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# Exploring Intentions to Convert into Organic Farming in Small-Scale Agriculture: Social Embeddedness in Extended Theory of Planned Behaviour Framework

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Abstract:

CONTEXT: The European Union actively supports and promotes the development of more sustainable and resilient farming systems and contributes to the significant expansion of organic farming. Despite the considerable growth of the organic agricultural sector, this process faces several structural challenges, especially in countries with fragmented agriculture, such as Romania, where small-scale farming dominates. Small-scale farmers are quite reluctant to transition to organic farming even despite financial incentives.

OBJECTIVE: This study aims to understand small-scale farmers' reluctance to adopt organic farming by combining embeddedness theory, which links economic activities to social structures, with the Theory of Planned Behaviour (TPB).

METHODS: A survey of 150 small-scale farms in Romania's Centru region was conducted in 2023 using semi-structured face-to-face questionnaires. The research framework combines embeddedness theory and the extended TPB using structural equation modelling and simultaneous confirmatory factor analysis.

RESULTS AND CONCLUSIONS: It was demonstrated that network embeddedness exerts the most significant influence on pro-ecological behavioural intentions when considered in the context of other TPB constructs. However, this positive impact is partially offset by the negative impact of embeddedness at the farm level. Our research results suggest that changing the approach of small-scale farmers to organic farming requires strengthening network embeddedness through workshops, training sessions, rallies, and meetings that would highlight the benefits of organic farming.

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SIGNIFICANCE: We shed more light on the behavioural drivers of adopting organic practices in small-scale framing and argue that the relational embeddedness construct represents a significant extension of the TPB framework for agri-environmental studies.

Key words: organic farming, Romanian agriculture, structural equation modelling, extended TPB, social embeddedness

## 1. Introduction

As the world faces a looming climate, biodiversity and food security crisis (Hertel 2011, Tilman et al. 2011, Wheeler and Von Braun 2013) the adaptation of sustainable food production systems is of great importance (Rees et al., 2023). Organic farming has been identified as a key component of the overall solution due to its capacity to mitigate some of the negative externalities resulting from intensive agricultural practices (Lee, Choe, and Park 2015, Muller et al. 2017, Squalli and Adamkiewicz 2018, Pe'er et al. 2020). Organic farming is characterised by extensive farming practices and the provision of environmental public goods that respond to societal demand for the use of environmentally friendly farming practices and to increased consumer demand for organic products. The specific organic farming practices contribute to the protection of biodiversity, the maintenance of soil fertility and functionality, the reduction of pollution of water resources (by eliminating pesticide run-off and strict manure management), the improvement of water management (by improving soil structure, reducing the risk and severity of floods and droughts in the context of climate change), the reduction of carbon dioxide emissions and the assurance of animal welfare conditions (by reducing livestock density) (European Commission 2021, Gomiero, Pimentel, and Paoletti 2011, Montanarella and Panagos 2021, Moschitz et al. 2021).

The European Union (EU) is a global pioneer in initiatives to mitigate the negative environmental impacts of agriculture while promoting the development of more sustainable and resilient farming systems (Martín-García et al., 2024). This has contributed to a significant expansion of organic farming (Alonso-Adame et al., 2025). According to Eurostat data, the total area under organic farming reached 15.9 million hectares in 2021, representing 9.9% of the total utilised agricultural area in the EU (Eurostat, 2023). Regrettably, the progress of this process across Europe does not uniformly meet the anticipated pace and scope, as evidenced, for instance, in Romania.

In Romania, there are over 3.42 million farms, of which approximately 35% rely primarily on agriculture for their livelihood. In addition, the land structure in Romania is very fragmented

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and land consolidation is very difficult for legal reasons (Czyżewski & Kryszak, 2024). The majority of Romanian farms (94.6%) are classified as very small, with an annual standard output of less than EUR 8,000 yearly. The remaining 5.3% are considered small and medium, (EUR 8,000-249,999 SO), and only 0.1% of Romanian farms are classified as large (Muntean et al., 2020).

The development of the organic farming in Romania is facing several structural challenges. A considerable number of small and medium farms initiate the transition to organic production but ultimately abandon it. Consequently, the number of organic operators has been on a downward trajectory since 2012 (decreasing from 15,544 to 9,008 in 2018) (Popovici et al., 2022). The reason for this is the minimal concern for small farms, because the typical size of organic farms in Romania is markedly larger (51 ha) than that of conventional farms (2 ha). Romania has also one of the lowest proportions of organic certified areas, hence this sector still requires significant growth in order to achieve the ambitious target of 25% of the agricultural area being organic by 2030, as set out in the Farm-to-Fork strategy.

The reasons why Romanian peasants are reluctant to convert to organic farming are not entirely clear. According to Popovici et al., (2022), who presented a very thorough picture of organic farming in Romania, farmers are subject to many disruptive factors in terms of fundraising, market access and adaptation strategies. They also lack motivation to switch to organic production due to the high perceived initial cost of the transition. Consequently, financial incentives in the form of subsidies are found to be inadequate.

However, in accordance with Granovetter's (1985) findings, besides financial incentives, human economic activities are inextricably linked to the social structure within which they operate, rendering them incapable of being evaluated in isolation. The embeddedness theory asserts that rational economic behaviour is constantly influenced by the surrounding social context (Zheng et al., 2022). Embeddedness is related to different types of interactive relationships between institutional and individual actors and has been studied at the farm level from different perspectives: territorial, social network and societal (Schwabe et al., 2022) or more general ‘relational’ approach (Zhang et al., 2023). All of these approaches align with the definition of ‘relational embeddedness’ utilized in small and medium enterprises studies, which, first, encompasses the attitudes and behaviours exhibited by partners towards one another (Alinaghian et al., 2020) and, secondly, the frequency of communication and interaction among network members (Zhou et al., 2022). There is a gap in our knowledge of how this social context, perceived from the perspective of embeddedness theory, affects farmers' willingness to adopt organic practices, especially in small-scale farming.

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**Therefore, the aim of our paper is to assess the impact of relational embeddedness on farmers' behavioural intentions to adopt organic farming practices in Romanian smallholder agriculture.**

Traditionally, the Theory of Planned Behaviour (TPB) is employed to elucidate human behaviours. This socio-psychological theory explains behavioural intentions as the result of three primary drivers: attitudes (AT), subjective norms (SN), and perceived behavioural control (PBC) (Ajzen 1991, Ajzen 2020). TPB has found very wide application in agri-environmental studies and is considered well suited to explaining farmers' behaviour in the context of environmental management, given its potential to test new socio-psychological constructs (e.g. Zhang et al. 2023, Lin and Guan 2021, Shahangian, Tabesh, and Yazdanpanah 2021, Kasargodu Anebagilu et al. 2021, Rezaei et al. 2019). In our study we combine embeddedness theory and the extended TPB framework using structural equation modelling (SEM). i.e. simultaneous confirmatory factor analysis (SCFA) on the sample of 150 farms from the region of Centru (Transylvania). Data were collected through face-to-face semi-structured questionnaires.

Our new contribution is twofold. Firstly, we shed more light on the behavioural drivers of adopting organic practices in small-scale framing. Secondly, we argue that the relational embeddedness construct represents a significant extension of the TPB framework for agri-environmental studies.

