua & Letta, 2022). Within the FBP sector, large firms – those exceeding the 250-employee threshold of the European Commission’s enterprise classification – represent less than 2% of the firm population (ISTAT, 2024). Their structural features – collective bargaining coverage, established human resource management practices, and exposure to multi-year supply contracts – qualitatively distinguish their labour adjustment behaviour from that of small and medium-sized enterprises in the same sector, which has been examined in earlier work (Garbelli, 2025). The longitudinal labour dynamics of this segment, however, have not been systematically documented.

Empirical evidence on labour adjustment in Italian manufacturing during and after the pandemic is concentrated in three strands. The first examines the macro-sectoral consequences of lockdown measures and the buffering role of short-time work schemes (Falavigna & Ippoliti, 2022; Giupponi & Landais, 2023). The second investigates product and labour market frictions in Italian manufacturing using firm-level data, but with reference periods that predate the pandemic (Devicienti & Fanfani, 2025; Mondolo, 2022). The third addresses the agri-food and FBP sector specifically, but typically

through a supply-chain or food-security lens rather than from a labour economics perspective (Bargoni *et al.*, 2022; Barile *et al.*, 2024; Rinaldi & Bottani, 2023). Firm-level longitudinal evidence on employment dynamics, the profitability-employment link, and labour cost behaviour within the large-firm segment of Italian FBP, covering both the pandemic and the post-pandemic recovery, is currently absent.

This study addresses that gap. Drawing on a balanced firm-level panel of 98 large Italian FBP firms covering 2019-2023, the analysis pursues three connected questions. RQ1 examines whether sectoral affiliation accounts for heterogeneity in employment growth across firms, with particular attention to whether such heterogeneity emerged during the post-shock recovery phase. RQ2 tests whether firm profitability, measured by EBITDA, is empirically associated with subsequent employment growth – a relationship whose strength has theoretical implications for the presence of labour hoarding behaviour. RQ3 estimates the within-firm elasticity of unit labour costs with respect to firm size, providing evidence on the presence of scale economies in labour deployment. The empirical strategy combines fixed-effects panel regressions with sector and time controls, and is supported by a battery of robustness checks, including alternative samples, alternative functional forms, and a Hausman specification test.

The contribution is threefold. Substantively, the analysis provides firm-level longitudinal evidence on labour dynamics within the large-firm segment of Italian FBP companies across the 2019-2023 period. It documents moderate aggregate employment growth, a null short-run association between profitability and employment, and a significant negative within-firm elasticity of unit labour costs to firm size, while finding no statistically reliable evidence of the sectoral differentiation in the recovery phase that the framework anticipates. Methodologically, it applies a fixed-effects identification strategy to a setting where most prior evidence has been descriptive or cross-sectional, complementing the main analysis with a transparent reconciliation of the sample and a series of specification tests. Theoretically, it develops a conceptual framework connecting the resilience perspective predominant in recent agri-food research to the labour adjustment tradition originating with Oi (1962) and Hamermesh (1993) and consolidated in Cahuc *et al.* (2014). Resilience research defines its constructs at the level of food systems, farming systems and supply chains, and offers limited guidance on their measurement at firm level (Linnenluecke, 2017; Meuwissen *et al.*, 2019). The framework developed here specifies resilience to the labour margin and treats the quasi-fixity of labour, institutional rigidity and resource endowment as the micro-foundations that render firm-level shock-absorption capacity observable in standard accounting data, deriving each research question as an empirical implication.

The remainder of the paper is organised as follows. Section 2 develops the conceptual framework, connecting system-level resilience constructs to the micro-foundations of labour adjustment and deriving the empirical expectation associated with each research question. Section 3 describes the data, sample selection, variables, and empirical strategy. Section 4 presents the results. Section 5 discusses the findings in dialogue with the literature, and Section 6 concludes with implications and limitations.

2. Conceptual framework

This section develops the conceptual framework that motivates and organises the empirical analysis. The argument proceeds in three steps. Section 2.1 situates the study within resilience research on agri-food systems and identifies the level-of-analysis and operationalisation gap that motivates a firm-level approach. Section 2.2 introduces the quasi-fixity of labour as the micro-foundation through which firm-level shock-absorption capacity becomes observable in accounting data, and specifies the three mechanisms by which it operates. Sections 2.3 to 2.5 derive from these mechanisms one empirical implication for each research question. Section 2.6 synthesises the framework in Figure 1 and Table 1 and states the correspondence between each construct, its observable proxy, and the estimation reported in Section 4.

2.1. Resilience, compounded shocks, and the firm as unit of analysis

Since 2020, resilience has become the dominant organising concept in research on how agri-food systems respond to disruption. Migrating from ecology into food systems research, the concept was given a canonical formulation by Tendall *et al.* (2015), who define food system resilience as the capacity to deliver food security over time in the face of disturbances of varying nature and intensity. Zurek *et al.* (2022) review the resulting body of work and its unresolved conceptual tensions, while FAO (2021) adopts resilience as a policy frame for agrifood systems. Meuwissen *et al.* (2019) provide the most operationally articulated version, defining the resilience of a farming system as its ability to sustain its functions through three distinct capacities: robustness, the capacity to withstand shocks and stresses without structural change; adaptability, the capacity to reconfigure inputs, production, marketing and risk management without altering the identity of the system; and transformability, the capacity to change that identity altogether. Italian empirical contributions have applied this apparatus to specific agri-food sub-sectors and supply chains during and after the pandemic (Bargoni *et al.*, 2022; Barile *et al.*, 2024; Rinaldi & Bottani, 2023).

Two features of this literature define the space in which the present study operates. The first is the level of analysis, which is predominantly systemic: the food system, the farming system, the supply chain. These are aggregates whose behaviour is not the simple sum of the behaviour of the firms composing them, and the resilience framework is designed accordingly. The second, in part a consequence of the first, is that operationalisation at firm level remains underdeveloped. Linnenluecke (2017), reviewing influential publications on resilience in business and management research, finds the construct conceptualised and measured in markedly different ways across five distinct research streams, with limited cumulative progress on the empirics of detecting resilience in advance of the adversity that would reveal it. Meuwissen *et al.* (2019) themselves present their framework as a heuristic to be operationalised through mixed methods rather than as a measurement model.

The large-firm segment of Italian food and beverage processing is precisely the setting in which this gap binds. Food and beverage manufacturing was among the limited set of activities authorised to remain operational during the 2020 national lockdown (Cerqua & Letta, 2022). The system-level outcome variable, continuity of function, was therefore largely preserved by regulatory design. What varied across firms was not whether they continued to deliver, but through which internal margin they absorbed the disruption and at what cost. A framework anchored to the continuity of system function has limited purchase on this variation. The analytically relevant question is displaced inward, to the firm.

This study accordingly adopts what Meuwissen *et al.* (2019) term specified resilience: resilience to an identified challenge, assessed on an identified margin, as distinct from general resilience to unanticipated disturbance. The challenge is the compounded shock sequence of 2019-2023. The margin is labour. Two considerations motivate this specification. Substantively, labour is the principal quasi-fixed input in food processing: personnel costs represent a large and contractually rigid share of the cost base, and workforce continuity was the operative constraint during a period in which production could not be suspended. Methodologically, employment, personnel costs and profitability are reported annually and on a standardised basis in firms' financial statements, which makes the labour margin the one on which firm-level resilience can actually be measured for a full population of large firms rather than for a self-selected sample of survey respondents.

Within the tripartition proposed by Meuwissen *et al.* (2019), the analysis addresses robustness and, in the recovery phase, differentiated adaptability. Transformability falls outside both the observation window and the reach of accounting data, and no claim is made about it. What remains is to specify how firms manage labour under shock in a manner that generates testable

predictions for these observable quantities. That specification is supplied by labour adjustment theory.

2.2. Labour as a quasi-fixed factor: micro-foundations of firm-level shock-absorption capacity

The foundational insight is due to Oi (1962): labour is not a perfectly variable input. Recruitment, screening and training constitute investments that are at least partly firm-specific and that are borne before the worker's productive contribution is realised. Labour therefore carries a fixed cost component alongside its variable wage cost, and the employment relationship acquires the character of an asset rather than of a spot transaction. Three consequences follow.

First, separation destroys a sunk investment. A firm that dismisses a trained worker forfeits the accumulated firm-specific human capital and must re-incur the cost upon re-hiring. Retention through a downturn is therefore not organisational inertia but the exercise of an option whose value rises with the expected speed of recovery and with the specificity of the skills involved.

Second, employment adjusts only partially. Hamermesh (1993) and Hamermesh and Pfann (1996) formalise dynamic factor demand under adjustment costs, distinguishing convex costs, which generate smooth partial adjustment towards the notional optimum, from lumpy and asymmetric costs, which generate extended periods of inaction punctuated by discrete adjustments. Under either structure, the employment change realised within a period is a fraction of the notional desired change, and that fraction falls as adjustment costs rise. The observable correlation between a period's shocks and that period's employment change is correspondingly attenuated.

Third, adjustment is displaced onto other margins. When headcount is costly to move, firms absorb shocks through hours worked, capacity utilisation, inventories, margins, and the composition rather than the level of the workforce.

To these technological frictions, European labour markets add an institutional layer that raises adjustment costs further (Cahuc *et al.*, 2014): employment protection legislation, coordinated sectoral bargaining, and publicly subsidised short-time work. All three are salient for large Italian firms. Nationwide collective agreements set wage floors and regulate the terms of separation; the prevalence of open-ended contracts and the accrual of severance entitlements raise the cost of downward adjustment; and short-time work schemes lower the cost of retention during transitory contractions. Giupponi and Landais (2023), using Italian administrative data, show that short-time work operates precisely as a subsidy to labour hoarding, with

employment-preserving effects concentrated among firms facing temporary rather than permanent reductions in output. Falavigna and Ippoliti (2022) document heterogeneity in the effects of pandemic relief measures across Italian manufacturing firms with differing exposure to lockdown restrictions. Devicienti and Fanfani (2025) show that when Italian firms face wage growth mandated through collective bargaining, adjustment operates substantially through the composition of the workforce rather than through its size.

A third element completes the account. Retention is rational under quasi-fixity and costly under institutional rigidity, but whether it is affordable depends on the firm's resource position. Larger firms spread the fixed component of personnel-related costs, such as human resource administration, training infrastructure, and supervisory and compliance functions, across a larger workforce, and command greater bargaining power in input markets (Mondolo, 2022). Scale therefore operates not merely as a determinant of average labour cost but as a determinant of how much retention a firm can sustain without compromising its cost position.

The bridge between the two literatures can now be stated precisely. What the resilience literature designates as robustness, the capacity to withstand shocks and stresses without structural change (Meuwissen *et al.*, 2019), is, at firm level and on the labour margin, the joint product of these three elements, which we refer to as shock-absorption capacity. The term is used here in its shock-absorption sense, and is distinct from absorptive capacity as established in the knowledge and innovation literature. Quasi-fixity makes retention rational; institutional rigidity makes separation costly; resource endowment makes retention affordable. This reformulation carries a methodological consequence that motivates the empirical design. Robustness ceases to be a disposition inferred *ex post* from observed survival, an inference vulnerable to circularity, since firms are classified as resilient because they persisted and their persistence is then explained by their resilience. It becomes instead a set of mechanisms with implications for quantities recorded, independently of the analyst's judgement, in firms' financial statements.

The terminology is fixed at this point and used consistently throughout. Resilience denotes the superordinate literature and its system-level constructs. Shock-absorption capacity on the labour margin denotes the specified firm-level construct examined here. Within the resilience capacities distinguished by Meuwissen *et al.* (2019), the analysis captures robustness and, in the recovery phase, differentiated adaptability. Quasi-fixity, institutional rigidity and resource endowment denote the three micro-foundations. The three research questions denote the observable implications.

Three such implications follow, one for each research question: that employment is stable through the shock while sectoral divergence, if it emerges at all, is deferred to the recovery phase; that short-run profitability

is decoupled from short-run employment growth; and that the cost of maintaining the workforce declines with within-firm increases in size. Sections 2.3 to 2.5 develop each in turn.

2.3. Robustness under shock and differentiated adaptability in recovery (RQ1)

If quasi-fixity and institutional rigidity operate as described, the first-order prediction for employment in this segment is stability rather than either contraction or expansion. Firms that continue to operate, that face high costs of separation, and that anticipate recovery have limited incentive to reduce headcount during the shock; equally, firms facing high costs of hiring and uncertain demand have limited incentive to expand. The aggregate expectation over a window spanning both shock and recovery is therefore one of moderate net change.

Stability, however, is a statement about the aggregate and not about its composition. Robustness in the sense of Meuwissen *et al.* (2019) implies withstanding the shock without structural change; adaptability implies reconfiguration in response to altered conditions. The framework predicts that these two capacities are active in different phases and would leave different traces in the data.

During 2020, the constraints facing food and beverage sub-sectors were largely common: mandatory health protocols, restrictions on mobility, and the essential-activity designation applied across the sector. Common constraints acting on firms with a common adjustment technology should elicit a common response, and sectoral affiliation should therefore account for little of the cross-firm variation in employment change during the shock year. As those constraints were progressively lifted, the binding influences became sub-sector-specific: the recomposition of demand between household consumption and food service, differential exposure to input and energy cost increases, and heterogeneous supply-chain dependencies. Reconfiguration in response to such conditions is adaptability, and it is sub-sector-specific by construction.

The framework therefore yields two empirically separable implications for RQ1. First, quasi-fixity and institutional rigidity imply employment stability during the shock, providing a firm-level trace of robustness on the labour margin. Second, if the lifting of common constraints permits sub-sector-specific reconfiguration, sectoral affiliation should account for a greater share of employment variation during recovery than during the shock itself.

The second implication is deliberately conditional and falsifiable. Failure to detect increased sectoral differentiation would indicate that differentiated

adaptability is not observable on the labour margin in this sample and period, whether because such differentiation is weak, or because the available sector-level variation is insufficient to identify it reliably. The theoretically appropriate comparison is between the shock year and the recovery sub-period, and both are estimated separately in Section 4.2.

2.4. Labour hoarding and the decoupling of profitability from employment (RQ2)

Under frictionless labour demand, employment responds to the marginal value of labour, and a firm experiencing an improvement in profitability expands its workforce. This mapping is the natural benchmark, and it is the benchmark against which the framework makes its sharpest prediction.

Partial adjustment under quasi-fixity attenuates the mapping in three respects. First, the fraction of the notional adjustment realised within a period falls as adjustment costs rise (Hamermesh & Pfann, 1996); with annual accounting data, and with adjustment costs of the magnitude implied by open-ended contracts and firm-specific training, that fraction may be small. Second, firms respond to the permanent rather than the transitory component of a change in profitability, and in a window containing a pandemic, a supply-chain disruption and an inflationary shock in four consecutive years, the transitory component dominates: current profitability is an unusually noisy signal of the future marginal value of labour. Third, labour hoarding operates symmetrically. Firms retain workers through low-profitability periods as insurance against future re-hiring costs (Giupponi & Landais, 2023; Lastauskas, 2022), which severs the downward branch of the relationship, while the costs of expansion and the noisiness of the signal blunt the upward branch.

The framework therefore predicts that the within-firm association between lagged profitability and subsequent employment growth is approximately zero in this segment and period. Two clarifications are essential to the status of this prediction.

The first concerns interpretation. A coefficient statistically indistinguishable from zero is therefore consistent with the predicted empirical signature of the mechanism rather than being theoretically uninformative. Under quasi-fixity and labour hoarding, a weak short-run association is the expected observable manifestation of employment being partially insulated from transitory profitability fluctuations. The claim is deliberately bounded. Failure to reject the null does not establish that the underlying parameter is zero, and what the framework predicts is a relationship weak enough to be undetectable at conventional power rather than the exact absence of one. The

estimate is therefore consistent with the range of relationships predicted by the framework and does not display the positive association implied by the frictionless benchmark.

The second concerns falsifiability, which is what gives the first its force. The prediction is directional and can fail. Were adjustment costs low relative to the profitability variation present in the sample, as they plausibly are in segments with high shares of fixed-term and seasonal contracts, or among smaller firms with thinner bargaining coverage, the estimated coefficient would be positive and significant. The estimate therefore provides evidence relevant to distinguishing between these two theoretical benchmarks, rather than merely failing to reject a convenient null. Its scope is correspondingly bounded: the prediction concerns the short-run, within-firm margin. Long-run relationships operating through capacity investment and capital deepening are not addressed by this specification and remain open.

2.5. Scale, the affordability of retention, and unit labour cost (RQ3)

The third element of the framework concerns the resource dimension of shock-absorption capacity. Retention through a shock is a cost, and the capacity to bear it is not uniformly distributed. The within-firm relationship between size and unit labour cost is the accounting trace of that capacity. Two mechanisms generate a negative relationship, and the contribution of the framework at this point is to make their separation an explicit object of the empirical design rather than an interpretive caveat appended to the estimate.

Scale economies in labour deployment. Fixed personnel-related costs, including human resource administration, training infrastructure, and supervisory and compliance functions, are spread across a larger workforce as the firm expands (Cahuc *et al.*, 2014; Hamermesh, 1993; Oi, 1962). Larger firms also hold greater bargaining power in input markets, which may translate into lower equilibrium compensation for comparable positions (Mondolo, 2022). Under this mechanism the negative elasticity reflects a genuine cost advantage, and it constitutes a component of shock-absorption capacity in its own right: firms with lower unit labour cost can sustain a given workforce through a given contraction at lower cost.

Two considerations qualify this expectation. Evidence from other food and beverage settings indicates that the relationship between firm size and performance is not uniform within the sector: Ibrahim *et al.* (2025) find that size operates in opposite directions in the food and in the beverages segments of manufacturing, which is consistent with the caution expressed below about attributing a within-firm elasticity to scale alone. And the same asymmetry operates on the financing side of the balance sheet: Iotti (2023)

documents for Italian agri-food firms that access to credit favours larger and more structured enterprises, with public guarantees partly offsetting the disadvantage of smaller ones. Scale therefore conditions both the cost of maintaining a workforce and the terms on which its maintenance can be financed.

Workforce composition. Firms that expand tend to hire disproportionately into entry-level positions, whose compensation lies below the incumbent average, mechanically lowering average labour cost per employee. Devicienti and Fanfani (2025) document this channel with precision for Italian firms, showing substitution towards younger workers and fixed-term contracts in response to wage shocks. Under this mechanism the negative elasticity reflects a change in what is being averaged rather than a change in the efficiency of labour deployment. Their identifying variation, shocks originating in collective bargaining, differs from the within-firm variation exploited here, but the mechanism transfers directly.

The two mechanisms are observationally equivalent in the sign of the aggregate elasticity, and a full decomposition would require matched employer-employee data of the kind exploited by Devicienti and Fanfani (2025). They are not, however, equivalent in every partition of the data, and this yields a discriminating prediction that can be specified in advance of estimation.

Consider firms contracting in size. Under the composition mechanism operating alone, contraction concentrated among lower-tenure and lower-paid workers raises the average labour cost of those remaining, so that the elasticity of unit labour cost to size should weaken or reverse sign within this group. Under the scale mechanism, by contrast, the loss of scale raises unit labour cost as size falls, preserving the negative elasticity. The sub-sample of shrinking firms therefore constitutes a discriminating test. The empirical expectation underlying RQ3 is a negative within-firm elasticity of unit labour cost to size, with the composition probe reported in Section 4.4 pre-specified as the test of whether scale operates as a contributing channel.

Two limits on what the probe can support should be stated together with the expectation. It establishes contribution, not magnitude; no decomposition is claimed. And scale and composition do not exhaust the possible sources of a negative within-firm elasticity, which may also reflect other time-varying firm characteristics correlated with size that the available data do not observe. The claim advanced here is correspondingly modest: that scale operates as one contributing channel among others, not that the elasticity identifies it.

2.6. *Synthesis*

Figure 1 represents the framework as a whole. Compounded shocks act on an agri-food system whose response the literature conceptualises through the capacities of robustness, adaptability and transformability, defined at system level and lacking established firm-level proxies. Specifying resilience to the labour margin displaces the analysis to the firm, where three micro-foundations, the quasi-fixity of labour, institutional rigidity, and resource endowment, render shock-absorption capacity observable. Together, these micro-foundations generate three observable implications corresponding to the three research questions. Table 1 states the correspondence in full, mapping each construct to its mechanism, its observable proxy, the expected sign or pattern, and the section in which it is estimated.

3. **Materials and methods**

This section describes the data sources, the sample construction, the variables, and the empirical strategy used to test the three research questions. A dedicated subsection covers the robustness checks performed to assess the sensitivity of the main results.

3.1. *Data sources and sample construction*

The empirical analysis draws on firm-level financial and employment data from the AIDA (Analisi Informatizzata delle Aziende Italiane) database maintained by Bureau van Dijk. AIDA, a comprehensive repository of balance sheets, profit and loss accounts, and structural information on Italian incorporated businesses, is widely used in firm-level studies of the Italian economy. It provides standardised accounting information comparable across firms and over time, in line with the Italian OIC accounting framework.

The target population was defined as Italian incorporated firms simultaneously satisfying three criteria: (i) primary economic activity classified within ATECO divisions 10 (Manufacture of food products) or 11 (Manufacture of beverages); (ii) at least 250 employees in at least one year over the period 2019-2023, in line with the European Commission's enterprise size classification (Recommendation 2003/361/EC); (iii) availability of balance sheet data in AIDA over the same period. The 2019-2023 window captures firm-level dynamics one year before the pandemic shock, the shock years (2020-2021), and the recovery and inflationary period (2022-2023).

An initial extraction identified 182 firms that satisfied the size and sectoral criteria at some point during the observation window. This sample revealed substantial heterogeneity in data availability and panel structure: some firms crossed the 250-employee threshold during the observation period, others reported employment data intermittently, and a small number presented anomalous patterns suggestive of corporate restructuring. To ensure that the results reflect the labour adjustment behaviour of firms continuously operating as large enterprises, the final sample was restricted to firms satisfying three additional conditions: continuous presence above the 250-employee threshold in all five years; complete availability of the financial and employment variables required for the analysis; and the absence of corporate events that would compromise the comparability of within-firm dynamics.

The application of these criteria yields a balanced panel of 98 firms observed over five consecutive years, totaling 490 firm-year observations. The reconciliation between the initial extraction and the final sample is transparent: of the 182 firms initially identified, 98 satisfy all balance and continuity conditions. The remaining 84 were excluded because they either crossed the 250-employee threshold during the observation period or reported incomplete financial or employment data over the five years. The sensitivity of the main results to this sample restriction is examined explicitly in Section 3.4.

3.2. Variables

Employment is measured by the number of full-time equivalent employees reported in AIDA, which corresponds to the average number of employees recorded in the firm's annual financial statements. Profitability is measured by EBITDA (earnings before interest, taxes, depreciation, and amortisation), expressed in current euros and computed from the relevant income statement items in line with the Italian OIC framework. Unit labour cost (ULC) is constructed as the ratio of total personnel costs (item B9 of the Italian income statement, comprising wages and salaries, social security contributions, severance accruals, and other personnel-related costs) to the number of employees, expressed in thousands of euros per employee per year.

Sub-sectoral affiliation is identified using the four-digit ATECO 2007 classification of the primary economic activity and aggregated into broader sub-sectors for the heterogeneity analysis (RQ1). All financial variables are expressed in nominal terms. The choice of nominal values preserves comparability with the unit labour cost measure and with the firms' financial reporting practices; the implications of nominal versus real measurement

during a period of high inflation are addressed in the robustness analysis. Summary statistics for all variables are reported in Table 2, and the sectoral composition of the sample appears in Table 3.

3.3. Empirical strategy

The three research questions are addressed through complementary panel-data specifications, all estimated with firm-fixed effects to control for time-invariant unobserved heterogeneity at the firm level.

For RQ1, aggregate employment stability is assessed descriptively on the balanced panel. Sectoral differentiation is examined through a pooled regression of within-firm employment growth on a full set of sector indicators and year effects, estimated separately for the shock year and the recovery sub-period. Sector affiliation is time-invariant and would be absorbed by firm fixed effects, so a within-firm specification is not available for this test. Because the sector cells are small and highly unequal, inference relies on a wild cluster bootstrap and a firm-level permutation test in addition to conventional robust standard errors; the rationale is set out in Section 4.2. The empirical expectations tested here are those derived in Section 2.3.

For RQ2, the link between profitability and subsequent employment growth is estimated as:

$$\Delta \log(\text{Employment})_{i,t} = \alpha + \beta \cdot \log(\text{EBITDA})_{i,t-1} + \mu_i + \delta_t + \varepsilon_{i,t},$$

where $\Delta \log(\text{Employment})_{i,t}$ is the log change in firm i 's employment between year $t-1$ and year t , $\log(\text{EBITDA})_{i,t-1}$ is the lagged log of EBITDA, μ_i are firm fixed effects, δ_t are year fixed effects, and $\varepsilon_{i,t}$ is the error term. The lagged structure reflects the argument in Section 2.4 that hiring decisions respond to profitability with a lag. The coefficient β captures the within-firm elasticity of subsequent employment growth to current profitability.

For RQ3, the within-firm relationship between size and unit labour cost is estimated as:

$$\log(\text{ULC})_{i,t} = \alpha + \theta \cdot \log(\text{Employment})_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t},$$

where $\log(\text{ULC})_{i,t}$ is the log of unit labour cost, $\log(\text{Employment})_{i,t}$ is the log of firm size, and μ_i and δ_t are firm and year fixed effects, respectively. The coefficient θ captures the within-firm elasticity of unit labour cost to firm size, to be interpreted in light of the joint operation of scale and composition mechanisms discussed in Section 2.5.

The choice of fixed effects over random effects estimation is supported by a Hausman specification test on the RQ3 model, reported in Section 4.4. The specifications set out above are constructed to test the empirical implications derived in Sections 2.3 to 2.5, and Table 1 states the correspondence between each construct, its observable proxy, and the estimation reported here.

3.4. Robustness checks

The robustness analysis pursues three objectives: testing whether the main results survive on a less restrictive sample, whether they are robust to alternative functional forms, and whether the interpretation of the RQ3 elasticity is supported by additional evidence on its mechanism. The results are reported in Section 4.5, after the baseline estimates.

Extended sample. The main RQ2 and RQ3 specifications are re-estimated on an extended sample obtained by relaxing the requirement of continuous presence above the 250-employee threshold to include firms observed above it in at least three years. This rule identifies 130 eligible firms. A data-quality screening was then applied to the source extraction: records were reviewed at firm level, and firms displaying discontinuities in reported headcount or personnel costs that cannot represent genuine variation in labour cost were excluded. Two eligible firms were affected, one reporting seven employees in two consecutive years between years in which it reports more than 360, and one reporting personnel costs per employee an order of magnitude below what its own reported headcount would imply. The extended sample therefore comprises 128 firms.

Alternative functional specifications. Alternative specifications are tested for each model. For RQ2 these include contemporaneous rather than lagged profitability, sector-by-year fixed effects, employment in levels as the dependent variable, and two specifications that exclude the shock year: one omitting the 2020 employment growth observations and one omitting the observations for which 2020 profitability serves as the regressor. For RQ3 they include firm fixed effects without year effects, heteroskedasticity-robust standard errors, sector-by-year fixed effects, and the exclusion of 2020.

Composition probe. A composition probe is performed for RQ3, following the discriminating logic pre-specified in Section 2.5: composition operating alone predicts attenuation or reversal of the elasticity among firms contracting in size, whereas scale economies predict its persistence. The sample is partitioned into terciles based on the average annual employment growth rate over the observation window, and the RQ3 specification is re-estimated within each tercile. A leave-one-out analysis is performed within terciles to assess the influence of individual firms. The probe provides indirect evidence

on whether scale operates as a contributing channel; it does not identify the magnitude of that contribution, and no decomposition is claimed.

3.5. *Software and replicability*

All analyses were performed in Python 3.11, using the `linearmodels` package for fixed-effects panel estimation and the Hausman specification test, and `statsmodels` for ancillary computations. The sample reconciliation procedure described in Section 3.1 is documented to allow for a critical assessment of the sample selection choices.

4. Results

This section presents the empirical results. It opens with a description of the sample, then reports the findings for each research question, and concludes with a summary of the robustness checks. Interpretation in light of the theoretical framework is deferred to Section 5.

4.1. *Sample description*

The balanced panel comprises 98 large Italian FBP firms that remained above the 250-employee threshold over 2019-2023, for 490 firm-year observations. The sample covers a broad range of FBP sub-sectors, with the largest concentrations in bakery, pasta and confectionery (28.6% of firms), meat processing (16.3%), preserved food (14.3%), and dairy (11.2%). Beverages, ready meals, animal feed, coffee processing, infant nutrition, fish processing, and oils and fats account for the remaining sub-sectors. The full sectoral composition of the sample is reported in Table 3.

Descriptive statistics for the main variables, by year, are reported in Table 2. Total employment in the sampled firms rises from approximately 72,900 in 2019 to approximately 77,300 in 2023, an aggregate growth of about 6.1% over five years. Mean firm size increases from 744 to 789 employees, with the median rising from 458 to 472, indicating that growth is broadly distributed rather than concentrated in a few firms. Mean unit labour cost rises from approximately 52.7 thousand euros per employee in 2019 to approximately 56.9 thousand euros in 2023, an increase of 7.9% in nominal terms. Mean EBITDA, expressed in current euros, fluctuates over the period without a strong monotonic trend, in line with the heterogeneous profitability conditions experienced by the sector during the pandemic and post-pandemic phases.

4.2. RQ1 – Employment stability and sectoral differentiation

Aggregate employment in the balanced panel rises from 72,883 in 2019 to 77,327 in 2023, a cumulative increase of 6.1%. The distribution of firm-level adjustment is narrow: 80.6% of firms display an absolute compound annual employment growth rate below 5% over 2019-2023. The mean year-on-year log change in employment is stable across the window, moving from 1.73% in 2020 to 1.56% in 2023. This pattern corresponds to the first implication derived in Section 2.3: employment is preserved through the shock and adjusts gradually thereafter, the firm-level trace of robustness on the labour margin.

The second implication concerns sectoral differentiation, and here the evidence does not support the prediction. Joint tests of the sector indicators were initially estimated with standard errors clustered at the firm level. Because sector affiliation is constant within firm and several sub-sectors contain only one or two firms, the resulting cluster covariance matrix is rank-deficient, with one zero eigenvalue among the eleven sector indicators, and the associated test statistics are computed on a pseudo-inverse. We therefore do not rely on them and base inference instead on procedures that do not require this covariance estimate.

Neither a wild cluster bootstrap nor a firm-level permutation test provides evidence of sectoral differentiation in the recovery sub-period ($p = .663$ and $p = .470$ respectively). The share of variation in firm-level employment growth associated with sector affiliation is eta-squared = .057 in the shock year and .105 in 2021-2023; the increase is in the direction the framework predicts but is not statistically distinguishable from zero (permutation $p = .237$). Both values lie below the mean of their respective permutation null distributions, which are elevated by the small and highly unequal sector cells, so neither point estimate should be read as evidence of differentiation. The dispersion of year-on-year log employment changes does not widen across the recovery: its standard deviation is 9.5% in 2020, 11.6% in 2021, 9.1% in 2022 and 7.5% in 2023 (Figure 2).

One divergence requires comment. In the shock year the heteroskedasticity-robust joint test rejects ($F = 2.70$, $p = .006$) while the permutation test does not ($p = .833$). The divergence is not a clustering artefact, since with one observation per firm in 2020 there is no within-firm correlation to accommodate, but a small-cell one: two sub-sectors contain a single firm each, so their indicators fit those observations exactly and contribute zero residual variance, which inflates the joint statistic. Pooling sub-sectors represented by two firms or fewer removes the effect entirely and F falls to 1.10 ($p = .371$). Procedures reliable under this sector structure therefore yield no evidence of the predicted recovery differentiation, and the

recovery sub-period, which is the prediction at issue, is non-significant under every procedure without exception.

The data therefore do not provide statistically reliable evidence of the predicted increase in sectoral differentiation during the recovery phase. The highly unbalanced sector structure, twelve sub-sectors across 98 firms with four of them represented by one or two firms, further limits the precision with which sector-level heterogeneity can be estimated. The framework is consequently supported in its first implication for RQ1 and not supported in its second; Section 5.4 discusses what follows from this asymmetry.

4.3. *RQ2 – Profitability and employment growth*

The fixed-effects panel regression specified in Section 3.3 is estimated on the balanced panel, with cluster-robust standard errors at the firm level.

The estimated coefficient on lagged log EBITDA is $\beta = -0.005$ (standard error 0.021, $p = 0.803$), statistically indistinguishable from zero. The point estimate is also economically negligible: a doubling of lagged EBITDA would correspond to a change in subsequent employment growth of less than half a percentage point, well within the standard error band. The within-firm R^2 of the regression is low, indicating that variation in employment growth across firm-years is not meaningfully explained by lagged profitability under this specification. The full set of estimates, including the robustness specifications discussed below, is reported in Table 4.

This is the pattern anticipated in Section 2.4, where a coefficient indistinguishable from zero is derived in advance as the empirical signature of partial adjustment and labour hoarding. The estimate does not establish that the underlying parameter is zero; it locates the relationship where the framework places it, and away from the positive and significant coefficient that would obtain were adjustment costs low relative to the profitability variation present in the sample.

The null result is robust to alternative functional specifications. Across the alternatives reported in Table 4 – contemporaneous rather than lagged profitability, sector-by-year fixed effects, employment in levels, the extended sample, and two specifications excluding the shock year – the coefficient remains small and statistically indistinguishable from zero, with p-values ranging from .125 to .960. The Inference on sectoral differentiation are detailed in Table 7.

4.4. RQ3 – Firm size and unit labour cost

The fixed-effects panel regression specified in Section 3.3 is estimated on the balanced panel, with cluster-robust standard errors at the firm level.

The estimated coefficient on log employment is negative and statistically significant at the 1% level: $\theta = -0.343$ (standard error 0.129, $p = 0.008$). The magnitude indicates that, within firms over the observation window, a 10% increase in size is associated with a decrease of approximately 3.4% in unit labour cost per employee. The baseline specification includes firm and year fixed effects, with standard errors clustered at the firm level.

The Hausman specification test yields a statistic of 8.50 with one degree of freedom ($p = .004$), rejecting the consistency of the random effects estimator and supporting the fixed-effects specification.

The negative within-firm elasticity is robust across alternative specifications, with magnitudes between -0.215 and -0.343 on the balanced panel and -0.246 on the extended sample. It survives the exclusion of the shock year, the substitution of heteroskedasticity-robust for cluster-robust standard errors, the removal of year effects, and the introduction of sector-by-year fixed effects.

The composition probe, described in Section 3.4, partitions the sample into terciles based on the average annual employment growth rate of each firm and re-estimates the RQ3 specification within each tercile. The negative elasticity persists across all three: $\theta \approx -0.54$ ($p = 0.008$) in the lowest tercile of shrinking firms; $\theta \approx -1.09$ ($p < 0.001$) in the mid tercile of stable firms; $\theta \approx -0.17$ ($p = 0.034$) in the highest tercile of growing firms (Table 6). The larger magnitude in the mid tercile reflects the structure of within-firm variation: firms in this tercile display the smallest within-firm variation in size (mean within-firm SD of log employment equal to 0.04, compared with 0.06 and 0.11 in the low and high terciles), so that the same co-movement between size and unit labour cost translates into a steeper elasticity. The magnitude of this coefficient is sensitive to individual observations: a leave-one-out analysis yields values ranging from -1.126 to -0.611 across single-firm deletions (Section 4.5). The persistence of a negative elasticity across all three terciles, including shrinking firms – where a composition mechanism alone would predict the opposite sign – is more informative than the precise magnitudes. This finding points to the presence of genuine scale economies as a contributing channel.

4.5. Robustness analysis

The three robustness exercises described in Section 3.4 are reported here. Across all of them the qualitative pattern of the main results is preserved.

On the extended sample of 128 firms, the RQ2 coefficient on lagged log EBITDA remains statistically indistinguishable from zero, and the RQ3 elasticity is -0.246 , significant at the 1% level. The latter is of the same sign and order of magnitude as the baseline estimate of -0.343 , and more precisely estimated, which is what a sample extension should produce if the baseline is not driven by the composition of the balanced panel.

Across the alternative functional specifications, the RQ3 elasticity remains negative and statistically significant, with magnitudes between -0.215 and -0.343 . The coefficient on lagged profitability in the RQ2 specifications remains statistically indistinguishable from zero throughout, including when the shock year is excluded under either definition.

The composition probe returns a negative elasticity in all three terciles: -0.539 among contracting firms, -1.098 among stable firms and -0.172 among expanding firms. The persistence of a negative elasticity among contracting firms is inconsistent with composition operating alone, which would predict attenuation or reversal within that group, and is therefore consistent with scale operating as a contributing channel. The leave-one-out analysis indicates that the estimate for the middle tercile is sensitive to individual observations, ranging from -1.126 to -0.611 across single-firm deletions. The lower tercile, on which the discriminating inference rests, is stable: the coefficient remains negative under every single-firm deletion, with the value closest to zero at -0.227 .

For RQ1 the robustness analysis is reported in Section 4.2 rather than here, since the inferential procedures for the sectoral test are not alternative specifications of a baseline estimate but the basis on which that result is assessed.

5. Discussion

This section interprets the empirical findings in light of the theoretical framework developed in Section 2 and in dialogue with the relevant prior literature. Four substantive aspects of the results are discussed in turn – labour adjustment in essential manufacturing, the profitability-employment nexus, the within-firm size-ULC relationship, and sectoral heterogeneity – followed by limitations and generalisability.

5.1. Robustness on the labour margin in essential manufacturing

The aggregate employment dynamics in the sample – moderate growth of approximately 6.1% over the five-year window, with mean firm size rising from

744 to 789 employees – fit the labour adjustment tradition originating with Hamermesh (1993) and consolidated in Cahuc *et al.* (2014). Under operational continuity, large firms in essential sectors are expected to display moderate employment changes reflecting adjustment costs, institutional rigidities, and the retention of firm-specific human capital in anticipation of recovery.

Employment is preserved through the lockdown year of 2020 and grows modestly thereafter, with no evidence of the abrupt contraction and rebound observed in non-essential manufacturing. In the terms of the framework developed in Section 2, this is robustness on the labour margin: system function is sustained and the shock is absorbed without structural change to the workforce. The pattern is consistent with the institutional channels documented for Italian manufacturing during the same period (Cerqua & Letta, 2022; Falavigna & Ippoliti, 2022; Giupponi & Landaïs, 2023).

5.2. The profitability-employment nexus

The null association between lagged profitability and subsequent employment growth, robust across multiple specifications, is one of the most theoretically informative findings of the analysis. In a frictionless setting, profitability shocks would map directly onto employment adjustments. Adjustment costs and institutional rigidities, however, attenuate this link.

Hiring frictions, training investments, and severance liabilities make firms reluctant to expand their workforce in response to fluctuations that may prove temporary (Cahuc *et al.*, 2014; Hamermesh, 1993). Permanent contracts and sectoral collective bargaining further increase the cost of both downward and upward adjustments – a setting consistent with labour hoarding behaviour, in which firms retain workers during low-profitability periods as insurance against future re-hiring costs (Giupponi & Landaïs, 2023; Lastauskas, 2022). The observation window also features exceptionally heterogeneous shocks – pandemic disruption in 2020, supply-chain frictions in 2021, energy and inflation shock in 2022, partial normalisation in 2023 – under which current profitability is a particularly noisy signal of future labour demand.

The null result has clear interpretive limits. The within-firm specification controls for time-invariant firm characteristics and year fixed effects; this is a demanding test of the short-run linkage, but not the only one. The null result may also reflect model limitations: EBITDA is a coarse measure of firm performance, the annual reporting cycle may be too short to capture lagged hiring responses, and causal identification is not pursued. Long-run profitability–employment relationships, operating through investment decisions and capacity expansion, are not addressed by the present specification and remain open empirical questions.