The remainder of the article is structured as follows: in the next section, we discuss the role of embeddedness in shaping farmers' behaviour in two stages - first, focusing on previous extensions of the TPB in agri-environmental studies, and second, integrating the notion of relational embeddedness into the TPB framework. Next, we present the data and methods in three subsections devoted to the data collection process, the SEM-SCFA methodology, and the model specification, including goodness-of-fit issues. We then describe the results and discuss them in the context of the state of the art. Conclusions form the final section.

## 2. The Role of Embeddedness in Shaping Farmers' Behaviour within Extended TPB Framework – Literature Review

### *2.1 Extended TPB Framework*

According to the TPB, human behaviour is driven by three types of considerations: beliefs about the likely consequences of a behaviour - AT, beliefs about what important others think I should do – SN, and beliefs about my ability to perform the behaviour – PBC. These beliefs

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provide the basis for forming an intention to engage in the behaviour, but the actual performance of the behaviour depends on behavioural control (Ajzen & Schmidt, 2020). Consequently, PBC can be examined in isolation from the remainder of the TPB framework as self-efficacy, which is considered to be synonymous with PBC (Rosenstock 1990, Prentice-Dunn and Rogers 1986, Schwarzer 2014). This strand of works has demonstrated that PBC (self-efficacy) has a statistically significant and positive influence on decisions regarding agricultural practices that benefit the environment (Czyżewski et al., 2023).

The TPB in its basic form is very well suited to explain farmers' behaviour (Senger, Borges, and Machado 2017, Daxini et al. 2019, Despotović, Rodić, and Caracciolo 2019, Bagheri, Emami, and Damalas 2021). However, the theory can be improved with additional variables that can enhance the predictive ability of the model (Rezaei et al. 2019, Rezaei, Seidi, and Karbasioun 2019, Savari and Gharechaee 2020, Ataei et al. 2021). The following literature review presents the most common extensions of the TPB with new constructs (bolded) aimed at better understanding farmers' behaviours and attitudes towards green practices.

Damalas (2021) analysed Greek farmers and introduced the construct of **perceived risk of loss**, finding a negative correlation with the intention to reduce pesticide use. Attitudes and subjective norms were positively correlated with education, while risk of loss was negatively correlated. Sun et al. (2022) showed that in digital farm management decisions, **expected loss or cost reduction** are a key factors enriching the TPB. Amare and Darr (2023) found that the intention to adopt agroforestry innovations is driven by positive **evaluations of monetary and livelihood benefits,** and **pressure from experts**. Mancha and Yoder (2015) identified that **individual's awareness and understanding of how to protect the environment (self-identity)**, influences farmers' intentions to engage in eco-friendly behaviours, extending the TPB.

Table 1. Cognitive constructs used in original and extended TPB for explaining pro-environmental behavioural intentions in agriculture

<table>
<tr><td colspan="2">Original TPB</td></tr>
<tr><td>Attitude</td><td rowspan="3">Bagheri, Emami, and Damalas 2021, Govindharaj et al. 2021, Shahangian, Tabesh, and Yazdanpanah 2021, Tama et al. 2021, Sun et al. 2022, Amare and Darr 2023b, Garmendia-Lemus et al. 2024</td></tr>
<tr><td>Subjective norm</td></tr>
<tr><td>Perceived behavioural control</td></tr>
<tr><td colspan="2">Extended TPB</td></tr>
</table>

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| | |
|---|---|
| Morality and value perception | Schwartz 1977, Arvola et al. 2008, Fielding, McDonald, and Louis 2008, Chen 2016, Garrigan, Adlam, and Langdon 2018, Shahangian, Tabesh, and Yazdanpanah 2021, Cao et al. 2022, Kasargodu Anebagilu et al. 2021 |
| Knowledge and understanding of environmental risk | Michie et al. 2008, Kasargodu Anebagilu et al. 2021, Tama et al. 2021 |
| Behavioural willingness – openness to risk opportunity | Kasargodu Anebagilu et al. 2021 |
| Perceived risk of loss | Damalas 2021, Sun et al. 2022 |
| Familiarity | Scott, Jones, and Webb 2014, Hajli et al. 2017, Shahangian, Tabesh, and Yazdanpanah 2021 |
| Environmental risk perception | Tajeri Moghadam et al. 2020, Shahangian, Tabesh, and Yazdanpanah 2021, Tama et al. 2021, Wang et al. 2021 |
| Policy effectiveness, schemes complexity | Lin and Guan 2021, Li, Jiang, and Tang 2024 |
| Self-identity, individual's awareness, and ascribed responsibility | Mancha and Yoder 2015, Ataei et al. 2021, Cao et al. 2022, Li, Jiang, and Tang 2024 |
| Evaluation of financial and non-financial benefits | Amare and Darr 2023b |

Imani et al. (2021) noted that social pressure encourages green practices, but implementation requires **necessary skills and resources (familiarity)**. In order to encourage Chinese tea farmers to use organic manure, Li, Jiang, and Tang (2024) propose that it is necessary **to involve politics to build environmental awareness** and promote the popularisation of sustainable agriculture. The authors argue that **farmers' awareness of their role in environmental protection** goes hand in hand with strengthening the popularisation of sustainable agriculture and environmental protection strategies by the government and its agencies.

Kasargodu Anebagilu et al. (2021) found that among **knowledge, morality, and willingness (openness to risk)**, knowledge was the least significant for Chilean farmers using vegetative filter strips. In contrast, Tama et al. (2021) found that a high level of **knowledge and perception of environmental risks** is necessary to have a intention to apply conservative agriculture. The authors concluded that knowledge had the highest impact on attitude, while attitude had the greatest direct impact on intention. Cao et al. (2022) concluded that **value perception, ascribed responsibility**, and **moral inclinations** significantly affect behavioural intentions, highlighting

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the need for deeper understanding to enhance policy effectiveness and motivate sustainable practices, especially among village leaders. In summary, constructs extending TBP are juxtaposed with works using its base form in Table 1.

### *2.2. Relational Embeddedness in the Context of Other TPB's Constructs*

The decision-making process of an individual farmer is shaped by dispositional, cognitive, and social factors as described by Dessart, Barreiro-Hurlé, and Van Bavel (2019). This follows from the general theory of attitudes (Aronson et al., 1994). Dispositional factors include moral issues, individuality and resistance to the influence of surrounding conditions. They are relatively stable and closely related to the individual, but their impact on decisions is indirect. Cognitive factors, on the other hand, have a direct impact on decisions because they are related to the farmer's knowledge, costs, benefits and perceived risk.

The dispositional drivers of framers behaviour are covered by the morality construct (MO) used commonly in TPB which shall have an indirect influence on behavioural intentions (we follow this line of thought in our study). The cognitive factors are addressed in TPB by AT, SN, and PBC and some commonly used TPB's extensions, e.g. perceive risk related to a given behaviour. Equally important, however, are social factors such as injunctive motives and norms (Dessart et al., 2019). They are shaped by the social embeddedness during the interactions with other individuals and institution, referring to the definition proposed in the introduction. Hence, they shall indirectly affect behavioural intentions through SN, MO and PBC. The application of embeddedness theory may help to identify the contextual conditions that influence farmers' adoption and implementation of the organic farming model. However, the relational embeddedness has not been previously tested in models explaining behavioural intentions to implement sustainable practices within TPB framework.