5.3. Firm size, unit labour cost, and the joint operation of scale and composition mechanisms

The negative within-firm elasticity of unit labour cost to firm size, θ of approximately -0.343 on the balanced panel and -0.246 on the extended sample, is consistent with two distinct mechanisms whose relative contribution the data cannot fully separate.

The first is scale economy in labour deployment: as firms expand, fixed personnel-related costs are spread over a larger workforce, specialisation in human resource management generates efficiency gains, and bargaining power in input markets may translate into lower equilibrium wages for comparable positions (Cahuc *et al.*, 2014; Hamermesh, 1993; Mondolo, 2022). The second is workforce composition: firms that expand typically hire workers for entry-level positions, where wages are systematically lower than the firm's incumbent average, mechanically reducing the average labour cost per employee. Devicienti and Fanfani (2025) document this composition mechanism with precision for Italian incorporated businesses, showing that more efficient firms substitute high-wage workers with low-wage employees in response to wage shocks.

The composition probe described in Section 4.4 provides indirect evidence on the relative contribution of these mechanisms, following the logic pre-specified in Section 2.5. The elasticity remains negative among firms contracting in size, which is inconsistent with composition operating alone, and a leave-one-out analysis confirms that this holds under every single-firm deletion, with the value closest to zero at -0.227 . The probe therefore indicates that scale operates as one contributing channel among others; it does not identify the magnitude of that contribution, and scale and composition do not exhaust the possible sources of a negative within-firm elasticity.

The result is consistent with persistent cost advantages associated with scale within the large-firm segment of Italian FBP over a five-year window characterised by substantial macroeconomic turbulence – a pattern aligned with the broader evidence on firm-level adjustment capacity in Italian manufacturing (Devicienti & Fanfani, 2025; Mondolo, 2022).

5.4. Sectoral heterogeneity and the post-shock recovery phase

The evidence bears asymmetrically on the two implications derived for RQ1 in Section 2.3. Employment stability through the shock is clearly present: aggregate employment grows moderately, four firms in five adjust by less than 5% annually on average, and no abrupt contraction and rebound of

the kind observed in non-essential manufacturing appears in the data. This is the firm-level trace of robustness on the labour margin.

The predicted emergence of differentiated sectoral adaptability during the recovery is not established. Under inference that does not rely on the rank-deficient cluster covariance estimate, sector affiliation does not account for a statistically detectable share of employment variation in any sub-period, and the increase in that share between the shock year and the recovery is not distinguishable from zero. The framework is therefore only partially supported: while the firm-level evidence is consistent with robustness on the labour margin, it does not provide statistically reliable evidence of the predicted transition toward differentiated sectoral adaptability during recovery. Two readings remain open and the data cannot separate them. Sectoral differentiation may be genuinely weak on the labour margin in this segment, or the sector structure of the sample, with four of twelve sub-sectors represented by one or two firms, may be too unbalanced to identify it. What the analysis does establish is that claims of pronounced sectoral divergence in essential-sector recoveries require sector-level variation that a firm population of this size and composition does not supply.

5.5. Limitations and generalisability

Several limitations should be acknowledged. The sample is restricted to incorporated firms that remain above the 250-employee threshold over the observation window, which excludes threshold-crossing firms, firms with intermittent reporting, and unincorporated businesses; the extended-sample robustness check yields qualitatively consistent results, but the findings refer specifically to large established firms. The analysis relies on accounting data from AIDA, which provides standardised firm-level information but not worker-level information on the composition of the workforce; a precise decomposition of the size-ULC elasticity into scale and composition components would require matched employer-employee data, which are not available here. The five-year observation window captures the immediate pandemic and post-pandemic period but does not extend to long-run adjustment dynamics. Financial variables are expressed in nominal terms, which preserves comparability with the firms' financial reporting practices but does not separate real and nominal components during a period of substantial inflation.

Within these limits, the analysis provides firm-level evidence on labour adjustment dynamics in a specific and policy-relevant segment of Italian manufacturing during a period of compounded shocks, offering a baseline for further research on the heterogeneity of firm-level responses within essential manufacturing.

5.6. Implications for resilience research

The findings bear on the resilience literature from which the framework departs. Research on agri-food resilience has been constrained by the difficulty of operationalising its constructs below the system level (Linnenluecke, 2017; Meuwissen *et al.*, 2019), and firm-level applications frequently classify firms as resilient on the basis of observed survival, an inference exposed to circularity. The framework advanced here replaces that inference with implications for quantities recorded independently of the analyst, and the results illustrate both what such implications can deliver and what they cost. Robustness on the labour margin leaves two traces that the data support: employment stability through the shock, and a decoupling of short-run employment growth from short-run profitability. A third implication, the emergence of differentiated sectoral adaptability in recovery, is not supported. That an implication of the framework can fail is not incidental to the exercise but constitutive of it: constructs specified in this way are testable, and testable constructs can be disconfirmed.

Stated generally, the contribution is a logic of successive specification rather than a measure: a system-level construct is specified to an identified challenge and an identified adjustment margin, the micro-foundations governing that margin are made explicit, and together they generate observable implications in data recorded independently of the analyst. It is this logic, rather than any particular coefficient reported here, that is transferable to other essential sectors and other shock episodes.

6. Conclusion

This study examined the labour adjustment dynamics of large Italian food and beverage processing firms over 2019-2023, a window encompassing the COVID-19 pandemic, subsequent supply-chain disruptions, and the inflationary shock of 2022-2023. Drawing on a balanced firm-level panel of 98 firms continuously above the 250-employee threshold, and grounding the empirical questions in the labour adjustment tradition originating with Hamermesh (1993) and Cahuc *et al.* (2014), the analysis pursued three connected research topics: sectoral heterogeneity in employment growth, the link between firm profitability and subsequent employment growth, and the within-firm elasticity of unit labour cost to firm size.

Three main findings emerge. Aggregate employment in the segment grew moderately over the observation window, and firm-level adjustment was contained: four firms in five changed their workforce by less than 5% annually on average. The framework's second implication for the first

research question, that sectoral differentiation would emerge as common constraints were lifted, is not supported under inference robust to the sample's unbalanced sector structure; the framework is thus partially supported, and the analysis reports the disconfirmation alongside the two implications that hold. Lagged profitability shows no statistically significant association with subsequent employment growth, consistent with labour hoarding and adjustment costs in a segment where employment protection and collective bargaining raise the cost of workforce adjustment. Unit labour costs decline significantly with within-firm increases in employment, indicating scale economies in labour deployment that operate alongside a workforce composition mechanism the present data cannot fully separate from them.

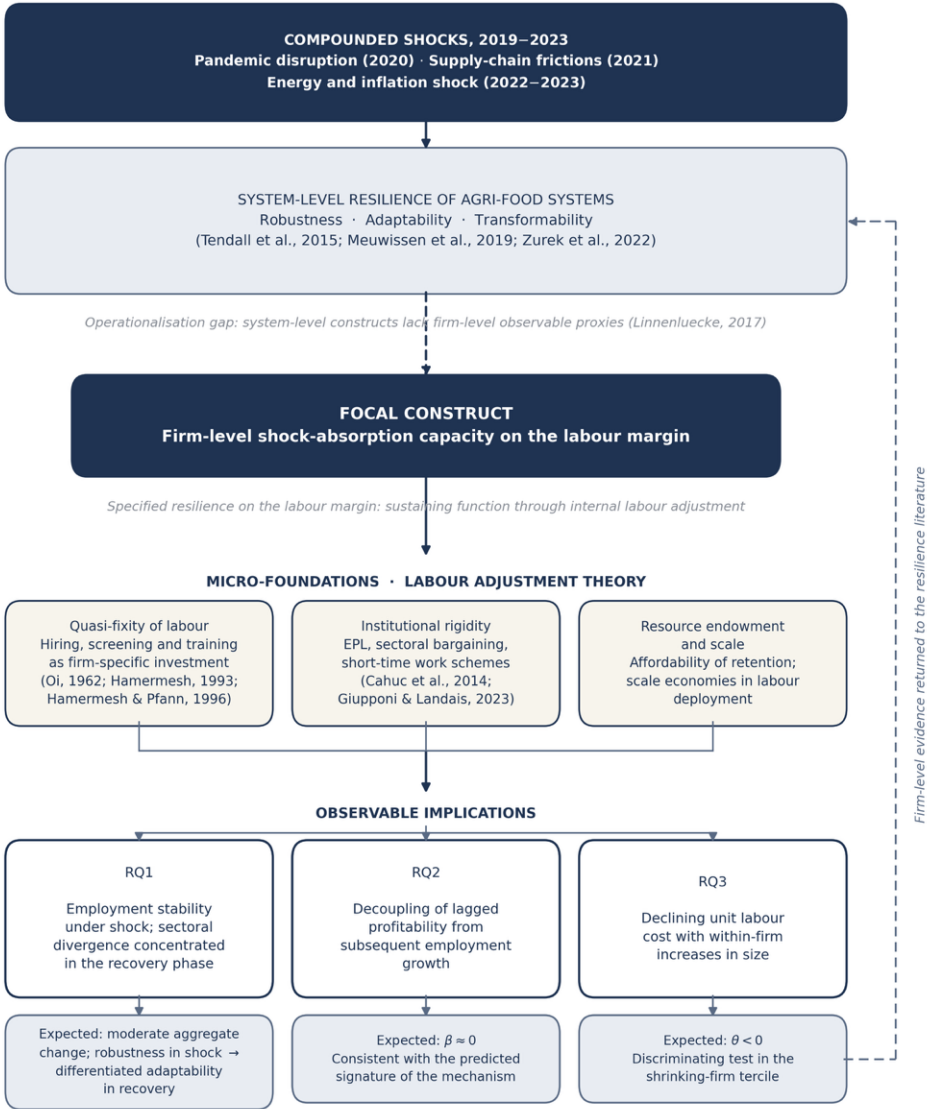
The contribution is threefold. Substantively, the analysis provides firm-level longitudinal evidence on labour dynamics within the large-firm segment of Italian FBP companies. Methodologically, it applies a fixed-effects identification strategy to a setting where most prior evidence has been descriptive or cross-sectional. Theoretically, it develops a conceptual framework connecting the resilience perspective predominant in recent agri-food research with the micro-foundations of labour adjustment, specifying resilience to the labour margin and deriving each research question as an empirical implication of quasi-fixity, institutional rigidity and resource endowment. In doing so it supplies firm-level observable proxies for constructs that resilience research has principally defined at system level.

Several lines for further research follow. The interaction between firm size and labour cost structures over longer horizons, the role of workforce composition in shaping aggregate sectoral productivity, and the heterogeneity of recovery trajectories across sub-sectors of essential manufacturing all warrant further investigation through analyses combining firm-level accounting data with matched employer-employee information. Comparative analyses across European essential manufacturing sectors would also contribute to a more complete understanding of how large firms in these sectors absorb periods of compounded shocks.

Within the limits discussed in Section 5.5, the analysis offers a documented and theoretically grounded account of the labour adjustment behaviour of a specific, policy-relevant segment of Italian manufacturing during a period of exceptional turbulence.

Tables and figures

Figure 1 - Conceptual framework: from system-level resilience to firm-level labour adjustment



Source: Authors' elaboration.

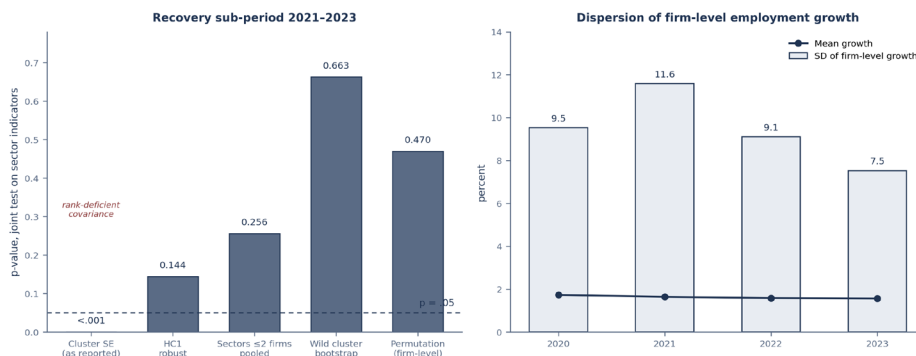
Table 1 - Conceptual framework: constructs, mechanisms, observable proxies, and empirical expectations

Resilience construct	Firm-level mechanism	Observable proxy	RQ	Expected sign or pattern
Robustness	Quasi-fixity of labour and institutional rigidity: retention is rational, separation is costly (Oi, 1962; Cahuc <i>et al.</i> , 2014)	Aggregate and within-firm employment growth, 2019–2023	RQ1	Moderate aggregate change; sectoral affiliation explains little variation during the shock year
Adaptability (differentiated)	Sub-sector-specific reconfiguration once common constraints are lifted	Joint significance of sector indicators, estimated separately by sub-period	RQ1	Sectoral effects weak in 2020 under common constraints, markedly stronger in 2021–2023
Robustness (labour hoarding)	Partial adjustment; dominance of the transitory component; symmetric hoarding (Hamermesh & Pfann, 1996; Giupponi & Landais, 2023)	Within-firm coefficient of employment growth on lagged log EBITDA	RQ2	$\beta \approx 0$ – consistent with the predicted signature; a positive and significant β would be inconsistent with the framework
Resource dimension of shock-absorption capacity	Scale economies in labour deployment; affordability of retention (Hamermesh, 1993; Mondolo, 2022)	Within-firm elasticity of log ULC to log employment	RQ3	$\theta < 0$
Composition (competing mechanism)	Entry-level hiring lowers the incumbent average (Devicienti & Fanfani, 2025)	Elasticity re-estimated within employment-growth terciles	RQ3	Composition alone predicts $\theta \geq 0$ among shrinking firms; persistence of $\theta < 0$ indicates scale contributes

Notes: ULC = unit labour cost. β denotes the coefficient on lagged log EBITDA in the RQ2 specification; θ denotes the coefficient on log employment in the RQ3 specification. Resilience constructs follow the terminology of Meuwissen *et al.* (2019). The expectations stated here are those formulated in advance of estimation.

Source: Authors' elaboration.

Figure 2 - Inference on sectoral differentiation and the dispersion of firm-level employment growth



Source: Authors' elaboration on AIDA data.

Table 2 - Descriptive statistics by year

Year	N firms	Mean empl.	Median empl.	Mean ULC (€k)	Median ULC (€k)	Mean EBITDA (€k)	Median EBITDA (€k)
2019	98	743.7	458.0	52.72	53.02	28,214.75	15,428.34
2020	98	763.9	470.5	52.76	52.57	29,722.86	14,192.61
2021	98	776.1	476.5	54.17	54.59	32,730.48	16,880.87
2022	98	774.9	475.5	55.96	55.78	30,107.23	16,260.08
2023	98	789.1	471.5	56.89	57.88	35,464.72	20,846.35

Notes: Balanced panel of 98 Italian food and beverage processing firms continuously above the 250-employee threshold over 2019-2023. ULC = unit labour cost, computed as total personnel costs (item B9 of the Italian income statement) divided by the number of employees, expressed in thousands of euros per employee. EBITDA in thousands of euros. All financial variables are in nominal terms.

Source: Authors' elaboration on AIDA data.

Table 3 - Sectoral distribution of the sample

Sub-sector	N firms	% of sample
Bakery, pasta, and confectionery	28	28.6
Meat processing	16	16.3
Preserved food	14	14.3
Dairy	11	11.2
Ready meals	8	8.2
Alcoholic beverages	7	7.1
Animal feed	4	4.1
Non-alcoholic beverages	4	4.1
Infant nutrition and dietary products	2	2.0
Coffee processing	2	2.0
Fish processing	1	1.0
Oils and fats	1	1.0
Total	98	100.0

Notes: Classification based on the firm's primary economic activity (ATECO 2007 four-digit code) and aggregated into broader sub-sectors.

Source: Authors' elaboration on AIDA data.

Table 4 - RQ2 – Profitability and subsequent employment growth

Specification	Coefficient β	Std. error	p-value	N
(1) Baseline: lagged log EBITDA, firm + year FE	−0.0053	0.0213	0.803	383
(2) Contemporaneous log EBITDA	0.0017	0.0180	0.926	383
(3) Sector-by-year fixed effects	−0.0054	0.0192	0.780	383
(4) Employment in levels (alternative DV)	0.0218	0.0184	0.236	383
(5) Extended sample (128 firms)	−0.1155	0.0751	0.125	483
(6) Excluding 2020 (shock year) employment adjustment	−0.0015	0.0305	0.960	286
(7) Excluding shock-year profitability signal	−0.0189	0.0250	0.451	288

Notes: Dependent variable is the year-on-year log change in firm employment, except in specification (4), where the dependent variable is log employment. Specifications (1)-(4) and (6) are estimated on the balanced panel of 98 firms;(5) on the extended sample of 128 firms. All specifications include firm fixed effects. Specifications (1), (2), (4), (5), and (6) include year fixed effects; specification (3) replaces year FE with sector-by-year FE. Standard errors clustered at the firm level. None of the coefficients reach statistical significance at conventional levels.

Source: Authors' estimates on AIDA data.

Table 5 - RQ3 – Firm size and unit labour cost

Specification	Coefficient β	Std. error	p-value	N
(1) Baseline: firm + year FE, cluster SE	-0.3434	0.1287	0.008	490
(2) Firm FE only (no year FE)	-0.2148	0.1263	0.090	490
(3) HC-robust standard errors	-0.3434	0.0975	<0.001	490
(4) Excluding 2020 (shock year)	-0.2187	0.0811	0.007	392
(5) Extended sample (128 firms)	-0.2456	0.0892	0.004	632
(6) Sector-by-year fixed effects	-0.3395	0.1079	0.002	490

Notes: Dependent variable is the log of unit labour cost (ULC). The main explanatory variable is the log of firm size (employment). All specifications include firm fixed effects. Specifications (1), (3), (4), and (5) include year fixed effects; specification (2) includes firm FE only; specification (6) replaces year FE with sector-by-year FE. Standard errors clustered at the firm level except in (3), which uses heteroskedasticity-consistent (HC) robust standard errors. Specification (5) extends the sample to 128 firms observed for at least 3 years above the 250-employee threshold.

Source: Authors' estimates on AIDA data.

Table 6 - RQ3 – Composition probe by employment growth tercile

Tercile	N firms	N obs	Coefficient θ	Std. error	p-value
Low (shrinking firms)	33	165	-0.5388	0.1988	0.008
Mid (stable firms)	33	165	-1.0983	0.1981	<0.001
High (growing firms)	32	160	-0.1717	0.0787	0.034

Notes: Sample partitioned into terciles based on the average annual employment growth rate of each firm over 2019-2023. The RQ3 specification (log ULC on log employment with firm and year FE) is estimated separately within each tercile, with standard errors clustered at the firm level. The negative elasticity persists across all three terciles, including firms shrinking in size.

Source: Authors' estimates on AIDA data.

Table 7 - Joint tests on the sector indicators, by inferential procedure and sub-period

Procedure	Shock 2020	Recovery 2021-23	Full window	Covariance
Cluster-robust joint F (withdrawn)	–	12.08	5.07	rank-deficient
Heteroskedasticity-robust joint F	2.70	1.47	1.49	full rank
p-value	(.006)	(.144)	(.134)	
Sub-sectors ≤ 2 firms pooled, F	1.10	1.29	0.80	full rank
p-value	(.371)	(.256)	(.601)	
Wild cluster bootstrap, p	(.893)	(.663)	(.456)	not required
Permutation on firm means, η^2	.057	.105	.061	not required
p-value	(.833)	(.470)	(.869)	

Notes: Dependent variable is the year-on-year log change in firm employment. The 2020 column is a single cross-section with one observation per firm and includes no year effects; the other columns include year effects. The wild cluster bootstrap uses Rademacher weights and 4,999 replications; the permutation test uses 20,000 draws on firm-level mean growth. The increase in η^2 from the shock year to the recovery sub-period is +.048 (permutation $p = .237$). The cluster-robust statistics in the first row are reported for transparency and are not relied upon: sector affiliation is constant within firm and four of the twelve sub-sectors contain one or two firms, so the cluster covariance matrix for the eleven sector indicators has rank 10 and the statistic is computed on a pseudo-inverse.

On the shock-year column. The robust joint test rejects ($p = .006$) while the permutation test does not ($p = .833$). With one observation per firm in 2020 there is no within-firm correlation, so this is not a clustering artefact but a small-cell one: two sub-sectors contain a single firm each, whose indicators fit those observations exactly and contribute zero residual variance. Pooling sub-sectors of two firms or fewer removes the effect and F falls to 1.10. The recovery sub-period, which is the prediction at issue, is non-significant under every procedure.

Source: Authors' estimates on AIDA data.

References

- Bargoni, A., Bertoldi, B., Giachino, C., & Santoro, G. (2022). Competitive strategies in the agri-food industry in Italy during the COVID-19 pandemic: An application of K-means cluster analysis. *British Food Journal*, 124(12), 4782-4799. Doi: 10.1108/BFJ-03-2022-0212.
- Barile, D., Secundo, G., & Del Vecchio, P. (2024). Food 4.0 for competing during the COVID-19 pandemic: Experimenting digitalization in family firms. *European Journal of Innovation Management*, 27(4), 1381-1402. Doi: 10.1108/EJIM-11-2021-0542.
- Cahuc, P., Carcillo, S., & Zylberberg, A. (2014). *Labor economics* (2nd ed.). Cambridge, MA: MIT Press.
- Cerqua, A., & Letta, M. (2022). Lockdown, essential sectors, and Covid-19: Lessons from Italy. *Journal of Health Economics*, 81, 102568. Doi: 10.1016/j.jhealeco.2021.102568.
- Devicienti, F., & Fanfani, B. (2025). Firms' margins of adjustment to wage growth: The case of Italian collective bargaining. *Economica*, 92(365), 107-149. Doi: 10.1111/ecca.12558.
- European Commission (2003). Commission Recommendation 2003/361/EC of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises. *Official Journal of the European Union*, L 124, 36-41.
- Falavigna, G., & Ippoliti, R. (2022). Relief policy and the sustainability of the COVID-19 pandemic: Empirical evidence from the Italian manufacturing industry. *Sustainability*, 14(22), 15437. Doi: 10.3390/su142215437.
- FAO (2021). *The state of food and agriculture 2021: Making agrifood systems more resilient to shocks and stresses*. Rome: Food and Agriculture Organization of the United Nations.
- Garbelli, M. E. (2025). Crisis, recovery, and regional asymmetries: A firm-level financial analysis of Italian food and beverage SMEs. *European Scientific Journal*.
- Giupponi, G., & Landais, C. (2023). Subsidizing labour hoarding in recessions: The employment and welfare effects of short-time work. *The Review of Economic Studies*, 90(4), 1963-2005. Doi: 10.1093/restud/rdac069.
- Hamermesh, D. S. (1993). *Labor demand*. Princeton, NJ: Princeton University Press.
- Hamermesh, D.S., & Pfann, G.A. (1996). Adjustment costs in factor demand. *Journal of Economic Literature*, 34(3), 1264-1292.
- Ibrahim, K.H., Handoyo, R.D., & Istifadah, N. (2025). Foreign direct investment, skilled labour, and technical efficiency: Perspective from Indonesia's foods and beverages exports. *Economia agro-alimentare/Food Economy - Open Access*, 27(3). Doi: 10.3280/ecag2025oa19002.
- Iotti, M. (2023). Financial evaluation and credit access of agricultural firms. *Economia agro-alimentare/Food Economy - Open Access*, 25(2). Doi: 10.3280/ecag2023oa15206.
- ISTAT (2024). *Struttura e competitività del sistema delle imprese industriali e dei servizi*. Rome: Istituto Nazionale di Statistica.

- Lastauskas, P. (2022). Lockdown, employment adjustment, and financial frictions. *Small Business Economics*, 58(2), 919-942. Doi: 10.1007/s11187-021-00486-z.
- Linnenluecke, M.K. (2017). Resilience in business and management research: A review of influential publications and a research agenda. *International Journal of Management Reviews*, 19(1), 4-30. Doi: 10.1111/ijmr.12076.
- Meuwissen, M.P.M., *et al.*, (2019). A framework to assess the resilience of farming systems. *Agricultural Systems*, 176, 102656. Doi: 10.1016/j.agsy.2019.102656.
- Mondolo, J. (2022). Product and labour market imperfections in the Italian manufacturing sector: A firm-level analysis. *Economia Politica*, 39(3), 813-838. Doi: 10.1007/s40888-021-00257-5.
- Oi, W.Y. (1962). Labor as a quasi-fixed factor. *Journal of Political Economy*, 70(6), 538-555. Doi: 10.1086/258715.
- Rinaldi, M., & Bottani, E. (2023). How did COVID-19 affect logistics and supply chain processes? Immediate, short and medium-term evidence from some industrial fields of Italy. *International Journal of Production Economics*, 262, 108915. Doi: 10.1016/j.ijpe.2023.108915.
- Tendall, D. M., Joerin, J., Kopainsky, B., Edwards, P., Shreck, A., Le, Q. B., Kruetli, P., Grant, M., & Six, J. (2015). Food system resilience: Defining the concept. *Global Food Security*, 6, 17-23. Doi: 10.1016/j.gfs.2015.08.001.
- Zurek, M., *et al.* (2022). Food system resilience: Concepts, issues, and challenges. *Annual Review of Environment and Resources*, 47, 511-534. Doi: 10.1146/annurev-environ-112320-050744.



Geographical Indications (GIs) in Côte d'Ivoire: Achievements and challenges

Kouakou Philipps Kouakou^{*,a,d}, Charlemagne Nindjin^{b,d},
Dominique Barjolle^c

^a Université Alassane Ouattara, Côte d'Ivoire

^b Université Nangui Abrougoua, Côte d'Ivoire

^c Université de Lausanne, Suisse

^d Centre Suisse de Recherches Scientifiques en Côte d'Ivoire

Abstract

This study analyzes the achievements and challenges related to geographical indications (GIs) in Côte d'Ivoire based on an analytical and structured literature review. It shows that the country has high GI potential, based on the diversity of its territorial resources and specific know-how. More than a dozen products show strong potential, including three GIs registered in 2023: Lagoons' Attiéké, Baoulé loincloth of Tiébissou, and mountains coffee. Institutionally, Côte d'Ivoire benefits from a relatively robust legal framework, backed by the Bangui Agreement and AIPO mechanisms, with the existence of national support structures. However, structural limitations remain: weak organizational capacities among producers, inadequate control and traceability infrastructure, fragmented institutional coordination, and heavy dependence on external support programs. Furthermore, research on typicality remains poorly integrated into governance mechanisms. All this shows that the sustainability of GIs in Côte d'Ivoire depends less on legal recognition than on strengthening collective governance and endogenous ownership by local actors.

Article info

Type:

Article

Submitted:

05/08/2025

Accepted:

10/09/2026

Available online:

01/10/2026

JEL codes:

Q01, Q13, Q18

Keywords:

Geographical

Indication

Labeling

Link to origin

Terroir

Côte d'Ivoire

Managing editor:

Luca Cacciolatti

* *Corresponding author:* Kouakou Philipps Kouakou - Lecturer - Université Alassane Ouattara, Abidjan, Côte d'Ivoire/Centre Suisse de Recherches Scientifiques en Côte d'Ivoire (CSRS) - E-mail: philippskouakou@uao.edu.ci

Introduction

Geographical Indications (GIs) are defined as a tool for protecting the reputation and promoting typical and renowned products, or as a legal instrument for recognizing natural heritage (Sautier, 2018) that promotes rural development (Cei *et al.*, 2018; Nizam & Tatari, 2022). They have the merit of globalizing local products whose quality is linked to their origin (Adebola, 2022). GIs arose from the desire to add value to quality products linked to their origin, especially in a context of increased consumer demand for quality products (Mamine *et al.*, 2016; Oger *et al.*, 2010).

Beyond their legal dimension relating to intellectual property, GIs are understood as complex socio-economic mechanisms at the interface between product quality, collective action, and territorial development (Nirosha & Jeyabalasingh, 2025). Numerous studies have highlighted their potential for rural development, increasing farmers' incomes (Crespo *et al.*, 2024), structuring supply chains, differentiating markets, and strengthening localized agri-food systems (Nizam & Tatari, 2022; Regolo *et al.*, 2025).

In West and Central Africa, the legal framework of the Bangui Agreement on Intellectual Property, in force since 1977 and amended in 1999 and 2015, has enabled the registration of eight products: Oku honey, Penja pepper, Mount Ziama coffee, sugar loaf pineapple from the Allada plateau, Bandiagara-Mali shallots, Galmi-Niger purple onion, Niger Kilichi, and Saponé hat. Since July 2023, these products have been joined by Lagoons' Attiéké, Baoulé loincloth of Tiébissou, and mountains coffee, all from Côte d'Ivoire (<https://ig-oapi.org/indication-geographique-protegee-a-loapi/>).

Côte d'Ivoire has thus registered its first GIs, but has biophysical (Avenard, 1971), cultural, pedoclimatic (Eldin, 1971), and human (RGPH, 2021) assets that could have ensured the registration of several products long ago. In addition, it has significant biological diversity, estimated at 17,343 known species, spread across several terrestrial and aquatic ecosystems (MINEDD, 2021). Several initiatives specific to the GI approach have also been undertaken. However, knowledge of these initiatives is currently fragmentary and scattered, with no analytical synthesis having been carried out. Consequently, it is difficult to identify recent developments and emerging issues that could inform future research and initiatives.

In order to address this gap, this study adopts a multidisciplinary conceptual framework drawing on institutional economics, development geography, and social sciences applied to agri-food systems. GIs are viewed not only as legal tools for protecting intellectual property, but also as complex socio-economic and territorial mechanisms.

From a conceptual point of view, GIs are based primarily on the notion of quality linked to origin, which establishes a close link between the

characteristics of a product, its terroir, and the local expertise involved in its production (Barham & Sylvander, 2011; Vandecandelaere *et al.*, 2009). This specific quality, based on typicality and reputation, forms the basis for the differentiation of GI products on the market.

Secondly, GIs are analyzed as institutional and collective mechanisms, requiring coordination between public and private actors, as well as structured forms of collective action within the sectors concerned (Barjolle & Sylvander, 2002; Giovannucci *et al.*, 2009). The governance of GIs, the definition of common rules and the organizational capacity of producers thus appear to be determining factors in their success.

In terms of collective governance, recent studies show that value co-creation and stakeholder coordination are key determinants of GI performance, in line with the concept of territorial common goods (Zhao *et al.*, 2024). The effects of GIs on territorial development and rural sustainability are well documented in various contexts, even if their impact remains heterogeneous depending on institutional structures and forms of collective action (Nizam & Tatari, 2022).

Finally, this research takes an approach to GIs as levers for territorial development, capable of contributing to the promotion of local resources, the strengthening of territorialized agri-food systems, and the improvement of producers' incomes, while raising issues of equity and inclusion (Adebola, 2022; Belletti *et al.*, 2016; Cei *et al.*, 2018). It is at the intersection of these three dimensions (quality linked to origin, collective governance, and territorial development) that the analysis of the achievements and challenges of GIs in Côte d'Ivoire is conducted.

What are the achievements of geographical indications (GIs) in Côte d'Ivoire?

What challenges remain to be addressed?

These are the key questions that this paper seeks to answer. Drawing on a structured literature review, it provides an analytical synthesis aimed at shedding light on current dynamics and guiding future research and actions related to geographical indications in Côte d'Ivoire.

1. Materials and methods

This article is based on a structured and analytical literature review, combining a descriptive and comparative approach. The methodological approach was carried out in four stages: (i) identification of sources; (ii) selection and filtering of documents; (iii) qualitative analysis of content; (iv) thematic structuring of results.

The documentary research was conducted using international scientific databases recognized for their academic rigor (Web of Science, Scopus, JSTOR, AGORA-Research4Life, Google Scholar), supplemented by specialized institutional sources (World Intellectual Property Organization-WIPO, African Intellectual Property Organization (AIPO), Ivorian Intellectual Property Office (IIPO), Food and Agriculture Organization (FAO), and the Centre for International Cooperation in Agricultural Research for Development (CIRAD).

The keywords used were defined iteratively in order to cover all the legal, institutional, economic, and territorial dimensions of GIs in Côte d'Ivoire. They include, in particular: *“geographical indication and Côte d'Ivoire”*, *“local products in Côte d'Ivoire”*, *“labeling and territorial development”*, and *“geographical indications and Africa”*.

The documents were selected according to explicit inclusion and exclusion criteria. The following were selected:

- Articles dealing with GIs published in peer-reviewed journals;
- Institutional and expert reports directly related to GIs or local products;
- Case studies relating to Côte d'Ivoire or comparable contexts (West Africa and developing countries).

The following were excluded:

- 44 papers lacking scientific basis or not peer-reviewed;
- 20 papers that were redundant or did not explicitly address GIs;
- 10 papers that did not align with the conceptual framework of this article and were therefore irrelevant to this study.

The selected corpus presents a diversity of territorial anchoring (table 1), consistent with the review's comparative objective. Côte d'Ivoire constitutes the main area of analysis, through works devoted to Attiéké of lagoons, Bondoukou's Kponan yam, and palm oil from Man. These references are supplemented by studies covering different contexts in West and Central Africa, as well as by works devoted to countries of the Global South that have experienced differentiated trajectories in the institutionalization of geographical indications, notably Morocco, India, Brazil, the Dominican Republic, Turkey, and Ecuador. Other references, of a conceptual, institutional, or international scope, were drawn upon to shed light on the economic, organizational, governance, and territorial valorization dimensions of GIs. These different contexts are not considered directly equivalent, but rather as comparative configurations enabling the identification of convergences and differences in the processes of building typicity, collective organization, governance, and the valorization of territorial resources.

Table 1 - Main geographical contexts of the corpus and the function of the references used

Territorial anchoring of the corpus	Main territories / contexts represented	Function in the review
Côte d'Ivoire: national scale	Côte d'Ivoire	Situate the national context of GIs, including territorial resources, socio-economic dynamics, and the institutional and regulatory framework.
Côte d'Ivoire: territorialized studies	Attiéké of lagoons; Bondoukou's Kponan yam; palm oil from Man; Baoulé loincloth from Tiébissou	Document the link between products, territories, and know-how, as well as issues of typicity, traceability, collective organization, and valorization.
West and Central Africa	Cameroon, Ghana, and other contexts covered by regional work on GIs	Place the Ivorian trajectory in perspective through comparable African experiences, particularly regarding collective action, governance, and product valorization.
Other countries of the Global South: case studies	Morocco, India, Brazil, Dominican Republic, Ecuador, Turkey, China	Compare different trajectories of institutionalization and development of GIs and identify the conditions favoring their contribution to territorial and economic development.
International, conceptual, and institutional references	Europe and international context	Provide the conceptual and institutional frameworks relating to quality linked to origin, terroir, collective governance, certification, intellectual property, and the evaluation of GIs.

In total, out of 125 documents initially identified, 51 sources (24 scientific articles, 15 books, and 12 reports) were selected for the final analysis. In addition, several methodological works were included.

The data analysis is based on a qualitative content analysis, inspired by the work of Bardin (2013) et Henry & Moscovici (1968) and adapted to the context of a literature review. The selected documents were manually coded by theme, allowing for the identification of recurrences, convergences, and

divergences in the discourse. The categories of analysis were constructed inductively and grouped around five analytical axes. A comparative cross-sectional analysis was then conducted to compare the Ivorian experiences with lessons learned from other African and international contexts, thereby strengthening the analytical scope of the results.

To distinguish findings directly documented in the source material from interpretations derived from the synthesis of the corpus, the analysis was conducted at two complementary levels. The first level consisted in identifying, for each document retained, the results explicitly reported regarding territorial resources, typicity, institutional arrangements, collective organization, governance mechanisms, and the conditions for the economic valorization of geographical indications. The second level consisted in comparing these results in order to identify convergences, recurrences, and divergences across sources. The cross-cutting conclusions presented in the results and discussion sections do not necessarily correspond to an observation made by a author, but rather emerge from this comparative reading of the corpus.

Particular attention was paid to statements concerning governance, producer appropriation, and the role of projects and public institutions. These dimensions were treated as emergent analytical categories when several sources converged on elements such as the central role of public institutions, the weakness of producer organizations, dependence on support mechanisms, or the limited articulation between research, producers, and public policy. Where the sources did not allow a causal relationship to be directly established, the wording was deliberately nuanced and presented as trends or interpretations arising from the analysis of the corpus.

2. Results

The main results are structured around the five analytical axes identified in the methodological approach: (i) territorial resources and GI potential in Côte d'Ivoire; (ii) construction of product typicity and research dynamics surrounding GIs; (iii) institutionalization of GIs; (iv) governance challenges and organizational constraints; and (v) conditions for sustainability and prospects for the development of GIs in Côte d'Ivoire.

2.1. Territorial resources and potential for geographical indications in Côte d'Ivoire

The first investigations into GIs in Côte d'Ivoire were conducted by the Ministry of Trade, the Food and Agriculture Organization of the United

Nations (FAO), and AIPO through Phase 1 of the Program to Support the Establishment of Geographical Indications (PAMPIG1) (AFD, 2015). Analysis of the identified territorial resources and these initiatives highlights three main findings. First, Côte d'Ivoire has significant GI potential based on the diversity of its agro-ecosystems and local know-how. Second, this potential is largely dominated by agri-food products. This confirms the fact that GIs are historically linked to ancient agricultural know-how and traditions, often passed down through generations (Barham, 2003). Also, regulations and protections around GIs have often been put in place in response to the needs of agri-food producers (Josling, 2006). This is the case in France with the Protected Designation of Origin (PDO/ AOC in French) system, which was introduced in 1935 to protect its wines (Guy, 2007). Thirdly, despite the abundance of resources, the formal link between product, territory, and collective organization remains unevenly consolidated, which limits the transformation of potential into effectively recognized GIs.

The grouping of identified territorial resources also allows us to observe three main categories. The first concerns agri-food products (Kent mangoes from Korhogo, Kponan yams from Bondoukou, mountain rice, red oil from Man, Attiéké from the Lagoons (CSRS, 2016; FAO, 2012) that are strongly rooted in specific terroirs, where soil and climate conditions and local farming practices play a decisive role in the quality and typical characteristics of the product. These products constitute the core of the GI potential in Côte d'Ivoire and have been the focus of most characterization studies.

The second category includes agricultural export products (cashew nuts from the savannahs, cotton from the savannahs, Trinitario cocoa, rubber from Grand Bouboury, mountains coffee), whose reputation is often established nationally or internationally, but for which the precise link to their geographical origin remains partially documented, with the exception of mountains coffee. The third category concerns artisanal products such as Katiola pottery and Tiébissou Baoulé loincloth (Bagal & Vittori, 2010), which are based on localized cultural know-how.

It appears that the potential for GI in Côte d'Ivoire relies more on the abundance and diversity of territorial resources than on the maturity of the organizational mechanisms needed to promote them. Beyond these territorial considerations, the collective structuring of sectors is also a major economic challenge. Indeed, the absence or weakness of producer organizations limits the ability of local actors to access differentiated and potentially more lucrative markets. In geographical indication systems, the economic development of products relies largely on the collective building of reputation, the establishment of control mechanisms, and the coordination of marketing strategies. This fact remains evident and is supported by several studies, notably that of (Cui *et al.*, 2025). When these organizational dimensions

remain fragile, producers struggle to capture the added value associated with the territorial differentiation of products.