As evidenced by the numerous authors cited in Table 1, TPB has the potential to be extended by the inclusion of new constructs that may enhance its predictive power. This position is supported even by Ajzen (2020), who asserts that the introduction of additional constructs into the model should be justified by testing the extended model against the original one. Otherwise, there is a risk of the lack of discriminant validity, high correlation with the original constructs, and decreased model fit (Chan and Bishop 2013, Amare and Darr 2023a). We concur with the aforementioned assertion. Potential overlap with the concept of PBC may pertain to the domains of 'knowledge,' 'openness to risk,' or 'familiarity'. If we consider PBC to be synonymous with

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self-efficacy, it can be argued that the latter is shaped by mastery experiences, social persuasion, and social modelling (Bandura, 1995). These factors are inextricably linked to educational and training processes (and the acquisition of knowledge in general). Consequently, knowledge, openness to risk, risk aversion, and familiarity with a given issue may also function as manifest variables in the determination of self-efficacy (PBC). In contrast, the construct of 'environmental risk perception,' 'self-identity,' and 'perception of policy effectiveness' may be highly correlated with attitudes. Hence, testing the extended model against the original one is in our view indispensable.

## 3. Materials and method

### *3.1 Data and Sample*

The criteria for the sample section were established with reference to the organic farming interventions outlined in the Romanian National Strategic Plan 2023-2027, specifically DR-05 – 'Organic farming - maintaining certification'. This intervention aims to decrease the use of chemical fertilizers, herbicides, and synthetic pesticides, ensure low livestock densities, and promote the application of biological pest control methods. Besides contributing to environmental protection, organic farming enhances food quality for consumer health by utilizing natural or naturally derived substances.

Support under this intervention is provided per hectare of agricultural land to farmers who voluntarily commit to maintaining specific organic farming practices and methods, as defined in Regulation (EU) No 848/2018. Support for the conversion to organic farming is complementary to support for maintaining organic farming practices; farmers who have completed the conversion period (2 or 3 years, depending on crop type) can enter into commitments for the maintenance of organic farming practices.

(Organic Targets 4 EU, 2024) The intervention scheme is relatively straightforward and comprises two types of parcels: i) parcels for arable crops, including permanent crops; ii) parcels for permanent grassland. The eligible beneficiaries are farmers with a minimum farm size of 1 hectare, where eligible parcels are at least 0.3 hectares for arable crops (excluding permanent crops) and grassland, and 0.1 hectares for permanent crops. The dual-track development of organic farming is typical in Romania (Organic Targets 4 EU, 2024). The two primary land use categories in organic farming are arable lands (comprising 59.24% of the total area) and permanent grasslands (37.09%).

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The primary objective of our research was to identify small farms with the potential to convert to organic farming under at least one type of package. Consequently, we included farms in our survey that met the following criteria: i) mixed-type farming – the farmer should engage in two farming systems: arable crops (including permanent crops) and grassland, adhering to the eligibility criteria mentioned above; ii) economic size of the farm: 8,000 - 25,000 EUR.

We randomly selected 150 farms from the 'Centru' region (Figure 1) that met these criteria, using the database created in the FAMFAR project, as detailed in studies by Czyżewski and Kryszak (2023) and Guth et al. (2022). Our sample characteristics are comparable to the statistics from the Farm Accountancy Data Network public database for mixed crop and livestock farms within the economic threshold of 8,000 - 25,000 EUR from the Romanian Centru region (FADN, 2024). The total regional population of such farms is 3224, covering nearly 5% of them in our sample.

The descriptive statistics of our sample are presented in Table 2, with the descriptions of variables detailed in Table 3. The average farm in the sample encompasses approximately 13 hectares of agricultural land, comprising 6.6 hectares of arable land, 6.0 hectares of grassland, and 0.3 hectares of permanent crops. Notably, all farms in the sample have prior experience with direct sales channels, which is particularly significant for adapting product distribution post-conversion. Given the limited bargaining power of small farms, they can achieve relatively high margins by directly selling certified products at organic bazaars or street markets.

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Figure 1. Regions in Romania (RO12 – 'Centru')
Source: (Eurostat, 2014)

Table 2. Descriptive statistics of variables used in SEM and other sample characteristics.

| Variable | Obs | Mean | Std.Dev. | Min | Max |
|---|---|---|---|---|---|
| *Used in SEM* | | | | | |
| SN1 | 150 | 5.45 | 1.20 | 1 | 7 |
| SN2 | 150 | 5.39 | 1.09 | 2 | 7 |
| SN3 | 150 | 5.42 | 1.05 | 1 | 7 |
| INT | 150 | 5.40 | 1.12 | 3 | 7 |
| ATQ1 | 150 | 5.64 | 0.94 | 3 | 7 |
| ATQ2 | 150 | 5.35 | 1.15 | 2 | 7 |
| ATQ3 | 150 | 5.57 | 1.05 | 2 | 7 |
| PBC1 | 150 | 4.35 | 1.09 | 1 | 7 |
| PBC2 | 150 | 4.74 | 1.11 | 2 | 7 |
| PBC3 | 150 | 4.62 | 1.09 | 2 | 7 |
| MO1 | 150 | 5.86 | 0.79 | 3 | 7 |

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| | | | | | |
|---|---|---|---|---|---|
| MO2 | 150 | 5.91 | 0.74 | 4 | 7 |
| MO3 | 150 | 6.51 | 0.67 | 5 | 7 |
| Edu | 150 | 4.67 | 1.14 | 1 | 7 |
| Trainning | 150 | 2.11 | 1.31 | 1 | 5 |
| Organisation | 150 | 0.45 | 0.50 | 0 | 1 |
| Children in school | 146 | 0.68 | 0.89 | 0 | 3 |
| Gender_M | 150 | 0.65 | 0.48 | 0 | 1 |
| Farm area | 150 | 12.58 | 18.32 | 2 | 165 |
| Age | 150 | 49.85 | 13.80 | 24 | 90 |
| Experience | 150 | 13.87 | 13.57 | 0 | 70 |
| *Other farms' statistics* | | | | | |
| Total workload per week in hrs /AWU | 150 | 93 /2.1 | 50.8 | 5 | 250 |
| Arable land (in ha) | 150 | 6.0 | 11.1 | 0.07 | 120 |
| Permanent grassland (in ha) | 150 | 6.6 | 11.2 | 0.3 | 72 |
| Permanent crops (orchards, fruit bushes anf vineyards) | 150 | 0.30 | 1.70 | 0 | 19.65 |
| Annual policy support in EUR | 150 | 2399 | 3188 | 0 | 25000 |
| Share of production for sale (%) | 150 | 78 | 13 | 0 | 100 |
| *Sale channels share (%)*: | | | | | |
| Local warehouses or stores | 150 | 16 | 17 | 0 | 60 |
| Processing plants | 150 | 19 | 19 | 0 | 70 |
| Other farmers | 150 | 30 | 26 | 0 | 100 |
| Street markets, bazaars | 150 | 20 | 16 | 0 | 100 |
| Retail chains | 150 | 1 | 4 | 0 | 25 |
| Tourists, neighbours | 150 | 14 | 13 | 0 | 60 |

Note: Reliability of indicators resulting from the latent constructs was checked by Cronbach's alpha coefficient which in all cases exceeds 0.7