In international experiences with GI, this territorial differentiation often enables producers to access more lucrative markets, particularly through the promotion of reputation, quality segmentation, and the securing of specific (Belletti *et al.*, 2016; Cei *et al.*, 2018). However, these economic effects remain heavily dependent on the sectors' ability to collectively organize marketing, control quality, and ensure an equitable distribution of value within value chains (Vecchio *et al.*, 2020; Cui *et al.*, 2025). In Côte d'Ivoire, current organizational weaknesses continue to limit producers' ability to fully capitalize on these economic opportunities.

This situation can lead to limited redistribution of profits within producing territories and reduce the potential impact of GIs on improving rural incomes and local economic development. Collective structuring thus appears to be a determining factor in transforming the territorial potential of products into real economic opportunities, particularly in terms of value creation, market access, and the sustainable promotion of local sectors.

2.2. Building typicality and research dynamics around GIs

Analysis of research and characterization initiatives relating to GIs in Côte d'Ivoire reveals three main trends. First, the development of product typicality is largely driven by cooperative research projects rather than by endogenous dynamics initiated by producers. Second, this work focuses mainly on the biophysical and technical dimensions of quality, while the social and organizational dimensions of typicality remain less explored. This is the case for work carried out on Attiéké of lagoons (Kouakou *et al.*, 2023), Pagne Baoulé de Tiébissou, Man red oil (Kouassi *et al.*, 2017; Sautier, 2018), Mountains coffee from Man, Kponan yam from Bondoukou (Kouakou & Anoh, 2019), etc. This work has made it possible to identify and characterize the links between certain product qualities and their agroecological conditions, thus helping to document their territorial specificity. However, there is a dominant focus on the agronomic, geographical, technological, and physicochemical aspects of quality, to the detriment of the social, cultural, and organizational dimensions that are central to the definition of GI typicality.

The contribution of local expertise, collective practices, and institutional arrangements to quality development remains only partially documented. Furthermore, research findings are rarely systematically incorporated into the process of drawing up specifications or into GI governance mechanisms. This weak link between research, public policy and producer organizations

limits the transformation of scientific knowledge into operational tools for the recognition and sustainable management of GIs. Finally, the production of scientific knowledge remains poorly linked to institutional mechanisms for the recognition and management of GIs, limiting its uptake by local actors. While research has helped to reveal the potential of certain products, its impact remains limited by the absence of sustainable mechanisms for the transfer and uptake of knowledge by local stakeholders.

In terms of ongoing initiatives, Kent mango from the savannahs, cocoa from Soubré, and pottery from Katiola are included in the Program to Support the Strengthening of Industrial Sector Competitiveness (PARSI in French) and are being closely monitored by the Ivorian Ministry of Trade. Supported by the Danané Town Hall with the backing of the IIPO, the Rice Development Agency, and the GRAINOTHEQUE Foundation, Danané rice is also part of the CIRAD (France) and AFD's "IG Facility" project, which means its certification is imminent.

It can therefore be concluded that research efforts and initiatives in the field of GIs in Côte d'Ivoire are still in their infancy and need to be consolidated. The development of typicality is still based on fragmented scientific evidence that is insufficiently integrated into the institutional and organizational dynamics of GIs. Research suffers in particular from a lack of funding and structured scientific supervision. The study by Cerdan *et al.* (2018) emphasizes the need to strengthen local capacities in participatory agricultural research in order to better identify territorial specificities. Although not dealing with the specific case of Côte d'Ivoire, Galtier *et al.* (2013) reveal that the lack of in-depth studies on the typical characteristics of agricultural products is a barrier to the advancement of GIs. Biénabe et Marie-Vivien (2017) suggest a multidisciplinary approach to study the typical characteristics of products and their territorial roots.

While characterizing products and formalizing their typicality are essential steps in the GI recognition process, their effectiveness also depends on the existence of organizational mechanisms capable of supporting their economic development. In the absence of sufficiently consolidated collective structures, producers have limited scope to develop coordinated market strategies, negotiate marketing conditions with intermediaries, or collectively organize product promotion. This organizational weakness can also affect the ability of sectors to establish transparent governance and value distribution mechanisms, limiting the potential economic benefits for producers and territories. In this context, the integration of organizational dimensions appears to be a determining factor in transforming the recognition of product typicality into real opportunities for economic development and territorial development.

2.3. Institutionalization of GIs: legal and regulatory framework

In Côte d'Ivoire, GIs are considered a separate type of intellectual property and enjoy *sui generis* protection (Giovannucci *et al.*, 2009).

As a member state of the Bangui Agreement, implemented by the African Intellectual Property Organization (AIPO), the country is party to several international conventions promoting GIs (OAPI, 2015). Significant regulatory provisions also exist at the subregional and local levels. At the international level, in May 2018, the Ivorian government agreed to implement the process of accession to the Geneva Act of the Lisbon Agreement on Appellations of Origin and Geographical Indications (<https://autriche.diplomatie.gouv.ci/>).

To facilitate the coordination of GIs, AIPO has established the principle of a national GI committee in each member state (Giovannucci *et al.*, 2009) with a specific operational mission (Bridier & Chabrol, 2009). This led to the creation of the National Committee for Geographical Indications and Collective Marks (CMC in French) by Decree No. 2012-699 of August 1, 2012. The CMC is therefore the executive body of the IIPO in matters relating to GIs (Official Journal RCI, 2012).

Analysis of the legal framework for GIs in Côte d'Ivoire reveals that the process is part of a regional system defined by the Bangui Agreement and implemented by AIPO. This framework provides a clear legal basis for the recognition and protection of GIs, while assigning the State a central role in supporting the registration process.

However, analysis of implementation methods reveals a marked dependence of GI initiatives on public institutions and support projects, both in terms of preparing recognition applications and structuring control and management mechanisms. This configuration limits producers' ability to fully embrace the rules and exercise effective control over their GI.

Moreover, the multiplicity of institutional actors involved leads to overlapping responsibilities, which can hinder the smooth running of processes and the consistency of GI governance. It therefore appears that the institutionalization of GIs in Côte d'Ivoire is based on a formally robust legal framework, but one that is still insufficiently operationalized from the point of view of collective governance. The main challenge lies not so much in the existence of rules as in their effective appropriation by producers and their coherent articulation between the various institutions involved. Therefore, existing regulations must prioritize support for stakeholders, especially associations, in their enforcement methods (Miranda *et al.*, 2020).

2.4. Governance challenges and organizational limitations of GIs

One of the main challenges specific to the entire AIPO region is the lack of solid infrastructure and operational frameworks. This includes quality control laboratories, traceability systems, and support services and technical assistance for producers and other actors in the value chain. The establishment and effective management of GIs require robust support structures, which are often lacking in many countries in the region (Calboli, 2021). Limited resources and fragmented regulatory efforts complicate the enforcement and monitoring of GIs.

Additionally, the analysis of the corpus highlights a predominant role played by public institutions, particularly IIPO and CMC, in initiating and supporting GI initiatives. This configuration contrasts with the principle of collective and sustainable ownership of GI processes by producer organizations. Indeed, one of the keys to the success of a GI is that the producers who are its direct beneficiaries are able to use it (Bridier & Chabrol, 2009).

Also, initiatives are still not coordinated within research institutions or government technical structures, which undermines their success by affecting the speed of the process. For example, Attiéké of Lagoons, Baoulé loincloth of Tiébissou, and Muntains coffee of Man, which could have been registered more than a decade ago, were only registered in July 2023. It is also worrying to note that some new initiatives do not always capitalize on the achievements of previous initiatives, with the result that studies tend to repeat actions already capitalized on by other previous projects. All this points to a lack of coordination between stakeholders (Debbag, 2024).

Created on August 1, 2012 (Journal officiel RCI, 2012), the CMC has been operational for less than five years. Therefore, the composition of its Steering Committee needs to be updated to take into account sectoral changes and to include the main umbrella organizations concerned by the GI, their various management boards, and, above all, the decentralized authorities that are supposed to ensure the continuity of government initiatives. Moreover, there is no law mentioning the financing of the GI approach, which does not guarantee support for potential sectors to be promoted, or the sustainability of those currently being promoted.

Finally, producer groups exist in almost all sectors covered by GI (Sautier, 2018). However, shortcomings have been identified in terms of their stability, autonomy, and the training of members in community life (Youan Bi, 2019), and therefore in terms of their forward-looking vision. Indeed, GIs are above all a collective endeavor and require a strong collective commitment from public and private (Giovannucci *et al.*, 2009; Pedelahore *et al.*, 2022). Equity within the sector, which is one of the conditions for the success of the

approach, also implies the pooling of actions across the entire value chain (Giovannucci *et al.*, 2009; WIPO, 2013). There is also limited knowledge, linked to a lack of awareness among actors in the various value chains, of how GIs can be a real tool for adding value to the products they cover (Calboli, 2021). This limits initiatives or prevents them from becoming sustainable. It is therefore clear that it is impossible to achieve sustainable success with GIs without establishing a solid collective organization (Barjolle & Sylvander, 2002) or without ensuring creative capacity building and training (Adebola, 2022) for existing organizations.

In summary, analysis of GI experiences in Côte d'Ivoire highlights three major challenges in terms of governance and collective organization. First, GI systems face significant organizational and technical capacity constraints, particularly in terms of traceability, control, and collective management. The producer organizations involved often have limited human and financial resources, making it difficult to implement traceability systems, internal control, and monitoring of compliance with specifications. This situation affects the credibility and sustainability of GIs, particularly in the post-registration phases. Secondly, coordination gaps persist between the various actors in the sectors, limiting the effectiveness of governance mechanisms. These gaps can be observed within the sectors, but also between public institutions and other support structures.

It should be noted that, the dominance of public institutions and support projects in the management of GI initiatives tends to restrict the autonomy and ownership of these mechanisms by producer organizations. While this support is essential during the start-up phase, it creates a high degree of dependence on external support mechanisms, limiting the emergence of endogenous governance mechanisms and the ability of producers to exercise effective control over their GI. The current limitations of GIs in Côte d'Ivoire are therefore less a result of a lack of productive potential than of structural weaknesses in collective governance mechanisms. Strengthening organizational capacities, improving coordination between actors, and gradually reducing dependence on external support appear to be essential conditions for the sustainability of GIs in Côte d'Ivoire. Without these developments, GIs risk remaining formal legal instruments whose economic benefits for producers and territories remain limited.

2.5. Sustainability conditions and prospects for GI development

Ensuring the sustainability of GIs and strengthening their contribution to territorial development relies on four key actions.

At the organizational level, strengthening producers' organizational and technical capacities appears to be a key lever for the sustainability of

GIs. This concerns collective management, the implementation of control and traceability systems, and the ability to negotiate with other actors in the sectors and markets. Without this strengthening, GIs risk remaining dependent on institutional support or external projects, compromising their long-term viability. CMC will therefore need to step up its efforts to inform and train key stakeholders on the concept of GIs. A better understanding of GIs can motivate producers to actively participate in the process, thereby strengthening adherence and product quality (Calboli, 2021).

Investing in support infrastructure to ensure the quality and traceability of GI products is also crucial. This involves setting up quality control laboratories and robust traceability systems. WIPO emphasizes the importance of adequate infrastructure for GI development (WIPO, 2021), while Rangnekar (2002) notes that strong infrastructure can help maintain high standards and enhance the reputation of labeled products.

The sustainability of GIs requires better coordination between the institutional framework, research, and industry stakeholders in order to transform available knowledge into operational tools. Indeed, scientific knowledge about product typicality and local practices can only fully contribute to the development of GIs if it is systematically integrated into governance processes, particularly the development and updating of specifications.

This involves revising and improving existing laws, as well as establishing clear mechanisms for their implementation. Marescotti et Belletti (2021) rightly emphasize the importance of a robust regulatory framework to protect GIs and ensure their integrity, while Marie-Vivien (2010) highlights the crucial role of the state in this process. Above all, it is essential to strengthen monitoring and control mechanisms (Crespi & Marette, 2020), which are key to maintaining consumer trust and preserving the reputation of GI products (Menapace & Moschini, 2012), while also defining an endogenous policy to provide financial support for initiatives. Studies by Vecchio *et al.* (2020) and Quiñones-Ruiz *et al.* (2017) show that reducing certification costs can encourage more producers to obtain GI certification, thereby improving the diversity and quality of available products.

Finally, the prospects for the development of geographical indications (GIs) in Côte d'Ivoire depend on their ability to be embedded in broader economic and territorial dynamics, including market access, the enhancement of product reputation, and the consideration of social and environmental sustainability issues. Such integration determines the capacity of GIs to generate tangible benefits for producers and the territories concerned. Rural communities, organized along the value chains of products identified as potential GIs, must therefore develop producer organizations, which are one of the key success factors for GIs (Bagal *et al.*, 2023). These organizations

should be supported by a national policy for the promotion and valorization of terroir products, aimed at fostering their creation, capacity building, and long-term sustainability.

Overall, these findings suggest that the sustainability of geographical indications in Côte d'Ivoire does not depend solely on their legal recognition, but on the gradual consolidation of endogenous mechanisms of governance, coordination, and economic valorization. This is in line with the recommendations made to the Ecuadorian Protected Designation of Origin (PDO) for cocoa (Miranda *et al.*, 2020). The development prospects of GIs thus lie in their ability to evolve from mere protection tools into genuine instruments of territorial development.

3. Discussion

An analysis of the achievements and challenges associated with the development of GIs in Côte d'Ivoire highlights a unique institutional and organizational trajectory that enriches current discourse on the role of GIs in developing countries. While the literature largely emphasizes the potential of GIs in terms of promoting local resources, structuring value chains, and regional development (Belletti *et al.*, 2016; Cei *et al.*, 2018; Nizam & Tatari, 2022), the Ivorian case reveals that legal and institutional recognition is a necessary but not sufficient condition for ensuring their collective ownership and sustainability.

Côte d'Ivoire has a remarkable potential of products eligible for geographical indications (GIs), based on the diversity of its agrosystems, its agricultural and artisanal know-how, and the long-standing nature of certain production practices. However, despite the early identification of these resources as early as the 2000s, the first formal GI registrations were only obtained in 2023.

Contrary to the implicit assumption that an abundance of territorial resources would mechanically lead to the emergence of GIs, the Ivorian experience shows that transforming potential into operational schemes depends heavily on inter-institutional coordination, producers' organizational capacity, and the collective appropriation of rules. This observation echoes the work of Galtier *et al.* (2013) and Biénabe & Marie-Vivien (2017), while also providing new empirical insights into West African contexts that remain insufficiently documented.

A comparison with Morocco allows us to go beyond simply noting the different levels of maturity of the geographical indications systems and to shed light on the governance trajectories underlying their development. In both countries, government action plays an important role in the emergence

and structuring of GI initiatives. However, the ways in which public intervention, producer organizations, and regional research and development are coordinated appear to differ. In Morocco, GIs and, more broadly, the promotion of local products have gradually been integrated into agricultural and rural development policies, particularly through mechanisms combining certification, support for producer groups, commercial promotion, and the development of value chains (Amsellem *et al.*, 2010; Debbag, 2024). This trajectory does not, however, mean that Moroccan governance is free of challenges: recent studies continue to highlight problems related to coordination, resources, marketing, and local stakeholders' ownership of the system (Debbag, 2024; Ratib & Ouahi, 2025).

The value of this comparison thus lies less in contrasting a supposedly mature Moroccan model with a still-emerging Ivorian model than in highlighting two distinct institutional trajectories. In Morocco, public intervention appears to have gradually evolved toward a framework in which certification policies are integrated with mechanisms for collective organization, economic development, and market access. The Moroccan strategy specifically calls for strengthening producer groups, developing aggregation partnerships, and improving market access, thereby expanding the governance of local products beyond mere legal recognition. In Côte d'Ivoire, the analyzed data set reveals a pattern in which institutional impetus and program support still precede the consolidation of producers' organizational capacities. The comparison therefore suggests that the central issue is not merely the existence of a legal framework, but rather the capacity of public mechanisms to foster, over the long term, a transition from primarily institutional governance to a governance model that is more evenly shared among public institutions, producer organizations, and other actors in the value chain.

This interpretation can be linked to the governance framework proposed by Barjolle and Sylvander (2002), according to which the success of geographical indications depends on the ability of the relevant stakeholders to collectively establish and enforce common rules. From this perspective, the Moroccan experience shows that strong initial state involvement can serve as a foundation for the institutionalization of GIs, but that its impact on territorial development depends on its coordination with professional organizations and mechanisms for economic development. The Ivorian case, in light of the body of research examined, appears to be a trajectory still in the process of consolidation: the institutional framework and product recognition have progressed more rapidly than the collective capacities necessary for their management, oversight, and promotion. A comparison with Morocco thus allows us to formulate a more general analytical proposition: in contexts where GIs are in an emerging phase, the challenge

of governance consists not only in creating institutions for recognition, but also in gradually organizing the transfer of capacity for action to the territorial actors responsible for sustaining the mechanisms after their institutionalization.

The example of countries such as India and Brazil, often cited as benchmarks in the literature on GIs in the Global South, further highlights the specificities of the Ivorian case. In India, GI initiatives have been characterized by more direct involvement of local organizations in defining product specifications and in post-registration management, fostering faster appropriation and better articulation between legal protection and territorial development (Marie-Vivien, 2010; Rangnekar, 2009). Similarly, in Brazil, several studies show that the territorial anchoring of GIs relies on research-action processes and on relatively well-established collective governance arrangements (Cerdan *et al.*, 2018).

By contrast, the Ivorian case illustrates an emerging model of highly centralized GIs, in which legal recognition precedes the consolidation of local organizational capacities. This reversal of the classical sequence may raise uncertainties regarding the sustainability of GIs and their ability to generate equitable benefits for producers. The case of Côte d'Ivoire thus provides an analytical point of contrast with certain trajectories documented in India and Brazil, particularly about the degree of involvement of producer organizations in the development and governance of GI systems.

From a scientific perspective, this synthesis contributes to existing knowledge on GIs by documenting the specific challenges of emerging institutional contexts, characterized by high centralization, fragmentation of initiatives, and weak coordination between research, public action, and producer organizations. The case of Côte d'Ivoire shows that legal recognition of GIs does not guarantee their social acceptance or their effective contribution to territorial development, thus confirming the critical analyses of Belletti *et al.* (2016) on the risk of a "quality-exclusion trap".

Dependence on support projects, the absence of endogenous financing mechanisms, and weaknesses in control and traceability systems raise questions about the long-term viability of GIs, particularly in the post-registration phases. These limitations call for in-depth reflection on GI governance models in countries where institutional capacities are still under development.

From an operational perspective, the lessons learned from the Ivorian case can be transferred to other countries engaged in similar initiatives, particularly within the AIPO region. They suggest that public policies on GIs should go beyond the sole logic of legal protection to invest more in organizational capacity building, stakeholder training, inter-institutional coordination, and the effective integration of research into governance

mechanisms. Under these conditions, GIs can evolve from simple labeling tools to real levers for sustainable territorial development.

4. Conclusions

This paper shows that the development of geographical indications (GIs) in Côte d'Ivoire is part of a contrasting dynamic, marked by strong territorial potential and recent institutional advances, but also by persistent structural limitations. The diversity of agrosystems, local know-how, and products with high cultural value gives the country multiple and varied territorial resources. However, there is a significant gap between the early identification of this potential and the effective recognition of GIs, which only occurred in 2023. The main achievements relate to the establishment of a relatively robust legal and institutional framework, backed by the regional AIPO system.

Nevertheless, the case of Côte d'Ivoire reveals the limitations of a highly institutionalized GI development model that is largely dependent on support projects, in which collective ownership by producer organizations remains fragile. Beyond the Ivorian context, this study shows that the success of GIs depends less on the abundance of territorial resources than on the quality of collective governance, coordination between actors, and the articulation between research, public action, and productive sectors. These lessons are transferable to other countries engaged in similar approaches, particularly in sub-Saharan Africa. In this context, strategies to promote GIs should go beyond a labeling-centered approach to include long-term actions, such as strengthening producer organizations, developing control and traceability infrastructure, and establishing endogenous financing mechanisms. Finally, post-registration empirical research appears necessary to assess the real effects of GIs on sector governance, value distribution, and social inclusion. From this perspective, the sustainable development of GIs in Côte d'Ivoire could be based on a phased approach centered on three complementary priorities: (i) strengthening producer organizations and collective governance mechanisms; (ii) the gradual establishment of systems for monitoring, traceability, and inter-institutional coordination; (iii) the development of strategies for economic promotion and access to differentiated markets. Such an approach would make it possible to gradually consolidate the endogenous capacities necessary for the long-term viability of GIs beyond mere external support projects.

References

- Adebola, T. (2022). Geographical indications in the era of the African Continental Free Trade Area (AfCFTA). *Journal of Intellectual Property Law & Practice*, 17(9), 748-760. Doi: 10.1093/jiplp/jpac074.
- AFD (2015). *Résumé d'évaluation – Appui à la mise en place des indications géographiques dans les États membres de l'OAPI (PAMPIG)*. -- <https://www.afd.fr/fr/ressources/resume-devaluation-appui-la-mise-en-place-des-indications-geographiques-dans-les-etats-membres-de-loapi-pampig>.
- Amsallem, I., Rolland, E., Cornu, J.-F., Thirion, M.-C., Du Castel, C., & Chabrol, D. (2010). *Indications géographiques, développement local et préservation des diversités biologiques et culturelles*. -- <https://agritrop.cirad.fr/>.
- Avenard, J. M. (1971). *Le milieu naturel de la Côte d'Ivoire* (Vol. 1). IRD Editions. -- <https://books.google.fr/books>.
- Bagal, M., & Vittori, M. (2010). Les indications géographiques en Côte d'Ivoire, produits potentiels et cadre juridique pertinent. *ACPEU TradeCom Facility in the context of the ACP regional workshops on Geographical Indications*, 43.
- Bagal, M., Vittori, M., & Samper, L. F. (2023). *Manuel sur les indications géographiques en Afrique*. -- <http://afripi.org/sites/default/files/2023-05/GI-Manual-FR>.
- Bardin, L. (2013). *L'analyse de contenu*. Presses universitaires de France. -- <https://shs.cairn.info/l-analyse-de-contenu--9782130627906>.
- Barham, E. (2003). Translating terroir: The global challenge of French AOC labeling. *Journal of Rural Studies, International Perspectives on Alternative Agro-Food Networks: Quality, Embeddedness, Bio-Politics*, 19(1), 127-138. Doi: 10.1016/S0743-0167(02)00052-9.
- Barham, E., & Sylvander, B. (Éds.) (2011). *Labels of origin for food: Local development, global recognition* (1^{re} éd.). CAB International. Doi: 10.1079/9781845933524.0000.
- Barjolle, D., & Sylvander, B. (2002). Some Factors of Success for Origin Labelled Products in Agri-Food Supply Chains in Europe: Market, Internal Resources and Institutions. *Économies et Sociétés*, 25.
- Belletti, G., Chabrol, D., & Spinsanti, G. (2016). Échapper au piège «qualité-exclusion» dans les indications géographiques: Réflexions sur le cas du poivre de Penja. *Agricultures (Montrouge)*, 25(5), 55002. Doi: 10.1051/cagri/2016034.
- Biénabe, E., & Marie-Vivien, D. (2017). Institutionalizing geographical indications in southern countries: Lessons learned from Basmati and Rooibos. *World Development*, 98, 58-67. -- <https://www.sciencedirect.com/science/article/pii/S0305750X15000881>.
- Bridier, B., & Chabrol, D. (2009). Indications géographiques en Afrique de l'Ouest et du Centre: Raisonner la diversité. *Savanes africaines en développement: innover pour durer*, 1-10. -- <http://hal.cirad.fr/cirad-00471273v1>.
- Calboli, I. (2021). Geographical Indications: New perspectives and recent developments. *Journal of Intellectual Property Law & Practice*, 16(4-5), 289-290. Doi: 10.1093/jiplp/jpab046.

- Cei, L., Stefani, G., Defrancesco, E., & Lombardi, G. V. (2018). Geographical indications: A first assessment of the impact on rural development in Italian NUTS3 regions. *Land Use Policy*, 75, 620-630. Doi: 10.1016/j.landusepol.2018.01.023.
- Cerdan, C., Andrade, N., Silva, A. L. da, Vieira, H., Silva, E., & Guerroué, J. L. L. (2018). La recherche agricole, vecteur de dynamiques collectives des territoires ruraux: L'Indication géographique «Vales da Uva Goethe» au Brésil. *Cahiers Agricultures*, 27(2), 2. Doi: 10.1051/cagri/2018013.
- Crespi, J. M., & Marette, S. (2020). *A Theory for Why Large Farms need Small Farms – Recherche Google* [University]. Center for Agricultural and Rural Development Iowa State University. -- <https://www.card.iastate.edu/>.
- Crespo, C. F., Nuñez, H., & Baldeon-Baez, S. (2024). Unearthing Unique Value: Exploring the Potential of Protected Designation of Origin on the Tangerine Industry of Patate, Tungurahua. *Economia Agro-Alimentare/Food Economy - Open Access*, 26(1). Doi: 10.3280/ecag2024oa16120.
- CSRS. (2016). *Rapport d'activité 2014-2015* (Rapport bimensuel Nos. 2014-2015; Numéros 2014-2015, p. 305). Centre Suisse de Recherches Scientifiques en Côte d'Ivoire. -- <https://www.csrs.ch/>.
- Cui, Y., Ma, X., & Zhang, Q. (2025). Agricultural geographical indications, industrial agglomeration, and farmers' income: Evidence from China. *Agricultural and Food Economics*, 13(1), 71. Doi: 10.1186/s40100-025-00410-5.
- Debbag, B. (2024). Labellisation des produits du terroir et enjeux de développement territorial: Analyse des contraintes dans le contexte marocain. *Revue des Études Multidisciplinaires en Sciences Économiques et Sociale*, 9(1). -- <https://revues.imist.ma/index.php/REMSES/article/view/40300>.
- Eldin, M. (1971). Le climat. *Le milieu naturel de la Côte d'Ivoire*, 73-108. -- <https://horizon.documentation.ird.fr/>.
- FAO (2012). *Qualité liée à l'origine et Indications Géographiques en Afrique de l'Ouest et du Centre* (p. 50). Fao. Fao.org.
- Galtier, F., Belletti, G., & Marescotti, A. (2013). Factors Constraining Building Effective and Fair Geographical Indications for Coffee: Insights from a Dominican Case Study. *Development Policy Review*, 31(5), 597-615. Doi: 10.1111/dpr.12027.
- Giovannucci, D., Josling, T., Kerr, W., O'Connor, B., & Yeung, M. T. (2009). *Guide des Indications Géographiques/ Faire le lien entre les produits et leurs origines*. Centre du Commerce International (ITC).
- Guy, K. M. (2007). *When champagne became French: Wine and the making of a national identity* (Vol. 121). JHU Press. -- <https://books.google.fr/books>.
- Henry, P., & Moscovici, S. (1968). Problèmes de l'analyse de contenu. *Langages*, (11), 36-60. -- <https://www.jstor.org/stable/41690369>.
- Josling, T. (2006). The War on Terroir: Geographical Indications as a Transatlantic Trade Conflict. *Journal of Agricultural Economics*, 57(3), 337-363. Doi: 10.1111/j.1477-9552.2006.00075.x.
- Journal officiel RCI (2012, novembre). *Décret n° 2012-699 du 1er août 2012 porte création, attributions, organisation et fonctionnement du Comité national des Indications géographiques et des marques collectives de la Côte d'Ivoire, en abrégé CMC*.

- Kouakou, K. P., & Anoh, K. P. (2019). Géotraçabilité de l'igname Kponan de Bondoukou. *Revue des sciences sociales du PASRES, PASRES Editions*, (23), 23.
- Kouakou, K. P., Nindjin, C., Kouassi, K. B., Mobio, A. J., Amanzou, N. A. A., & Amani, N. G. (2023). Attiéké des lagunes, origine géographique d'un produit de terroir en Côte d'Ivoire. *Revue de Géographie Tropicale et d'Environnement*, (1). -- <https://www.revuegeotrope.com/>.
- Kouassi, K. A., Ahongo, D. Y., Jean, P., & Adima, A. A. (2017). Indication géographique de l'huile de palme de "Man" (District des Montagnes-Côte d'Ivoire): Une analyse comparative des propriétés physico-chimiques et profils en acides gras de quelques huiles de palme rouge artisanales ivoiriennes. *European Scientific Journal*, 13, 373-385. Doi: 10.19044/esj.2017.v13n18p373.
- Mamine, F., Moutaigne, É., & Boutonnet, J.-P. (2016).
- Marescotti, A., & Belletti, G. (2021). *Evaluating geographical indications – Guide to tailor evaluations for the development and improvement of geographical indications*. Roma. Doi: 10.4060/cb6511en.
- Marie-Vivien, D. (2010). The Role of the State in the Protection of Geographical Indications: From Disengagement in France/Europe to Significant Involvement in India. *The Journal of World Intellectual Property*, 13(2), 121-147. Doi: 10.1111/j.1747-1796.2009.00375.x.
- Menapace, L., & Moschini, G. (2012). Quality certification by geographical indications, trademarks and firm reputation. *European Review of Agricultural Economics*, 39(4), 539-566. Doi: 10.1093/erae/jbr053.
- MINEDD (2021). *Profil environnemental* (p. 19). -- <https://environnement.gouv.ci/wp-content/uploads/2015/08/Profil-Environnemental-de-la-Cote-dIvoire-Juillet-2021.pdf>.
- Miranda, C. M., Moreno, R., & Moreno, P. (2020). Protected-Denomination-of-Origin Cocoa Bean: Chain governance and Sustainability Performance. *Economia Agro-Alimentare/Food Economy - Open Access*, 22(1). Doi: 10.3280/ecag1-2020oa10066.
- Nirosha, R., & Jeyabalasingh, P. M. (2025). Mapping the sustainability of geographical indication products: A systematic literature review. *Discover Sustainability*, 6. Doi: 10.1007/s43621-025-01332-4.
- Nizam, D., & Tatari, M. F. (2022). Rural revitalization through territorial distinctiveness: The use of geographical indications in Turkey. *Journal of Rural Studies*, 93, 144-154. Doi: 10.1016/j.jrurstud.2020.07.002.
- OAPI (2015). *Accord de Bangui instituant une organisation africaine de la propriété intellectuelle, acte du 14 décembre 2015*. Collection des lois accessibles en ligne (CLEA).
- Oger, R., Krafft, A., Buffet, D., & Debord, M. (2010). Geotraceability: An innovative concept to enhance conventional traceability in the agri-food chain. *Biotechnologie, Agronomie, Société et Environnement*, 14(4), 4.
- OMPI (2013). *Indications Géographiques: Introduction*. Worl Intellectual proper.
- Pedelahore, P., Gonomy, M., Sautier, D., Cerdan, C., Thouillot, F., & Fournier, S. (2022). *Sélectionner les produits à enregistrer en Indication Géographique: Démarche mobilisée et résultats obtenus pour quatre pays africains*. -- <https://agritrop.cirad.fr/602084>.

- Quiñones-Ruiz, X. F., Penker, M., Belletti, G., Marescotti, A., & Scaramuzzi, S. (2017). Why early collective action pays off: Evidence from setting Protected Geographical Indications. *Renewable Agriculture and Food Systems*, 32(2), 179-192. Doi: 10.1017/S1742170516000168.
- Rangnekar, D. (2002). *Geographical indications: A review of proposals at the TRIPS Council*. UNCTAD. -- <http://ipbio.org/pdfs/papers/GI>.
- Rangnekar, D. (2009). Geographical Indications and Localisation: A case study of Feni. *ESRC Report*. -- https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1564624.
- Ratib, A., & Ouahi, L. (2025). Les Indications Géographiques au Maroc: Défis de mise en œuvre et perspectives pour la valorisation des produits locaux. *International Journal of Accounting Finance Auditing Management and Economics*, 6(9), 447-461. -- <https://revue.ijafame.com/index.php/home/article/view/1993>.
- Regolo, J., Gendre, C., & Poméon, T. (2025). Does the geographical indications protection policy encourage more sustainable agriculture in the territories? Moving from claims to empirical evidence. *Ecological Economics*, 238, 108717. Doi: 10.1016/j.ecolecon.2025.108717.
- RGPH. (2021). *RGPGH 2021, résultats glogaux* (p. 37). INS. -- <https://www.ins.ci/>.
- Sautier, D. (2018). *Collecte et analyse de données de terrain en vue de la sélection de produits candidats à un enregistrement en Indication Géographique en Côte d'Ivoire*. -- <https://agritrop.cirad.fr/>.
- Vandecandelaere, E., Arfini, F., Belletti, G., & Marescotti, A. (2009). *Linking people, places and products: A guide for promoting quality linked to geographical origin and sustainable geographical indications*. FAO/SINER-GI, second edition. -- www.foodquality-origin.org.
- Vecchio, Y., Iddrisu, A.-L., Adinolfi, F., & De Rosa, M. (2020). Geographical Indication to Build up Resilient Rural Economies: A Case Study from Ghana. *Sustainability*, 12(5), 5. Doi: 10.3390/su12052052.
- WIPO (2021). *Geographical Indications: An Introduction, 2nd edition*. -- <https://doi.org/10.34667/tind.44179>.
- Youan Bi, T. B. A. (2019). Préférences des consommateurs et filière de l'attiéké en Côte d'Ivoire. Impacts d'une démarche d'indication géographique (IG). *Revue internationale des études du développement*, 239(3), 89-114. Doi: 10.3917/ried.239.0089.
- Zhao, T., Yu, X., & Liu, S. (2024). Research on the Co-Creation Mechanism of Geographical Indication Industry Value Based on Evolutionary Game Analysis. *Sustainability*, 16(5), 2075. Doi: 10.3390/su16052075.

Copyright © FrancoAngeli

This work is released under Creative Commons Attribution - Non-Commercial –
No Derivatives License. For terms and conditions of usage please see: <http://creativecommons.org>



Does Contract Farming Enhance Farmer Welfare? Evidence from Smallholder Red Chilli Farmers

Anik Suwandari^{*a}, Joni Murti Mulyo Aji^a, Ebban Bagus Kuntadi^a,
Mohammad Rondhi^a, Rokhani^a, Rizky Yanuarti^a

^a Faculty of Agriculture, University of Jember, Indonesia

Abstract

Red chilli (*Capsicum annum* L.) plays a vital role in cuisine and rural livelihoods, yet its cultivation remains vulnerable to fluctuating prices, climate risks, and limited market access. Contract farming (CF) has emerged as a potential mechanism to connect smallholder farmers with formal value chains while reducing production and marketing uncertainties. This study investigates the impact of CF on farmer welfare and the factors influencing participation among smallholder red chilli producers in East Java. Primary data from 108 farmers were analyzed using logistic regression to identify determinants of CF participation and propensity score matching (PSM) to assess income effects. The results show that participation in CF arrangements is associated with higher annual income among sampled farmers, primarily through better access to inputs, stable prices, and technical assistance. Younger farmers and those with plots located near their homes are more likely to participate, whereas those with full land ownership tend to avoid contracts to maintain autonomy. The findings suggest that CF may help mitigate market risks and improve livelihoods under comparable production settings in high-value horticulture. However, inclusive program design is essential, particularly to address regional disparities, generational gaps, and land tenure issues. Policy recommendations emphasize standardized contracts, logistical support for remote areas, and targeted outreach to marginalized farmer groups.

Article info

Type:

Article

Submitted:

27/05/2025

Accepted:

17/03/2026

Available online:

01/10/2026

JEL codes:

Q12, Q13, C25

Keywords:

Contract farming
Logistic regression
Propensity score
matching
Red chilli

Managing Editor:

Fabio A. Madau

* *Corresponding author:* Anik Suwandari - Department of Agribusiness, Faculty of Agriculture, University of Jember - Jember, Indonesia. E-mail: anik.faperta@unej.ac.id.

Introduction

Red chilli (*Capsicum annuum* L.) serves as both a culinary staple and economic lifeline for Indonesian smallholders, with the nation ranking among the world's top producers (Mariyono & Sumarno, 2015; Muflikh *et al.*, 2023; FAOSTAT, 2024). Small-scale farmers dominate this vital sector, contributing over 80% of national output (Mariyono *et al.*, 2020), yet face systemic vulnerabilities including extreme price volatility (200-300% annual fluctuations), devastating crop diseases (30-50% yield losses from anthracnose), and climate disruptions that jeopardize planting cycles (Manurung, 2024). These challenges trap many of Indonesia's 1.2 million chilli farmers in poverty cycles (Sahara *et al.*, 2015), with 62% earning below provincial minimum wages. In this precarious context, contract farming (CF) has gained policy traction as an institutional solution promising market stability through pre-negotiated terms on pricing, inputs, and technical support (G. Das *et al.*, 2023; van der Haar *et al.*, 2023).

Contract farming is increasingly promoted as a mechanism to integrate smallholders into modern value chains while mitigating production and market risks (Rondhi *et al.*, 2020). Proponents argue that such arrangements provide farmers with guaranteed markets, better prices, and access to quality inputs, thereby improving productivity and income (Meemken & Bellemare, 2020). Conversely, critics highlight potential risks such as unequal bargaining power, exploitative terms, and the exclusion of the most vulnerable smallholders (Adams *et al.*, 2019). In Indonesia, CF has been adopted in various agricultural sectors, including poultry (Aji *et al.*, 2023; Setiadi *et al.*, 2022), sugarcane (Hakim & Rifin, 2024; Rokhani *et al.*, 2021), and horticulture (Angreheni *et al.*, 2024; White & Wijaya, 2022).

Despite these developments, a major research gap remains in measuring the welfare impact of contract farming within Indonesia's horticultural sector, particularly among smallholder red chilli farmers. While numerous studies have explored adoption behavior and institutional arrangements, empirical evidence on how CF affects farmers' welfare outcomes, such as income stability, access to markets, and resource autonomy, remains scarce and fragmented. This study addresses this specific gap by providing quantitative evidence of CF's welfare effects and identifying key determinants of participation in red chilli production systems. Other related gaps, such as the environmental sustainability of CF practices or gendered access to contract schemes, are acknowledged but not the primary focus of this paper. These dimensions, though important, require different methodological frameworks (e.g., environmental life-cycle assessment or gender-sensitive qualitative inquiry) that fall beyond the present study's quantitative design. By concentrating on welfare measurement, this research provides a

focused and policy-relevant contribution to understanding how institutional innovations like CF can serve as inclusive agribusiness models for Indonesia's smallholders.

This research contributes novel insights into how contract farming can be optimized to support both economic and social sustainability in high-value horticulture. Using a combination of household survey data and econometric analysis, combining logistic regression and propensity score matching (PSM). The logistic regression will identify key socio-economic and institutional factors influencing farmer's decision to enter contract, while PSM will control for selection bias by comparing income outcomes between contract and non-contract farmers with similar characteristics. The analysis will generate the Average Treatment effect on the Treated (ATT), allowing for a robust and quantitative understanding of the welfare impact. Given the Indonesian government's push for agricultural modernization and inclusive agribusiness models (Prihadyanti & Aziz, 2023), this research provides timely evidence to inform policymakers and development practitioners on the effectiveness of contract farming as a pro-smallholder strategy. Furthermore, with rising food insecurity and rural poverty exacerbated by climate change (Hasegawa *et al.*, 2018; Mbuli *et al.*, 2021) and economic shocks (Koo *et al.*, 2021; Laborde *et al.*, 2019), identifying sustainable farming models is critical to safeguarding farmer livelihoods and ensuring national food security. However, the findings are expected to function as a decision-making tool for policymakers, agribusiness actors, and development practitioners to design more inclusive and beneficial contract schemes.