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Table 3. Description of variables used for building latent constructs

| |
|---|
| *INT - Behavioural intention* |
| I intend to implement organic farming practices (1 strongly disagree -7 strongly agree) |
| *AT - Attitudes (1 strongly disagree -7 strongly agree)* |
| AT1 - Implementing organic farming practices will improve people life quality |
| AT2 - Implementing organic farming practices would be profitable for my farm |
| AT3 - Implementing organic farming practices will be profitable only if associated with subsidies |
| *SN -Subjective norms (1 strongly disagree -7 strongly agree)* |
| SN1 - The public authorities expect me to implement farming practices |
| SN2 - Other farmers and professional associations expect me to implement farming practices |
| SN3 - Consumers (society) expect me to implement organic farming practices |
| *PBC - Perceived behavioural control (1 strongly disagree -7 strongly agree)* |
| PBC1 - I think that implementing organic farming practices is possible by myself |
| PBC2 - My skills and knowledge allow me to implement organic farming practices |
| PBC3 - I am able to implement organic farming practices without technical and administrative support |
| *MO -Moral obligations (1 strongly disagree -7 strongly agree)* |
| MO1 - I believe that implementing organic farming practices is fair for future generations |
| MO2 - I believe that implementing organic farming practices is a commitment to society |
| MO3 - I believe that my obligation is to pass the land in good condition to my successors |
| *EMB_net - Network relational embeddedness* |
| – Edu - embeddedness in educational network proxied by the education level (1-7) (1 - no education 2 - primary, 3 – secondary, 4 – vocational, 5 – general 6 –higher bachelor degree, 7 – higher master degree) |
| – Training - embeddedness in systems of agricultural training conducted by relatives and/or experts, perceived intensity (1-5) |
| – Organisation - are you a member of any farmers' organization (association, producer group etc.)? |
| – Children in school - number of children at school age in the household |
| *EMB_farm - Farm-level relational embeddedness* |
| – Gender _M - Declared gender (1 male, 0 female) |
| – Age – age in years |
| – Experience - How long are you farm manager (in years)? |
| – Farm area - Total farm area (ha) |

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### *3.2 Methods*

Structural Equation Modelling (SEM) is currently regarded as a significant and effective method for studying interdisciplinary phenomena, including those in the social sciences (Brown 2015, Hooper, Coughlan, and Mullen 2008). SEM integrates the strengths of analysis of variance, regression and factor analysis, extending them with the capacity to model causal relationships utilising latent variables (Garson 2015, Brown 2012). SEM enables the identification of direct, indirect and total independence between variables, both latent and observed, and between individual variables (Garson 2015). In comparison to multiple regression, SEM offers greater flexibility in assumptions, allowing for interpretation even in the presence of multicollinearity. SEM is a broad term that covers a whole bunch of different models, including measurement models, which are also known as confirmatory factor analysis (CFA). In this study, we're using a particular version of CFA, which is called simultaneous confirmatory factor analysis (SCFA) where we look at the relationships between both latent and observable variables.

In this study, we utilise ordinal Likert-scale variables, with the majority of categories comprising seven. There is a debate in the literature as to whether ordinal variables can be treated as continuous. Several authors have argued that this does not bias the results, particularly if the frequency distributions of variables are not skewed, which is the case here (Rhemtulla, Brosseau-Liard, and Savalei 2012, Li 2016). Furthermore, Robitzsch (2020) posits that treating ordinal variables as continuous can be justified in almost all cases, and the rationale for doing so is not contingent on the number of categories or the marginal distribution of ordinal variables. Additionally, employing modelling strategies for non-normal distributions carries the risk of underlying latent variables deviating from the latent normality (Robitzsch, 2020). Nevertheless, in order to address the aforementioned issue, we adhere to the recommendation put forth by Kline (2011), which states that in the case of non-normality of continuous endogenous variables, a corrected estimator, such as the robust Satorra-Bentler estimator, should be employed.

### *3.3. SEM Specification and Goodness-of-fit*

To test whether introducing constructs reflecting social embeddedness into the baseline TPB model improves the goodness-of-fit model, we performed the analysis in three steps (referring to the comments of Amare and Darr (2023a). We sequentially estimated the models depicted in

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Figures 2,3,4. Descriptions of the indicators can be found in Table 3.

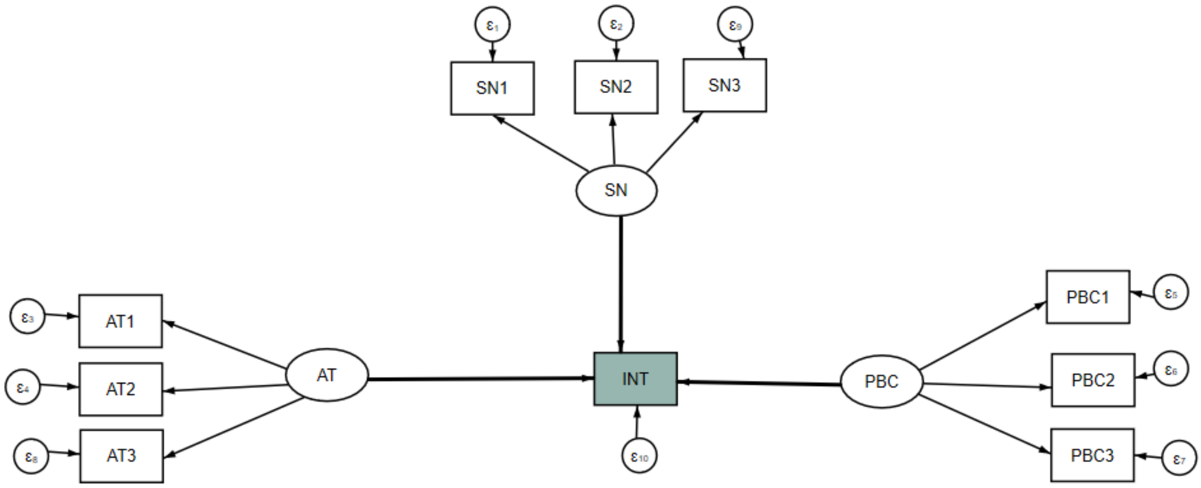


Figure 2. Base TPB model

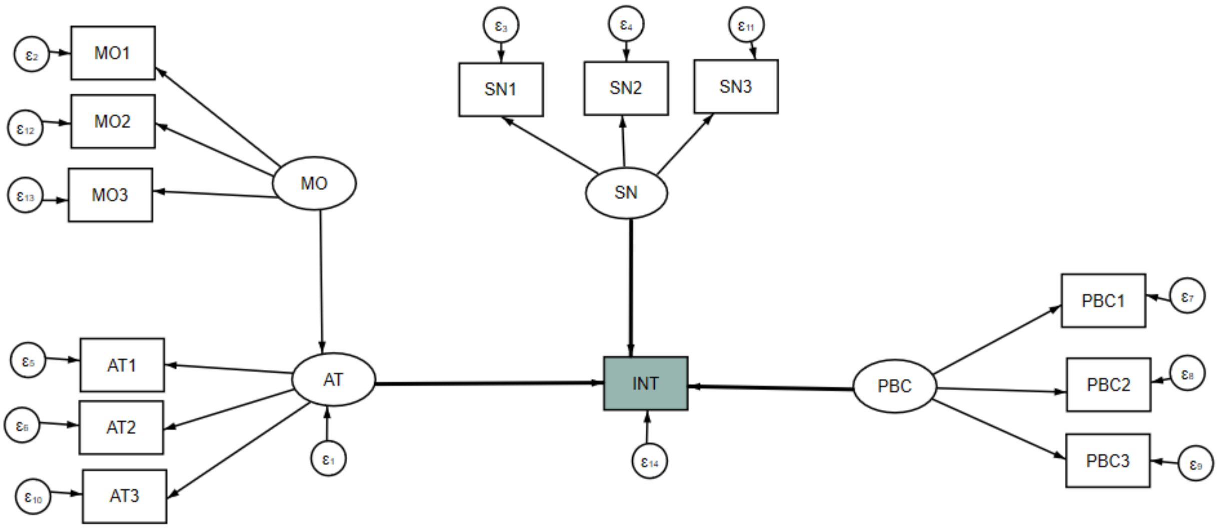


Figure 3. Base TPB model extended with MO

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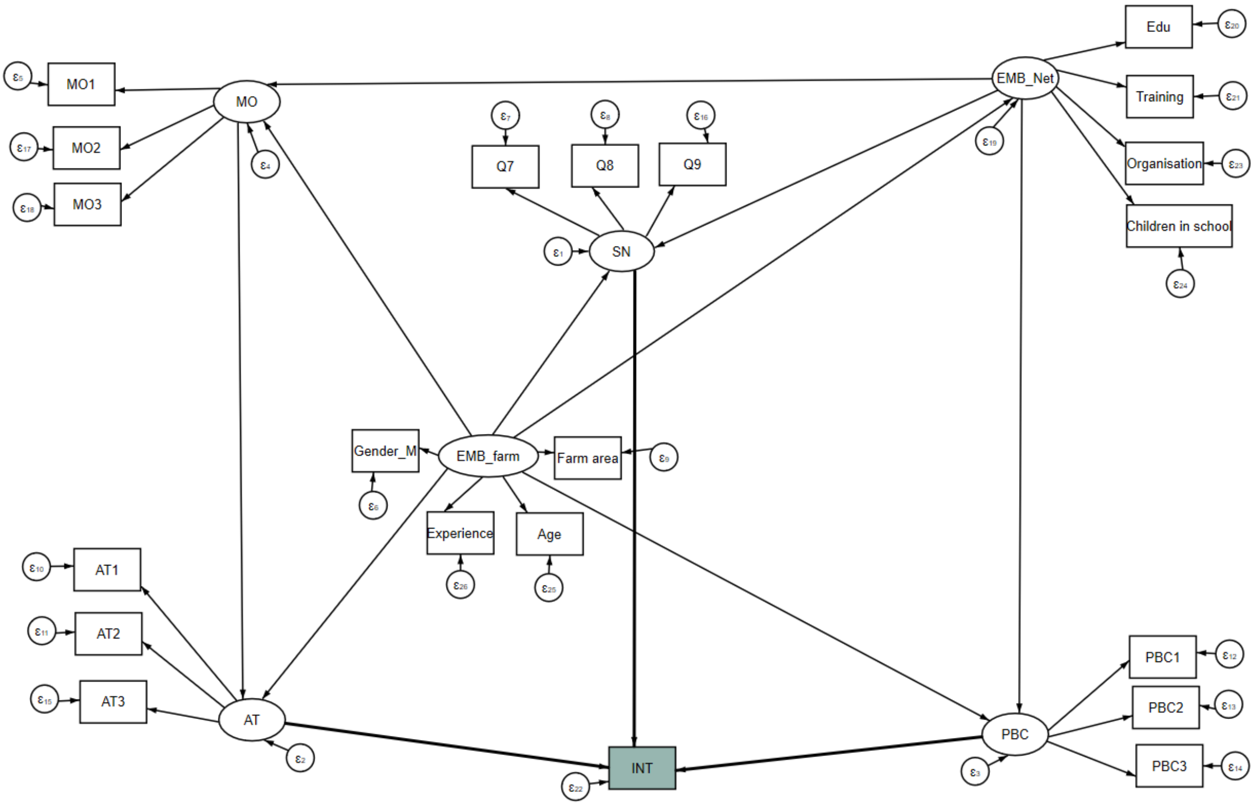


Figure 4. Final extended TPB model

The indicators of relational embeddedness within social networks and at the farm level adhere to the definition provided in the introduction section. The variables constituting the embeddedness constructs should encapsulate the attitudes and behaviours demonstrated by partners towards each other, as well as the frequency of interactions among members of the social networks.

Consequently, we posit that the higher the level of education, the more frequent the interaction with other students and teachers. This same explanation can be used to justify the intensity of training. Similarly, participation in farmers' organisations ensures more frequent and intense interactions with other actors in agri-business. Having more children in school implies involvement in social relations with teachers, other parents, and children's extracurricular activities.

With regard to the embeddedness at the farm level, the gender indicator refers to the current debate on women's empowerment in agriculture (Czyżewski & Kryszak, 2024). The cited authors demonstrate that Romanian agriculture is dominated by men who tend to maintain a

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patriarchal system of family dependency. Older framers are more conservative in this regard. Longer experience in farm management and a larger farm area imply deeper and more complex interactions with suppliers, customers and all professional surroundings of the farm (see Table 3). We adopted the principle that we only accept statistically significant relationships in the model (at the 0.90 confidence level).

We test the following set of hypotheses:

H1: Network relational embeddedness (EMB_Net) indirectly affects behavioural intentions to implement organic farming practices (INT), while shaping perceived behavioural control (PBC) and moral obligations (MO);

H2: Farm-level relational embeddedness (EMB_farm) indirectly influences INT through all other components of planned behaviour, i.e. attitudes (AT), subjective norms (SN), PBC, MO and EMB_Net;

H3: MO influences INT indirectly through AT;

H4: AT directly influence INT;

H5: SN directly influence INT;

H6: PBC directly influence INT.

In the final model, we have additionally introduced the following covariance paths, which are substantively justified by the study conducted:

- Covariance between Training and Organization - if a farmer is a member of a professional organization, he or she is more likely to attend training courses;
- Covariance between Children in school and Age - it is clear that older farmers have fewer school-age children;
- Covariance between Farm area and EMB_Net - larger farm implies more involvement in social networks, e.g. organisations or training.
- Covariance between AT1 and MO3 allows to assess the type of morality followed by the farmer (i.e. generalised morality vs limited morality - c.f. Alesina and Giuliano 2016). A positive sign confirms that those who want to pass the land in good condition to their successors at the same time care about the quality of life of all people (generalised morality). A negative sign may mean that greater concern for their successors goes hand in hand with less understanding of the common good (limited morality).

The goodness-of-fit metrics for all models are compared in Table 4. The comparison indicates that the goodness-of-fit statistics for models 1 and 2 are marginally acceptable. However, satisfactory fit statistics are achieved only when the constructs of embeddedness are

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included (refer to the last column in Table 4). Reliability of indicators resulting from the latent constructs was checked by Cronbach's alpha coefficient which in all cases exceeds 0.7.

Table 4. SEMs goodness-of-fit statistics

| Tested measure and acceptable cut-off | Model 1 | Model 2 | **Model 3** |
|---|---|---|---|
| *Comparative Fit Index (CFI)*<br>A revised form of TLI. Not very sensitive to sample size. Compares the fit of a target model to the fit of an independent, or null, model. CFI ≥ 0.90 | 0.775 | 0.779 | **0.900** |
| *Tucker Lewis Index (TLI)*<br>An TLI of 0.90 indicates the model of interest improves the fit by 90% relative to the null model. | 0.693 | 0.722 | **0.899** |
| *Root Mean Square Error of Approximation (RMSEA)*<br>A parsimony-adjusted index. RMSEA <0.08 | 0.137 | 0.119 | **0.063** |
| *Standardized Root Mean Square Residual (SRMR)*<br>The square-root of the difference between the residuals of the sample covariance matrix and the hypothesized model. SRMR < 0.08 | 0.252 | 0.227 | **0.074** |
| Coefficient of Determination (CD) | 0.995 | 0.996 | **0.950** |

Note: the final model estimates are bolded

Source: own estimations in Stata MP 16, for the descriptions of the tests, see Brown (2015).