Materials and Method

Data Description

Research relies on primary data collected through a purposive sampling strategy from 108 smallholder red chilli farmers located in three main producing districts in East Java, namely Jember, Lumajang, and Banyuwangi, which are officially recorded as chilli production centers in the province (Badan Pusat Statistik, 2024). The use of purposive (non-probability) sampling is intentional because the study aims to compare farmers participating in contract farming (CF) and those outside CF schemes within the same production system, rather than to produce statistically representative provincial estimates (Wan, 2019). Accordingly, the findings of this study are interpreted as context-specific evidence of welfare differences associated with contract farming participation and should not be generalized to the entire population of farmers beyond similar production and institutional settings.

At the farmer level, respondents were screened using four explicit inclusion criteria:

1. Commodity criterion: actively cultivating red chilli in the last production season (not ex-chilli farmers).
2. Experience criterion: minimum 3 years of experience in chilli cultivation, to avoid including purely experimental/one-off growers.
3. Contract status criterion: belonging to either (i) farmers who had at least one season under a contract/purchase agreement with buyers/aggregators, or (ii) comparable farmers in the same village who sold via non-contract/spot markets. This is important for constructing matched treatment–control pairs.
4. Location accessibility: farm plots located within the administrative village of the selected district to ensure comparability of agro-market conditions.

These criteria were chosen to (i) make CF and non-CF farmers comparable on basic farm characteristics, (ii) reduce recall and measurement errors, and (iii) ensure that observed income differences can credibly be analyzed using matching techniques (Mweshi & Sakyi, 2020).

Data were collected through structured face-to-face interviews using a pre-tested questionnaire administered by trained enumerators. The questionnaire covered: farmer demographics, farm assets and land tenure, chilli production practices, marketing channels (including contract terms, if any), access to inputs and extension, and income from chilli and non-chilli sources. Contract farmers were additionally asked about the type of agreement, price determination, delivery requirements, and support services received. Because the sample is purposive and relatively small ($n = 108$), the findings are not intended to be generalized statistically to all Indonesian red chilli farmers. Instead, the results should be interpreted as analytically transferable to contexts with similar market structures and contract arrangements.

Analytical Procedures

The data analysis for this study involves a combination of logistic regression and propensity score matching (PSM). In the first stage, a logistic regression model is used to estimate the propensity score, defined as the probability of a farmer participating in institutional agreements given a set of observable characteristics (Caliendo & Kopeinig, 2008; A. Das, 2021; Rosenbaum & Rubin, 1983, such as the participation or non-participation of farmers in institutional agreements, and various independent variables. Total of eight variables are employed as seen in Table 1. Harvest quantity was included as a proxy for farmers' baseline productivity and production capacity prior to participation in institutional agreements. As such, this

variable reflects pre-existing differences in farming performance rather than outcomes generated by the treatment.

Table 1 - Description of logistic regression variable on farmer decision to participate in contract farming in Indonesia, 2024

Factors	Variables	Description	Unit	Measure
Contract farming (CF)	Y	Farmer' decision to participate in contract farming (1 = participated; 0 = not participated)	–	Nominal
Age	X ₁	Farmers age in the year when the research was conducted	Year	Scale
Education	X ₂	Farmer's formal education from not going to school to master/doctor graduate	Year	Scale
Household size	X ₃	The total of farmers' family members in each household	Person	Scale
Experience	X ₄	Farmer's experience on red chilli farming	Year	Scale
Land ownership	X ₅	Farmer's land ownership to cultivate red chilli (1 = owned; 0 = rented)	–	Nominal
Harvest quantity	X ₆	Farmer's red chilli harvest result per years	Kg	Scale
Side occupation	X ₇	Farmer has activities to generate income other than farmig (1 = Yes; 0 = No)	–	Nominal
Distance	X ₈	Distance of farmer's farm to the nearest market	Km	Scale
Profit	z	Red chilli farmer income within a year	Rp	Scale

The used logistic regression model is as follow:

$$\ln\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \beta_7 X_{7i} + \beta_8 X_{8i} \quad (1)$$

Where Y_i is the farmers decision to participate in contract farming, X_{1-8} are the independent variables (refers to Table 1), P_i is the probability of farmer

who participate in contract farming (Behera, 2019), b_0 is the constant, and b_1 - b_8 are logistic regression coefficient for each variables include.

In the second stage, farmers participating in institutional agreements (treated group) are matched with non-participating farmers (control group) with similar propensity scores. Propensity Score Matching is a method for estimating causal treatment effects in observational studies by matching treated and control units with similar estimated probabilities of receiving treatment (propensity scores), thereby reducing selection bias due to observed covariates (Rosenbaum & Rubin, 2006). Since then, this analysis is widely used in many areas including agricultural policy, agricultural contract (Maertens & Vande Velde, 2017; Suwandari *et al.*, 2020; Yanuarti *et al.*, 2019a).

The identification strategy relies on the Propensity Score Matching framework, which assumes Conditional Independence and common support. The Conditional Independence Assumption (CIA) states that, conditional on observable covariates, the treatment assignment is independent of potential outcomes. In this study, farmers' participation in institutional agreements is assumed to depend on observable characteristics such as age, education, farming experience, farm size, and household characteristics. By conditioning on these variables, the selection bias due to observable factors can be reduced. In addition, the common support assumption requires that farmers in both treatment and control groups share comparable propensity scores. This condition ensures that meaningful matches can be constructed between participating and non-participating farmers.

The propensity score is the conditional probability of being treated; in our case, participating in CF. Specifically:

$$p(X) = \Pr(Y = 1 | X) = E(Y | X) \quad (2)$$

where Y is a binary variable indicating whether a farmer participates in CF (1 = Yes; or 0 = No), X is the multidimensional vector of pre-treatment characteristics of a farmer, $\Pr$ is the probability of being treated, E is the mean outcome and $p(X)$ is the propensity score. Standard logit regression models are commonly deployed to estimate $p(X)$. Following the estimation of the propensity score, one must estimate the average effect of treatment.

Estimation of the treatment effect is done using matching methods. The difference between groups of treated farmers and selected control group farmers is used to estimate the effect of treatment. Common methods include Nearest Neighborhood Matching (NNM), Kernel Matching (KM) and Radius Matching (RM) (Becker & Ichino, 2002). These alternative matching algorithms were applied to examine the robustness of the estimated treatment effects. Standard errors of the estimated Average Treatment Effect

on the Treated (ATT) were obtained using bootstrap procedures. The quality of the matching was assessed using balance diagnostics by comparing the distribution of covariates between treated and control farmers before and after matching. In addition, the number of observations within the common support region before and after matching was reported to ensure transparency and replicability of the matching process.

Before estimating the welfare effects of CF, the study verified the comparability between treatment (CF participants) and control (non-CF) groups through overlap assessment, common support identification, and balance testing (Pan & Bai, 2015; Rosenbaum & Rubin, 1983). The distribution of propensity scores was first examined to ensure sufficient overlap between groups, and observations with extreme values outside the common support region were excluded to improve matching quality. After matching, balance tests were conducted to confirm that the mean values of key covariates were statistically similar across both groups, indicating that differences in outcomes could be attributed mainly to CF participation. Matching quality was further assessed through the pseudo- R^2 statistic, where lower values after matching suggest adequate covariate balance and reduced selection bias.

In the final stage, the Average Treatment Effect on the Treated (ATT) is estimated to evaluate the impact of institutional agreements on farmers' welfare outcomes (Yanuarti *et al.*, 2019b). ATT is estimated as follows:

$$ATT = E[E\{Y_{1i} | D_i = 1, p(X_i)\} - E\{Y_{0i} | D_i = 0, p(X_i)\} | D_i = 1] \quad (3)$$

where the expectation is over the distribution of $(X_i) | D_i = 1$; i denotes the household, with 1_i and 0_i as the potential outcomes in the two counterfactual situations of treatment and non-treatment respectively and D is the treatment group indicator. The hypothesis is as follow:

H_0 : Participation in CF does not affect farmers' income.

H_1 : Participation in CF affect farmers' income.

Statistical inference is conducted using the standard errors associated with the ATT estimates. The null hypothesis is rejected if the estimated ATT is statistically significant at conventional significance levels ($p < 0.10$, $p < 0.05$, or $p < 0.01$).

Results

Table 2 presents comparative statistics between chilli farmers participating in contract farming (CF) and non-participants across eight

key variables. Notably, CF participants tend to be younger (mean age = 46.87 vs 54.44 years) with marginally higher education levels (9.12 vs 8.17 years of schooling), suggesting possible age and human capital biases in CF enrollment (Meemken & Bellemare, 2020). The substantial difference in harvest quantities (12,223.21 kg vs 3,086.67 kg) likely reflects both the productivity-enhancing effects of CF and self-selection of more commercially-oriented farmers into contracts (Rondhi *et al.*, 2020). Farm characteristics reveal important patterns, where CF participants operate closer to market centers (mean distance = 0.82 km vs 1.29 km), consistent with transaction cost theory predicting closer proximity reduces contract enforcement costs (Dubbart, 2019).

While land ownership is nearly balanced between groups (57 CF vs 51 non-CF), the younger average age and greater farming experience (12.97 vs 15.11 years) of CF participants may indicate generational shifts in market engagement strategies. The similar household sizes (4.01 vs 4.50 members) and side occupation prevalence (55 vs 53 households) suggest these factors are not primary determinants of CF participation in this sample.

Table 2 - Descriptive statistic of variables of farmer's decision to participate in Contract Farming (CF) in Jember, Lumajang, Banyuwangi, 2024

Variable		Participate in Contract Farming			Not Participate in Contract Farming		
		Mean	Standard Deviation	Freq.	Mean	Standard Deviation	Freq.
X ₁	Age (years)	46.87	9.86		54.44	13.02	
X ₂	Education (years)	9.12	2.98		8.17	2.47	
X ₃	Household size (person)	4.01	1.37		4.5	1.29	
X ₄	Experience (years)	12.97	8.75		15.11	8.98	
X ₅	Land ownership (1 = owned; 0 = rented)			57			51
X ₆	Harvest quantity (kg)	12223.21	12970.24		3086.67	2254.33	
X ₇	Side occupation (1 = Yes; 0 = No)			55			53
X ₈	Distance (km)	0.82	0.76		1.29	0.95	

Source: Own elaboration, 2024.

The logistic regression estimation produces a robust result, and four of six of the input variables have a statistically significant effect at the 90% confidence level.

Table 3 - Logistics regression output of factors that influence farmer decision whether to participate in Contract Farming or not

Variable	B	S.E.	Sig.	Exp(B) Odds Ratio
Age (years)	-0.052	0.034	0.127	0.949
Education (years)	0.111	0.118	0.344	1.118
Household size (person)	-0.415	0.220	0.060*	0.661
Experience (years)	-0.005	0.030	0.879	0.995
Land ownership	-1.655	0.672	0.014**	0.191
Harvest quantity (kg)	0.00045	0.000	0.012**	1.000
Side occupation	1.1225	0.856	0.190	3.073
Distance (km)	-0.7663	2.647	0.051*	0.465
Constant	5.783	2.289	0.012	324.66
Omnibus Test of Model Coefficient	0.000**			
Nagelkerke R Square	0.393			
-2 Log Likelihood (step 0)	105.968			
-2 Log Likelihood (step 1)	75.654			
Classification table (overall)	85%			

* Significant at 90% confidence level.

** Significant at 95% confidence level.

Source: Own elaboration.

In Table 3, logistic regression results reveal several key factors influencing farmers' decisions to participate in contract farming (CF). Household size, land ownership, harvest quantity, and distance to market emerge as statistically significant predictors of participation. Specifically, land ownership shows a strong negative association with CF participation ($B = -1.655$, $p < 0.05$), with landowning farmers being 80.9% less likely to join CF schemes ($\text{Exp}(B) = 0.191$). This suggests that farmers with secure land tenure may prefer independent production over contractual agreements. Conversely, harvest quantity exhibits a positive and significant relationship ($B = 0.00045$, $p < 0.05$), indicating that more productive farmers are marginally more likely to engage in CF, likely due to their capacity to meet volume commitments.

The model also identifies household size as marginally significant ($B = -0.415$, $p < 0.10$), where each additional household member reduces the odds of CF participation by 33.9% ($\text{Exp}(B) = 0.661$). This may reflect labor allocation trade-offs, as larger households might prioritize diversified income

sources over contractual obligations. Similarly, distance to market approaches significance ($B = -0.766$, $p < 0.10$), implying that farmers located farther from market centers are less likely to participate, possibly due to higher transaction costs.

Notably, age, education, farming experience, and side occupations do not significantly influence participation decisions in this sample. The model's robustness is supported by a significant Omnibus Test ($p < 0.01$) and a Nagelkerke R^2 of 0.393, explaining approximately 39.3% of the variance in CF participation. The classification accuracy of 85% further validates the model's predictive power (Ntshangase *et al.*, 2018). These findings highlight the importance of production capacity, land tenure, and market proximity in shaping smallholders' engagement with CF, providing a foundation for subsequent discussion on policy and institutional implications.

Table 4 - Balance Test Results for Propensity Score

Bias Reduction (%)	X₁	X₂	X₃	X₄	X₅	X₆	X₇	X₈
NNM	4.8	95.3	143.2	1.0	43.6	11.0	21.1	93.2
KM	12.6	97.8	158.4	8.9	61.7	29.4	48.6	96.5
RM	9.3	96.4	151.2	5.7	54.2	21.8	36.9	94.8

* Nearest Neighbourhood Matching (NNM), Kernel Matching (KM), Radius Matching (RM).

Table 4 reports bias reduction performance across alternative matching algorithms and shows clear improvements in covariate balance after matching. Overall, kernel matching (KM) achieves the highest bias reduction across most covariates, followed by radius matching (RM), while nearest neighbourhood matching (NNM) yields more variable performance. Substantial bias reductions are observed for key covariates such as education (X2) and market distance (X8) under all methods, indicating effective balancing of factors strongly associated with contract farming participation. KM and RM consistently improve balance for variables that remain weakly adjusted under NNM, including household size (X3), land ownership (X5), and side occupations (X7), suggesting that weighted and caliper-based approaches provide more stable matching outcomes. Although some covariates exhibit limited bias reduction under NNM, the overall pattern across matching specifications confirms that observable differences between treatment and control groups are substantially reduced, supporting the robustness of the subsequent treatment effect estimates.

Table 5 - Summary of Statistical Analysis Result for Testing Matching Quality

Matching Algorithm	Pseudo-R ²		P > Chi ²		Mean Bias		Median Bias	
	Before	After	Before	After	Before	After	Before	After
NNM*	0.612	0.431	0.00	0.28	56.8	50.4	53.50	44.30
KM*	0.612	0.430	0.00	0.37	56.8	52.3	53.50	34.23
RM*	0.612	0.441	0.00	0.25	56.8	55.1	53.50	40.62

* Nearest Neighbourhood Matching (NNM), Kernel Matching (KM), Radius Matching (RM).

Matching quality indicators indicate a consistent improvement in covariate balance across all matching algorithms after implementation (Table 5). For NNM, KM, and RM, the pseudo-R² values decline substantially from 0.612 to around 0.43-0.44, suggesting a marked reduction in systematic differences between contract farming participants and non-participants. Similarly, the likelihood ratio test becomes statistically insignificant after matching (P > Chi² ranging from 0.25 to 0.37), indicating that observable covariates no longer jointly explain treatment assignment. Mean and median bias measures also decrease across all methods, with kernel matching (KM) achieving the largest reduction in median bias, followed by radius matching (RM) and nearest neighbourhood matching (NNM). Although some residual imbalance remains, the overall pattern confirms that the matching procedures substantially improve covariate balance and provide an adequate basis for estimating treatment effects.

Table 6 - Impact of Contract Farming Participation on Red Chilli Farmers' Income

Matching Algorithm	Variable Outcome: Farmer's Income		
	ATT	Error Standard	t-value
NNM	105,760,863	53,485,129.4	1.98
KM	112,430,517	46,210,884.6	2.43
RM	108,975,342	49,876,510.2	2.18

* Nearest Neighbourhood Matching (NNM), Kernel Matching (KM), Radius Matching (RM).

Participation in contract farming cross alternative matching algorithms is consistently associated with higher farmer income (Table 6). The estimated average treatment effect on the treated (ATT) ranges from IDR 105.76

million under nearest neighbourhood matching (NNM) to IDR 112.43 million under kernel matching (KM), with radius matching (RM) yielding an intermediate estimate of IDR 108.98 million. All estimates are statistically significant at the 5% level (t-values between 1.98 and 2.43), indicating that the positive income effect of contract farming is robust to different matching specifications. The relatively lower standard errors observed under KM and RM suggest improved estimation efficiency compared with NNM, reinforcing the stability of the estimated welfare gains. These findings provide robust empirical evidence that contract farming can serve as an effective mechanism for income enhancement among Indonesian chilli farmers, though the wide confidence interval suggests the actual benefits may range considerably depending on farmer-specific characteristics and implementation conditions. The positive ATT aligns with theoretical expectations about contract farming's potential to improve market access and price stability for smallholders.

Discussion

Factors affecting farmer decision to participate in contract farming (CF)

Farmer age has a negative influence on farmer decision to participate in CF. Odds ratio value (Exp (B)) of age is 0.949 means that older farmer have a lower tendency to participate in CF by 0.949 times compared to younger farmer, assuming other variables are constant. Younger farmers are more inclined towards engaging in contract farming (CF). The rationale behind this trend is that younger individuals in the farming sector are generally more receptive to new advancements, particularly innovative farming models like CF. Conversely, their older counterparts often show resistance and hesitancy towards embracing such modern concepts. According to Vassalos and Li (2016), there's a noticeable reluctance among older farmers to participate in CF. This reluctance can be attributed to several factors; as farmers age, they may find it challenging to enter into long-term contracts or commitments. Additionally, there is a tendency among the older farming population to exhibit a lower level of trust in entrusting their farming operations to others, further contributing to their reluctance to adopt CF (Hota *et al.*, 2019).

Education positively impacts farmers' decisions to participate in contract farming because it equips them with essential knowledge and skills (Hoang, 2021; Olounlade *et al.*, 2020). Educated farmers are more aware of the latest agricultural practices and the benefits of contract farming, such as better access to markets and advanced technologies (Bellemare & Bloem,

2018). They also possess superior risk management and negotiation skills, making them more capable of securing favorable contract terms. Additionally, education fosters a willingness to embrace new innovations and improves their ability to understand the legal and financial aspects of contracts (Power & Goodnough, 2019). This combination of factors makes educated farmers more open and better prepared to engage in contract farming, recognizing it as an opportunity to enhance their productivity and income.

Household size, experience, land ownership, and distance from home to farming area can negatively impact farmers' decisions to participate in contract farming (CF) for various interconnected reasons. Larger household sizes may increase the need for immediate and stable income, leading farmers to prefer traditional farming methods perceived as less risky than CF (Ali, 2021), which often involves specific production standards and market uncertainties. Experienced farmers might be more set in their ways and skeptical of the benefits of CF (Poulsen *et al.*, 2018), preferring to rely on traditional farming practices that have served them well in the past. Additionally, they may prefer to maintain complete control over their farming practices rather than adhering to the requirements set by CF agreements.

Farmers who own their land outright may be less inclined to participate in CF due to a desire to maintain autonomy over their land use and skepticism about the long-term benefits of CF arrangements (Djurfeldt *et al.*, 2018), fearing potential loss of control over their most valuable asset. Together, these factors create a situation where farmers with larger households, more experience and have land ownership are less likely to see the benefits of participating in CF, opting instead for traditional farming methods that offer them more perceived control and stability. However, the positive but statistically weak association between side occupations and CF participation ($p = 0.190$) presents an interesting paradox – while supplemental income could theoretically enable farmers to absorb CF risks (Buitenhuis *et al.*, 2022), it also divert labor away from contracted production (Vicol *et al.*, 2022).