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## 4. Results

Figure 5 depicts the final model, with standardised estimates on the main paths. All detailed estimations are presented in Table 6. The most critical aspect of this study is the total effect, which includes both the direct and indirect influences of the engaged latent constructs on INT (Table 5). The results presented in Table 5 not only validate the proposed hypotheses but also offer insights into the nature of the interdependencies.

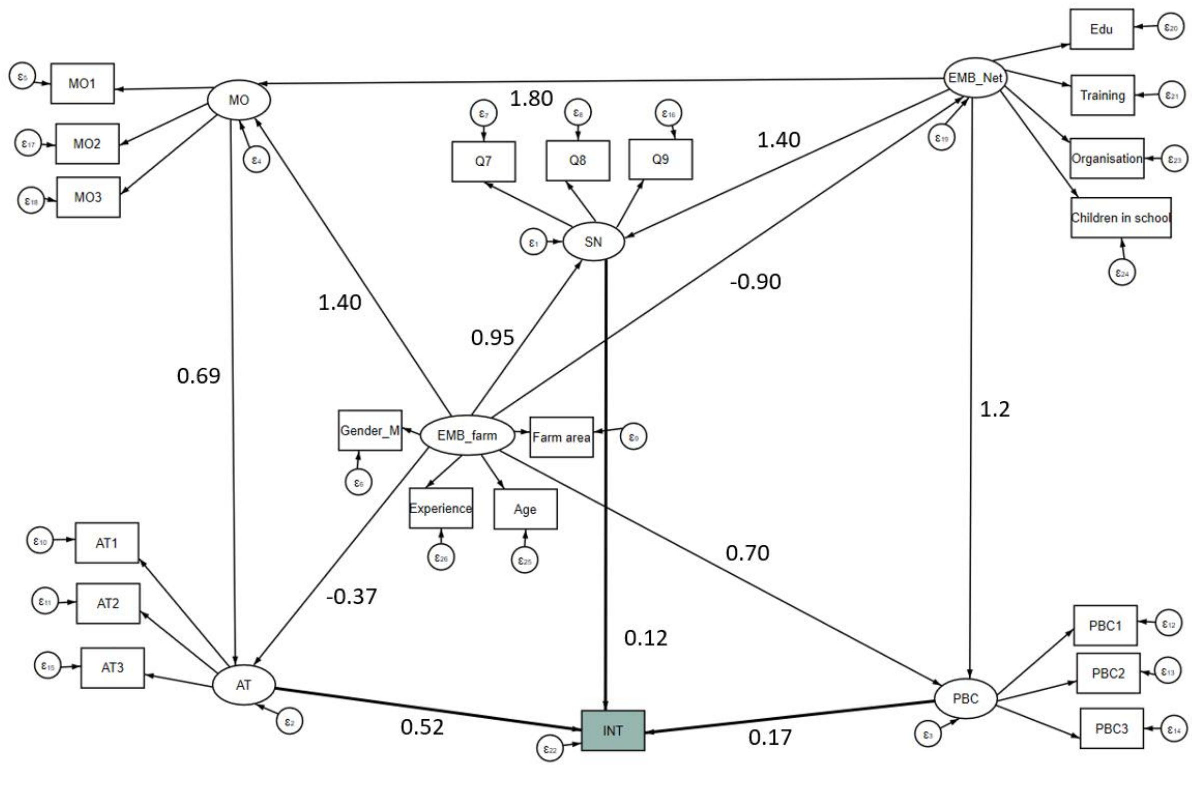


Figure 5. Final extended TPB model with standardized estimates

Table 5. Total effects of latent variables on the behavioural intention (INT) to implement organic farming practices

| INT drivers | Coef. | Std.Err. | z | P>z | **Std.Coef.** |
|---|---|---|---|---|---|
| SN | 0.142 | 0.084 | 1.690 | 0.091 | **0.122** |
| AT | 1(constrained) | | | | **0.524** |
| PBC | 0.278 | 0.126 | 2.210 | 0.027 | **0.166** |
| MO | 0.756 | 0.156 | 4.840 | 0.000 | **0.361** |
| EMB_Net | 1.510 | 0.433 | 3.490 | 0.000 | **1.030** |

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| | | | | | |
|---|---|---|---|---|---|
| EMB_Farm | -4.006 | 1.598 | 2.510 | 0.012 | **-0.371** |

Network embeddedness exerts the strongest influence on the outcome, with a standardized coefficient of 1.0, compared to the second-ranked AT (0.52) and the third-ranked MO (0.36). However, the positive impact of EMB_Net is partially offset by the negative influence of EMB_Farm (-0.37). This is due to the Gender_M, Age and Experience indicators, which determine the negative impact of EMB_Farm on EMB_Net and AT (Table 6, Figure 3) while enhancing PBC and MO. However, the latter is more likely to be treated as 'limited morality', as indicated by the negative correlations between A1 and MO3 (see Covariances section in Table 6). The rest of the results are in line with our expectations and are discussed in the next section.

Table 6. Final SEM estimations

| **Variables** | **Stand.Coef.** | **Std.Err** | **P>z** | **[90% Conf. Interval]** | |
|---|---|---|---|---|---|
| | | *Structural* | | | |
| **SN** | | | | | |
| EMB_Net | 1.387 | 0.295 | 0.000 | 0.901 | 1.872 |
| EMB_farm | 0.946 | 0.308 | 0.002 | 0.439 | 1.453 |
| **AT** | | | | | |
| MO | 0.689 | 0.067 | 0.000 | 0.579 | 0.800 |
| EMB_farm | -0.368 | 0.089 | 0.000 | -0.514 | -0.221 |
| **PBC** | | | | | |
| EMB_Net | 1.244 | 0.291 | 0.000 | 0.765 | 1.723 |
| EMB_farm | 0.702 | 0.317 | 0.027 | 0.180 | 1.223 |
| **MO** | | | | | |
| EMB_Net | 1.808 | 0.410 | 0.000 | 1.133 | 2.483 |
| EMB_farm | 1.439 | 0.441 | 0.001 | 0.714 | 2.164 |
| **EMB_Net** | | | | | |
| EMB_farm | -0.904 | 0.040 | 0.000 | -0.969 | -0.838 |
| | | *Measurement* | | | |
| **SN1** | | | | | |
| SN | 0.792 | 0.063 | 0.000 | 0.689 | 0.896 |
| _cons | 4.576 | 0.352 | 0.000 | 3.997 | 5.154 |

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| | | | | | |
|---|---|---|---|---|---|
| **SN2** | | | | | |
| SN | 0.699 | 0.054 | 0.000 | 0.611 | 0.788 |
| _cons | 4.924 | 0.328 | 0.000 | 4.384 | 5.464 |
| **SN3** | | | | | |
| SN | 0.606 | 0.057 | 0.000 | 0.513 | 0.700 |
| _cons | 5.202 | 0.351 | 0.000 | 4.626 | 5.779 |
| **INT** | | | | | |
| SN | 0.122 | 0.073 | 0.092 | 0.003 | 0.241 |
| AT | 0.524 | 0.071 | 0.000 | 0.408 | 0.641 |
| PBC | 0.166 | 0.073 | 0.023 | 0.046 | 0.286 |
| _cons | 4.895 | 0.269 | 0.000 | 4.452 | 5.338 |
| **AT1** | | | | | |
| AT | 0.654 | 0.043 | 0.000 | 0.583 | 0.725 |
| _cons | 6.031 | 0.366 | 0.000 | 5.428 | 6.633 |
| **AT2** | | | | | |
| AT | 0.757 | 0.047 | 0.000 | 0.680 | 0.833 |
| _cons | 4.632 | 0.234 | 0.000 | 4.246 | 5.017 |
| **AT3** | | | | | |
| AT | 0.597 | 0.051 | 0.000 | 0.513 | 0.682 |
| _cons | 5.272 | 0.301 | 0.000 | 4.777 | 5.768 |
| **PBC1** | | | | | |
| PBC | 0.601 | 0.067 | 0.000 | 0.491 | 0.712 |
| _cons | 3.971 | 0.211 | 0.000 | 3.623 | 4.318 |
| **PBC2** | | | | | |
| PBC | 0.914 | 0.050 | 0.000 | 0.832 | 0.996 |
| _cons | 4.279 | 0.195 | 0.000 | 3.959 | 4.600 |
| **PBC3** | | | | | |
| PBC | 0.623 | 0.053 | 0.000 | 0.536 | 0.710 |
| _cons | 4.270 | 0.220 | 0.000 | 3.908 | 4.632 |
| **MO1** | | | | | |
| MO | 0.674 | 0.053 | 0.000 | 0.586 | 0.762 |
| _cons | 7.467 | 0.429 | 0.000 | 6.762 | 8.172 |
| **MO2** | | | | | |

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| | | | | | |
|---|---|---|---|---|---|
| MO | 0.699 | 0.049 | 0.000 | 0.619 | 0.779 |
| _cons | 7.943 | 0.445 | 0.000 | 7.212 | 8.675 |
| **MO3** | | | | | |
| MO | 0.711 | 0.043 | 0.000 | 0.641 | 0.782 |
| _cons | 9.603 | 0.515 | 0.000 | 8.756 | 10.450 |
| **Edu** | | | | | |
| EMB_Net | 0.667 | 0.058 | 0.000 | 0.571 | 0.762 |
| _cons | 4.120 | 0.284 | 0.000 | 3.654 | 4.587 |
| **Training** | | | | | |
| EMB_Net | 0.498 | 0.053 | 0.000 | 0.411 | 0.584 |
| _cons | 1.617 | 0.074 | 0.000 | 1.496 | 1.738 |
| **Organization** | | | | | |
| EMB_Net | 0.546 | 0.055 | 0.000 | 0.455 | 0.637 |
| _cons | 0.908 | 0.079 | 0.000 | 0.779 | 1.038 |
| **Children in school** | | | | | |
| EMB_Net | 0.417 | 0.054 | 0.000 | 0.329 | 0.506 |
| _cons | 0.768 | 0.065 | 0.000 | 0.661 | 0.874 |
| **Gender_M** | | | | | |
| EMB_farm | 0.213 | 0.076 | 0.005 | 0.087 | 0.339 |
| _cons | 1.345 | 0.114 | 0.000 | 1.157 | 1.532 |
| **Farm area** | | | | | |
| EMB_farm | -0.304 | 0.038 | 0.000 | -0.366 | -0.242 |
| _cons | 0.692 | 0.082 | 0.000 | 0.557 | 0.828 |
| **Age** | | | | | |
| EMB_farm | 0.831 | 0.040 | 0.000 | 0.766 | 0.897 |
| _cons | 3.586 | 0.196 | 0.000 | 3.263 | 3.909 |
| **Experience** | | | | | |
| EMB_farm | 0.874 | 0.040 | 0.000 | 0.807 | 0.940 |
| _cons | 1.017 | 0.060 | 0.000 | 0.919 | 1.115 |
| *Covariances* | | | | | |
| Cov (AT1, MO3) | -0.439 | 0.078 | 0.000 | -0.567 | -0.312 |

| | | | | | |
|---|---|---|---|---|---|
| Cov (trainning, organization) | 0.504 | 0.066 | 0.000 | 0.396 | 0.612 |
| Cov (Chilldren in school, Age) | -0.363 | 0.063 | 0.000 | -0.466 | -0.260 |
| Cov(Farm area, EMB_Net) | 0.209 | 0.070 | 0.003 | 0.095 | 0.324 |

*Note:* Illustrative example of interpretation: the standardized coefficients of the impact on SN equal 1.387 for the EMB_Net, and 0.946 for the EMB_farm.

## 5. Discussion

The aim of our study was to investigate the relationship between socio-economic factors and the intentions of small-scale Romanian farmers to convert to organic farming, using TPB extended with embeddedness theory. TPB is currently one of the most commonly used approaches to study farmers' behavior and intentions, especially in relation to pro-environmental practices.
Our findings suggest that incorporating network embeddedness and farm level embeddedness into the TPB framework provides a more comprehensive understanding of Romanian farmers' pro-environmental behaviours. Both network embeddedness and farm-level embeddedness indirectly influence the intentions to convert to organic farming by affecting the classical components of the TPB, namely AT, SN and PBC, along with an additional component we introduced, i.e. MO. The total effect of network embeddedness emerged as the most significant among all factors. Thus, our results do not contradict previous studies on farmers' pro-environmental behaviours that utilized the classic TPB approach (Ataei et al. 2021, Amare and Darr 2023b); rather, they enrich these studies by incorporating variables that elucidate the influence on the three core components of the TPB. Similar conclusions are drawn from the works of Li, Jiang, and Tang (2024), Savari and Gharechaee (2020), Damalas (2021), Tama et al. (2021), and Shahangian, Tabesh, and Yazdanpanah (2021), where extending the TPB with additional variables enhanced the explanatory power of structural equation models describing farmers' intentions to adopt green practices.

The most significant psychological factor influencing farmers' intention to convert to organic farming was identified as network embeddedness, followed by AT, MO, EMB_farm and PBC and lastly, SN. The pivotal role of network embeddedness in post-socialist countries, such as Romania, is underscored by Schwabe et al. (2022) and Czyżewski and Kryszak (2024).

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These studies emphasize that the socialist legacy has led to a persistent mistrust among farmers towards institutions and each other, with their behaviours being predominantly shaped by informal practices, especially among older farmers. Our findings further substantiate this, revealing a negative correlation between EMB_farm and EMB_net. Older and more experienced farmers are less likely to engage in organizations and participate in training sessions. Additionally, they do not benefit from opportunities to deepen social relationships with peers due to not having school-aged children. The critical impact of EMB_net on the increased adoption of conservation practices and innovative technologies by farmers has been extensively documented in the literature (Zhang et al. 2023, Zhu, Yang, and Wang 2021, Niu et al. 2022, Zhao et al. 2022, Asprooth, Norton, and Galt 2023, Lee, Suzuki, and Nam 2019).