Meanwhile, distance between farmers' homes and their cultivated areas significantly affects their decision to participate in contract farming (CF), with a negative and marginally significant coefficient ($p = 0.051$). This suggests that farmers whose fields are located farther from their residences are less likely to engage in CF arrangements. This finding aligns with farm management theory, which posits that greater distances between homesteads and fields increase transportation costs, time constraints, and monitoring difficulties (Deininger *et al.*, 2017; Shuhao *et al.*, 2008). For CF schemes requiring strict adherence to production protocols (e.g., scheduled inputs, quality control), remote plots may be less attractive to both farmers and agribusiness firms due to higher supervision costs and lower compliance

likelihood. In Indonesia, where many chilli farmers maintain multiple small plots, this distance factor may explain why CF adoption remains limited despite its potential benefits.

Enhancing farmer participation in contract farming for red chilli commodities is essential to consider and address the identified factors that influence their decisions. Firstly, recognizing the negative influence of farmer age on participation implies that targeted efforts should be made to educate and engage older farmers in the benefits of contract farming (Vabi Vamuloh *et al.*, 2019). Initiatives such as workshops, training programs, and knowledge-sharing platforms can be implemented to bridge the generation gap and showcase the advantages of adopting innovative farming models like contract farming. Additionally, creating mentorship programs where younger farmers can share their positive experiences and outcomes in contract farming may help dispel the resistance among older farmers (Penniman, 2018).

Moreover, the impact of education on farmer participation suggests a need for widespread education initiatives within the farming community. Investments in educational programs that focus on the benefits, legal aspects, and risk management strategies associated with contract farming can empower farmers with the knowledge and skills necessary for successful participation (Amanah *et al.*, 2021; Davis *et al.*, 2021). Collaborations between agricultural institutions, government bodies, and NGOs can facilitate the dissemination of relevant information and ensure that farmers are well-informed about the advantages of contract farming.

Furthermore, considering the negative impact of factors such as household size, experience, land ownership, tailored strategies are needed to address the concerns of farmers with these characteristics. Implementing flexible contract terms, addressing concerns related to income stability, and customizing agreements based on the specific needs of larger households or experienced farmers could make contract farming more appealing to a broader demographic. Additionally, emphasizing the scalability of contract farming and showcasing success stories from farmers with extensive landholdings can dispel misconceptions and highlight the potential benefits of participation (Wanjira *et al.*, 2020).

Contract farming impact on farmer's income

Positive and statistically significant Average Treatment Effect on the Treated (ATT) demonstrates that contract farming (CF) substantially improves red chilli farmers' income in research area. This finding aligns with the theoretical proposition that CF reduces market uncertainties and improves

access to quality inputs (Barik *et al.*, 2024; Dubbert, 2019). The magnitude of this income effect, suggests CF can be transformative for rural livelihoods. Some mechanisms likely explain this result, first, CF's input provision (particularly improved seeds and fertilizers) appears to have boosted yields (Ncube, 2020), as evidenced by participants' significantly higher harvest quantities. Second, price stabilization clauses in contracts (Bizikova *et al.*, 2020) protected farmers from chilli's notorious price volatility. Third, technical assistance component potentially reduced production risks (Gramzow *et al.*, 2018; Meemken & Bellemare, 2020).

These findings carry important policy implications. The demonstrated income effects support Indonesia's National Agricultural Contract Farming Development Program but highlight the need for: 1) standardized contract templates ensuring fair terms, 2) targeted inclusion of smaller landholders, and 3) quality control systems maintaining chilli premium prices. Future research should explore the sustainability of these income gains and environmental impacts of intensified production. Compared to CF impacts on other Indonesian crops, red chilli shows exceptional responsiveness, likely due to its high value-per-hectare and traditional market inefficiencies. This suggests horticultural crops may benefit most from CF interventions in developing economies.

Conclusion and Suggestion

Participation in contract farming (CF) is associated with higher welfare outcomes among sampled smallholder red chilli farmers operating within comparable production and institutional settings. Specifically, CF participants earned, on average, approximately IDR 105.76 million more annually than non-participants. These welfare differences are linked to improved access to quality inputs, price stabilization mechanisms, and technical assistance, which together enhance productivity and reduce exposure to market risks. Farmer participation in CF is shaped by several socio-economic and spatial factors. Younger farmers are more likely to engage in CF schemes, while landowners and farmers with plots located farther from homesteads show lower participation probabilities. Although education and household size exhibit weaker statistical significance, their estimated effects remain consistent with broader theoretical expectations related to human capital and labor allocation decisions.

The findings highlight the conditional potential of CF as a pathway for agricultural commercialization and income enhancement among smallholder horticultural producers under similar contextual conditions. To improve

inclusivity and equity within CF arrangements, policy interventions should focus on: (1) promoting standardized and transparent contract designs to safeguard smallholders, (2) strengthening logistical support for farmers managing spatially dispersed plots, and (3) designing targeted outreach strategies for older and landowning farmers who may face higher entry barriers or exhibit greater risk aversion toward CF participation. Future research should extend this analysis using longitudinal data to capture dynamic welfare effects, examine environmental sustainability implications, and assess the role of digital technologies in expanding CF accessibility. Such efforts would improve understanding of how CF arrangements function across diverse institutional and agroecological contexts.

Author contributions

Conceptualization was contributed by Anik Suwandari and Joni Murti Mulyo Aji. Methodology was contributed by Anik Suwandari, Joni Murti Mulyo Aji, Mohammad Rondhi, and Rizky Yanuarti. Investigation and data curation were conducted by Anik Suwandari, Ebban Bagus Kuntadi, and Rokhani. Formal analysis was performed by Anik Suwandari, Ebban Bagus Kuntadi, Mohammad Rondhi, and Rizky Yanuarti. Writing – original draft was undertaken by Anik Suwandari. Writing – review and editing was contributed by all authors. Supervision was provided by Joni Murti Mulyo Aji, Mohammad Rondhi, and Rizky Yanuarti. Project administration was handled by Anik Suwandari.

Conflict of interest

All authors declare no conflict of interest.

References

- Adams, T., Gerber, J.-D., Amacker, M., & Haller, T. (2019). Who gains from contract farming? Dependencies, power relations, and institutional change. *The Journal of Peasant Studies*, 46(7), 1435-1457.
- Aji, J. M. M., Rondhi, M., Suwandari, A., Hapsari, T. D., Januar, J., & Yanuarti, R. (2023). Determinants of cost inefficiency and farmer performance in broiler contract farming. *Tropical Animal Science Journal*, 46(3), 382-388.
- Ali, E. (2021). Farm households' adoption of climate-smart practices in subsistence agriculture: Evidence from Northern Togo. *Environmental Management*, 67(5), 949-962.

- Amanah, S., Suprehatin, S., Iskandar, E., Eugenia, L., & Chaidirsyah, M. R. (2021). *Investing in farmers through public-private-producer partnerships: Rural Empowerment and Agricultural Development Scaling-up Initiative in Indonesia* (Vol. 7). Food & Agriculture Org.
- Angeheni, D., Darma, R., & Fudjaja, L. (2024). Empowering farmers: Unveiling the economic impacts of contract farming on red chilli farmers' income in Magelang District, Indonesia. *Open Agriculture*, 9(1), 20220300.
- Badan Pusat Statistik, I. (2024). *Produksi Tanaman Sayuran dan Buah-Buahan Semusim Menurut Kabupaten/Kota dan Jenis Tanaman di Provinsi Jawa Timur, 2024*. -- <https://jatim.bps.go.id/id/statistics-table/3/ZUhFd1JtZzJWVvpqWTJsV05XTllhVmhRSzFoNFFUMDkjMw==/produksi-tanaman-sayuran-menurut-kabupaten-kota-dan-jenis-tanaman-di-provinsi-jawa-timur--2023.html>.
- Barik, P., Bedamatta, R., & Vikraman, S. (2024). Smallholders in contract farming value chain: Challenges and opportunities, empirical evidence from West Bengal, India. *Journal of International Food & Agribusiness Marketing*, 1-33.
- Becker, S. O., & Ichino, A. (2002). Estimation of Average Treatment Effects Based on Propensity Scores. *The Stata Journal: Promoting Communications on Statistics and Stata*, 2(4), 358-377. Doi: 10.1177/1536867x0200200403.
- Behera, D. K. (2019). Farmer's Participation in Contract Farming in India: A Study of Bihar. *Agricultural Economics Review*, 20(2), 80-89.
- Bellemare, M. F., & Bloem, J. R. (2018). Does contract farming improve welfare? A review. *World Development*, 112, 259-271.
- Bizikova, L., Nkonya, E., Minah, M., Hanisch, M., Turaga, R. M. R., Speranza, C. I., Karthikeyan, M., Tang, L., Ghezzi-Kopel, K., & Kelly, J. (2020). A scoping review of the contributions of farmers' organizations to smallholder agriculture. *Nature Food*, 1(10), 620-630.
- Buitenhuis, Y., Candel, J. J. L., Termeer, K. J. A. M., & Feindt, P. H. (2022). Reconstructing the framing of resilience in the European Union's Common Agricultural Policy post-2020 reform. *Sociologia Ruralis*, 62(3), 564-586.
- Caliendo, M., & Kopeinig, S. (2008). Some Practical Guidance for the Implementation of Propensity Score Matching. *Journal of Economic Surveys*, 22(1), 31-72. Doi: 10.1111/j.1467-6419.2007.
- Das, A. (2021). Logistic regression. In *Encyclopedia of Quality of Life and Well-Being Research* (pp. 1-2). Springer.
- Das, G., Bhattacharyya, R., & Marjit, S. (2023). Contract Farming and Food Insecurity in an Open Competitive Economy: Growth, Distribution, and Government Policy. *Journal of Risk and Financial Management*, 16(4). Doi: 10.3390/jrfm16040249.
- Davis, K., Gammelgaard, J., Preissing, J., Gilbert, R., & Ngwenya, H. (2021). *Investing in farmers: Agriculture human capital investment strategies* (Issue 4). Food & Agriculture Org.
- Deininger, K., Monchuk, D., Nagarajan, H. K., & Singh, S. K. (2017). Does land fragmentation increase the cost of cultivation? Evidence from India. *The Journal of Development Studies*, 53(1), 82-98.
- Djurfeldt, A. A., Hillbom, E., Mulwafu, W. O., Mvula, P., & Djurfeldt, G. (2018). "The family farms together, the decisions, however are made by the man" -

- Matrilineal land tenure systems, welfare and decision making in rural Malawi. *Land Use Policy*, 70, 601-610.
- Dubbert, C. (2019). Participation in contract farming and farm performance: Insights from cashew farmers in Ghana. *Agricultural Economics*, 50(6), 749-763.
- Gramzow, A., Batt, P. J., Afari-Sefa, V., Petrick, M., & Roothaert, R. (2018). Linking smallholder vegetable producers to markets - A comparison of a vegetable producer group and a contract-farming arrangement in the Lushoto District of Tanzania. *Journal of Rural Studies*, 63, 168-179. Doi: 10.1016/j.jrurstud.2018.07.011.
- Hakim, R. I., & Rifin, A. (2024). Understanding Heterogeneity in Contract Farming Among Indonesian Sugarcane Farmers. *Jurnal Manajemen & Agribisnis*, 21(1), 109.
- Hasegawa, T., Fujimori, S., Havlík, P., Valin, H., Bodirsky, B. L., Doelman, J. C., Fellmann, T., Kyle, P., Koopman, J. F. L., & Lotze-Campen, H. (2018). Risk of increased food insecurity under stringent global climate change mitigation policy. *Nature Climate Change*, 8(8), 699-703.
- Hoang, V. (2021). Impact of contract farming on farmers' income in the food value chain: A theoretical analysis and empirical study in Vietnam. *Agriculture*, 11(8), 797.
- Hota, P. K., Mitra, S., & Qureshi, I. (2019). Adopting bricolage to overcome resource constraints: The case of social enterprises in rural India. *Management and Organization Review*, 15(2), 371-402.
- Koo, J., Mamun, A., & Martin, W. (2021). From bad to worse: Poverty impacts of food availability responses to weather shocks. *Agricultural Economics*, 52(5), 833-847.
- Laborde, D., Lakatos, C., & Martin, W. J. (2019). Poverty impact of food price shocks and policies. *World Bank Policy Research Working Paper*, 8724.
- Maertens, M., & Vande Velde, K. (2017). Contract-farming in Staple Food Chains: The Case of Rice in Benin. *World Development*, 95, 73-87. Doi: 10.1016/j.worlddev.2017.02.011.
- Manurung, M. (2024). *Analisis Kinerja Perdagangan Cabai Merah*. -- https://satudata.pertanian.go.id/assets/docs/publikasi/1D_Analisis_Kinerja_Perdagangan_Cabai_Merah_2024_-_publish.pdf.
- Mariyono, J., Abdurrachman, H., Suswati, E., Susilawati, A. D., Sujarwo, M., Waskito, J., Suwandi, & Zainudin, A. (2020). Rural modernisation through intensive vegetable farming agribusiness in Indonesia. *Rural Society*, 29(2), 116-133.
- Mariyono, J., & Sumarno, S. (2015). Chilli production and adoption of chilli-based agribusiness in Indonesia. *Journal of Agribusiness in Developing and Emerging Economies*, 5(1), 57-75. Doi: 10.1108/JADEE-01-2014-0002.
- Mbuli, C. S., Fonjong, L. N., & Fletcher, A. J. (2021). Climate change and small farmers' vulnerability to food insecurity in Cameroon. *Sustainability*, 13(3), 1523.
- Meemken, E.-M., & Bellemare, M. F. (2020). Smallholder farmers and contract farming in developing countries. *Proceedings of the National Academy of Sciences*, 117(1), 259-264.

- Muflikh, Y. N., Adhikari, R., & Abdul Aziz, A. (2023). Governance structures and price volatility perceptions in the Indonesian chilli value chain. *Journal of Agribusiness in Developing and Emerging Economies*, 13(4), 631-655. Doi: 10.1108/JADEE-08-2021-0198.
- Mweshi, G. K., & Sakyi, K. (2020). Application of sampling methods for the research design. *Archives of Business Review*, 8(11).
- Ncube, D. (2020). The importance of contract farming to small-scale farmers in Africa and the implications for policy: A review scenario. *The Open Agriculture Journal*, 14(1).
- Ntshangase, N. L., Muroyiwa, B., & Sibanda, M. (2018). Farmers' perceptions and factors influencing the adoption of no-till conservation agriculture by small-scale farmers in Zashuke, KwaZulu-Natal Province. *Sustainability*, 10(2), 555.
- Olounlade, O. A., Li, G.-C., Kokoye, S. E. H., Dossouhoui, F. V., Akpa, K. A. A., Anshiso, D., & Biauou, G. (2020). Impact of participation in contract farming on smallholder farmers' income and food security in rural Benin: PSM and LATE parameter combined. *Sustainability*, 12(3), 901.
- Pan, W. E., & Bai, H. E. (2015). *Propensity score analysis: Concepts and issues*.
- Penniman, L. (2018). *Farming while black: Soul fire farm's practical guide to liberation on the land*. Chelsea Green Publishing.
- Poulsen, M. N., Bailey-Davis, L., DeWalle, J., Mowery, J., & Schwartz, B. S. (2018). Agricultural implications of unconventional natural gas development: Divergent perceptions of sustainable and conventional farmers. *Culture, Agriculture, Food and Environment*, 40(1), 24-35.
- Power, K., & Goodnough, K. (2019). Fostering teachers' autonomous motivation during professional learning: A self-determination theory perspective. *Teaching Education*, 30(3), 278-298.
- Prihadyanti, D., & Aziz, S. A. (2023). Indonesia toward sustainable agriculture—Do technology-based start-ups play a crucial role? *Business Strategy & Development*, 6(2), 140-157.
- Rokhani, R., Asrofi, A., Adi, A. H., Khasan, A. F., & Rondhi, M. (2021). The effect of agricultural extension access on the performance of smallholder sugarcane farmers in Indonesia. *AGRARIS: Journal of Agribusiness and Rural Development Research*, 7(2), 142-159.
- Rondhi, M., Aji, J. M. M., Hasan, A. F., & Yanuarti, R. (2020). Factors affecting farmers' participation in contract farming: The case of broiler sector in Indonesia. *Tropical Animal Science Journal*, 43(2), 183-190.
- Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), 41-55.
- Rosenbaum, P. R., & Rubin, D. B. (2006). The central role of the propensity score in observational studies for causal effects. *Matched Sampling for Causal Effects*, 1083, 170-184. Doi: 10.1017/CBO9780511810725.016.
- Sahara, S., Minot, N., Stringer, R., & Umberger, W. J. (2015). Determinants and effects of small chilli farmers' participation in supermarket channels in Indonesia. *Bulletin of Indonesian Economic Studies*, 51(3), 445-460.
- Setiadi, A., Santoso, S. I., Mukson, M., & Roessali, W. (2022). Contract broiler farming as an effective pathway to improve rural prosperity in Indonesia. *International Social Science Journal*, 72(244). Doi: 10.1111/issj.12330.

- Shuhao, T. A. N., Heerink, N., Kruseman, G., & Futian, Q. U. (2008). Do fragmented landholdings have higher production costs? Evidence from rice farmers in Northeastern Jiangxi province, PR China. *China Economic Review*, 19(3), 347-358.
- Suwandari, A., Hariyati, Y., Agustina, T., Kusmiati, A., Hapsari, T. D., Khasan, A. F., & Rondhi, M. (2020). The Impacts of Certified Seed Plant Adoption on the Productivity and Efficiency of Smallholder Sugarcane Farmers in Indonesia. *Sugar Tech*, 22(3). Doi: 10.1007/s12355-020-00821-2.
- Vabi Vamuloh, V., Panwar, R., Hagerman, S. M., Gaston, C., & Kozak, R. A. (2019). Achieving Sustainable Development Goals in the global food sector: A systematic literature review to examine small farmers engagement in contract farming. *Business Strategy & Development*, 2(4), 276-289.
- van der Haar, S., Gallagher, E. J., Schoneveld, G. C., Slingerland, M. A., & Leeuwis, C. (2023). Climate-smart cocoa in forest landscapes: Lessons from institutional innovations in Ghana. *Land Use Policy*, 132, 106819. Doi: 10.1016/j.landusepol.2023.106819.
- Vicol, M., Fold, N., Hambloch, C., Narayanan, S., & Pérez Niño, H. (2022). Twenty-five years of Living Under Contract: Contract farming and agrarian change in the developing world. *Journal of Agrarian Change*, 22(1), 3-18.
- Wan, Z. (2019). Participant selection and access in case study research. *Challenges and Opportunities in Qualitative Research: Sharing Young Scholars' Experiences*, 47-61.
- Wanjira, E. O., Muriuki, J., & Ojuok, I. (2020). Farmer managed natural regeneration in Kenya. *World Agroforestry. Nairobi, Kenya*.
- White, B., & Wijaya, H. (2022). What kind of labour regime is contract farming? Contracting and sharecropping in Java compared. *Journal of Agrarian Change*, 22(1), 19-35.
- Yanuarti, R., Aji, J. M. M., & Rondhi, M. (2019). Risk aversion level influence on farmer's decision to participate in crop insurance: A review. *Agricultural Economics (Zemědělská Ekonomika)*, 65(10), 481-489. doi: 10.17221/93/2019-AGRICECON.

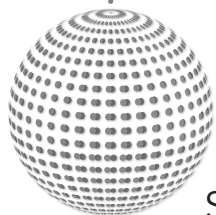


FrancoAngeli:

a strong international commitment

Our rich catalogue of publications includes hundreds of English-language monographs, as well as many journals that are published, partially or in whole, in English.

The **FrancoAngeli**, **FrancoAngeli Journals** and **FrancoAngeli Series** websites now offer a completely dual language interface, in Italian and English.



Since 2006, we have been making our content available in digital format, as one of the first partners and contributors to the **Torrossa** platform for the distribution of digital content to Italian and foreign academic institutions. **Torrossa** is a pan-European platform which currently provides access to nearly 400,000 e-books and more than 1,000 e-journals in many languages from academic publishers in Italy and Spain, and, more recently, French, German, Swiss, Belgian, Dutch, and English publishers. It regularly serves more than 3,000 libraries worldwide.

Ensuring international visibility and discoverability for our authors is of crucial importance to us.

FrancoAngeli

 **torrossa**
Online Digital Library