Our research specifically demonstrates that network embeddedness influences intentions to adopt green practices indirectly by affecting PBC, MO and SN. Consequently, the hypothesis H1 asserting that network embeddedness (EMB_Net) indirectly affects behavioural intentions to implement organic farming practices (INT) while shaping PBC and MO. Similarly, Yin and Shi (2019) found that individuals deeply embedded in village social networks in China believe they can achieve goals more effectively as a group. Niu et al. (2022) also contend that social networks can bridge cognitive differences and enhance farmers' adoption of new green technologies. Additionally, Zhang et al. (2023) showed that informal relationships among community members could reduce information asymmetries in public participation and enhance collaboration in village collective affairs. The positive effect of network-based targeting on increasing knowledge about green practices was also highlighted by Lee, Suzuki, and Nam (2019). Moreover, network embeddedness significantly influences MO in sensitive matters such as pro-environmental behaviours, as indicated by both Yin and Shi (2019) and our study. Zhang et al. (2023) further emphasize that rural network embeddedness enhances the sense of belonging and social obligation (subjective norms) to act on public issues, such as water and other environmental management.

The second pivotal factor influencing Romanian farmer's intention to convert to organic farming is attitude, which also exerts the most substantial direct impact on intention. This finding corroborates our hypothesis H4, asserting that AT directly affect behavioural intentions (INT). Specifically, farmers who perceive that implementing pro-environmental farming practices will enhance quality of life and be economically beneficial for their farms are more likely to adopt these practices. However, they also believe that such practices will be profitable only if they are supported by subsidies.

Similar findings were reported by Li, Jiang, and Tang ( 2024), who indicated that attitude is critical for the intention to implement organic manure in China. Damalas (2021) observed the same in his study on farmers' intentions to reduce pesticide use in Greece, and Tama et al. (2021) noted this regarding conservation agriculture in Bangladesh. Given that additional research supports the importance of attitude in comprehending pro-environmental behaviours and intentions (Rezaei, Seidi, and Karbasioun 2019, Rezaei et al. 2019, Bagheri, Emami, and Damalas 2021, Gao et al. 2017), people's attitudes should be taken into account when formulating policy solutions.

Another frequently considered extension of the TPB is moral obligations, which can influence intentions both indirectly and directly. They are particularly significant in morally-based domains, such as conservation (Kaiser, 2006) . In our study, we posited that MO affect AT and thereby indirectly influence intentions. This hypothesis (H3) was also confirmed. However, there are premises to say that the farmers studied are guided by a so-called limited morality (Alesina & Giuliano, 2016), which is mainly concerned with the wellbeing of the family rather than the whole of humanity. Regardless of the underlying motivation, MO increases the intention to engage in green practices and to convert to organic farming.

Our findings align with those of Savari and Gharechaee (2020) and Li, Jiang, and Tang (2024), who demonstrated that moral norms significantly influence farmers' decisions regarding environmental behaviours. Incorporating this variable increases the explanatory power of the model. Moral obligations were also examined in the study by Kasargodu Anebagilu et al. (2021), which highlighted their strong impact on intentions for pro-environmental behaviours, particularly among farmers, as evidenced by a substantial effect of behavioural morality on the intention to implement vegetative filter strips.

In our study, we sought to examine the impact of farm-level embeddedness on the heterogeneity of farmers' approaches to environmental issues. The hypothesis H2, assuming that farm-level embeddedness (EMB_farm) affects indirectly behavioural intentions (INT) through all other components of planned behaviour (i.e. AT, SN, PBC, MO, EMB_Net), has also been confirmed. Our findings revealed that older and more experienced male farmers managing smaller plots exhibit greater confidence in their skills (PBC), heightened awareness of their obligations to future generations (MO), and a stronger recognition of the expectations from various stakeholders (SN). Nonetheless, their attitudes toward ecological solutions are less favourable, and their engagement in rural social networks is weaker. Given that network embeddedness exerts the most substantial influence on the adoption of ecological practices,

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older and more experienced male farmers with smaller holdings are consequently less inclined to implement such practices. It is essential however to distinguish experience from training and skills development. Our research highlights a negative correlation between farm-level embeddedness and network embeddedness, with participation in training emerging as a critical variable. Consequently, since both of these domains impact PBC, the direct effect of PBC on intentions, although statistically significant, remains relatively weak. This finding supports however our hypothesis H6: Perceived behavioural control (PBC) directly affects behavioural intentions (INT).

Comparable effects of farm-level factors have been documented by (Ataei et al., 2021), who identified gender differences in the implementation of ecological solutions in Iran, and by Damalas (2021), who reported a negative correlation between farmers' age and their intentions to reduce pesticide use, alongside a positive correlation between education and such intentions. Similarly, Yin and Shi (2019) demonstrated that women and individuals with higher levels of education generally exhibit more pro-environmental attitudes.

The direct effect of subjective norms on farmers' pro-environmental behaviours is the weakest observed in our study but remains statistically significant, thereby validating our hypothesis (H5). This suggests that farmers who perceive that authorities, other farmers, professional associations, and consumers expect them to implement pro-environmental practices are more inclined to transition to organic farming. However, the influence of SN on farmers' intentions to adopt green practices is complex and not uniform. In the study by Ataei et al. (2021), which applied the classical TPB framework, this effect was the most pronounced. Conversely, other studies have identified it as the weakest influence, akin to our findings, or even as insignificant (Li, Jiang, and Tang 2024). Schwartz (1977) posited that SN may be internalized as personal moral norms, a mechanism that may also be at play in our study. The negligible impact of subjective norms on the intention to adopt green practices was also reported by Shahangian, Tabesh, and Yazdanpanah (2021) and Ataei et al. (2021). This indicates that, for the farmers examined in these studies, external expectations did not significantly influence their intentions.

## 6. Conclusions

Three principal conclusions and recommendations emerge from the results presented above. First, network and farm-level embeddedness are among the most significant factors influencing farmers' intentions to convert to organic farming. Network embeddedness indirectly affects the intention to adopt organic practices by shaping perceived behavioural control, moral obligations, and subjective norms. This finding diminishes the perceived importance of direct subsidies in shaping the agricultural model in Romania. Increasing organic production in Romanian smallholder agriculture necessitates a focus on programs and activities that enhance network embeddedness, such as workshops, training sessions, rallies, and meetings that highlight the benefits of organic farming.

As demonstrated, farmers who perceive that adopting environmentally friendly farming practices will enhance their quality of life and provide economic benefits to their farms are more likely to adopt these practices. Therefore, agricultural policies should prioritize supporting the establishment and operation of organizations and associations that foster networks between farmers already engaged in organic farming and those considering this transition. In short, support in the form of network embeddedness is crucial for influencing farmers' intentions to convert to organic farming.

Second, a significant barrier to organic conversion is farm-level embeddedness. Older and more experienced farmers, particularly male farmers, are less likely to adopt organic practices. Our findings, consistent with those of other researchers, highlight the critical role of financial incentives in motivating this group of farmers to take action. Consequently, subsidies for organic farming are essential for encouraging older farmers to transition to organic farming. Adequate levels of such subsidies are likely to catalyse the conversion process among this demographic. Moreover, the development of programs aimed at supporting the transfer of farms to successors or younger farmers, incorporating lectures on the advantages of organic farming into compulsory training, and reducing conversion costs through initiatives such as the establishment of shared machinery parks, can further facilitate the transition to organic farming.

Third, there is a necessity to investigate the grassroots and regional factors that influence the conversion to organic agriculture. As evidenced, this process is shaped by historical conditions, which differ notably between post-socialist countries and others. These conditions impact both network embeddedness and farm-level embeddedness. Policies formulated from a top-down perspective, without consideration of local conditions, will likely be ineffective in shaping the intentions of farms to convert to organic farming.

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**Conflict of interest disclosure**

The authors report there are no competing interests to declare.

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