

Research article

Does a higher environmental consciousness of farmers reduce expectations for financial compensation? A choice experiment to improve the organic farming intervention in Romania

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ARTICLE INFO

Keywords:

Organic farming
Choice experiment
Theory of Planned Behaviour
Environmental consciousness
Hybrid choice model
CAP

ABSTRACT

The European Green Deal sets an ambitious target of 25 % of agricultural land under organic farming by 2030. Eastern European countries, where small-scale agriculture predominates, still face significant challenges in meeting this goal. In Romania, although the organic sector has grown substantially, the proportion of certified land remains among the lowest in the EU. The reasons behind the reluctance of small and medium-sized farmers to convert to organic farming—and how best to encourage them—are not yet fully understood. This paper introduces the latent construct of farmers' environmental consciousness to explore how it shapes expectations of public policy. Drawing on the Theory of Planned Behaviour, we investigate Romanian farmers' preferences for adopting organic practices on arable land and permanent grassland, with the aim of informing improvements to existing policy schemes. A hybrid discrete choice model, specified through a multi-stage procedure, is employed. Our findings reveal that farmers hold favourable views towards converting small to moderate portions of arable land, while expressing negative attitudes towards grassland conversion. Reluctance can be mitigated through higher subsidies and targeted advisory support—though only professional consultancy proves effective. Basic information provision constitutes a deadweight loss, and collective certification schemes are unlikely to succeed. Notably, greater environmental consciousness is associated with a reduced expectation for financial compensation, suggesting that intrinsic motivation may play a key role in policy design and perception.

1. Introduction

Organic agriculture (OA) employs extensive farming methods and delivers environmental public goods that respond to society's growing demand for sustainable practices and the rising consumer interest in organic products. Research has demonstrated that OA can mitigate several adverse effects associated with intensive agricultural systems. Specific organic techniques contribute to the protection of biodiversity, the preservation of soil fertility, the reduction of water pollution through the elimination of pesticide run-off, and the enhancement of water management via improved soil structure (Squalli and Adamkiewicz, 2018; Pe'er et al., 2020).

The organic agriculture (OA) sector in Romania has undergone substantial expansion over the past two decades. Since 2001, the area

dedicated to OA has increased nineteen-fold, currently accounting for 4.5 % of the total agricultural land—still below the EU average of 10.6 % (OrganicTargets4EU, 2025). The majority of Romania's organic land is used for arable farming (59 %), followed by permanent grasslands (37 %). Romania enjoys a competitive advantage over other countries due to its abundant natural resources, favourable environmental conditions and climate, which are well-suited to organic farming. Nevertheless, there remains considerable potential for further development, as the proportion of organically cultivated land continues to be among the lowest in the EU, despite the notable growth in recent years.

Several structural challenges hinder the expansion of OA in Romania. Most notably, OA has limited reach among small-scale farms, which constitute the vast majority of the agricultural sector (Muntean et al., 2020). As a result, the average organic farm is significantly larger

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<https://doi.org/10.1016/j.jenvman.2025.127159>

Received 4 March 2025; Received in revised form 21 August 2025; Accepted 30 August 2025

Available online 12 September 2025

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than its conventional counterpart, which typically spans just 2 ha. Until 2002, the average size of organic farms continued to grow, reaching 51 ha. Many farms initiate the transition to organic production but subsequently abandon it, leading to one of the lowest shares of certified organic land in the EU—below 60 %.

The development of OA in Romania has followed an unstable trajectory. Between 2012 and 2018, both the proportion of organic land and the number of organic producers declined sharply—from 2.2 % to 1.6 %, and from 15,500 to 9000 respectively (OrganicTargets4EU, 2025). This downturn primarily affected grassland areas (Brumă et al., 2024). Since 2018, the share of organic land has begun to recover, reaching 4.5 % today. However, this growth is largely reflected in land area rather than producer numbers. In some regions, such as Alba County, trends remain stagnant or even negative (Popovici et al., 2022). Thus, Romania's organic sector still faces a long road ahead to meet the EU's ambitious targets, and the reasons behind small-scale farmers' reluctance to convert remain unclear.

Research into the drivers of OA adoption suggests that these can be broadly categorised into two groups: factors related to farmers and their farms, and those specific to OA itself. While some studies attempt to integrate both categories to identify the most critical determinants (e.g. Azam and Shaheen, 2019; Kumar et al., 2025), many focus on selected factors, with others only briefly mentioned.

The first group includes socio-demographic characteristics—such as age, education, gender and knowledge of OA—alongside behavioural traits (e.g. perceived risk, self-efficacy, attitudes, beliefs and norms) and farm-related attributes such as size, structure and performance (including efficiency and profitability). Farmers' observable and unobservable traits influence not only the decision to adopt organic practices but also the outcomes of such adoption (Daadi and Latacz-Lohmann, 2021). Canavari et al. (2022) identified low education levels and older age as key barriers to OA adoption. Conversely, the likelihood of adoption increases among female farmers, those participating in credit or training programmes, and members of farmer organizations (Hoang, 2021). Human capital is another important factor, which can be enhanced through involvement in farmer associations (Simin et al., 2024).

In developing countries, access to knowledge about OA is crucial. Limited access remains a major obstacle to adoption (Jiumpanyarach, 2021). Farmers with greater knowledge are more likely to adopt OA and allocate more land to it (Ume et al., 2023). Confidence in one's abilities also plays a role—low perceived ability may deter adoption even when attitudes towards OA are positive (Bottazzi et al., 2023).

The second group of drivers includes market-related factors (e.g. development of input and output markets, access to credit), institutional aspects (e.g. support systems, legal frameworks, administrative procedures, access to information), production and management requirements (e.g. techniques, regulations and constraints), and economic considerations (e.g. performance and profitability compared to conventional farming). Additionally, some studies examine spatial patterns in OA development.

A major barrier to OA adoption is the underdevelopment of organic markets, both in terms of supply and demand. Market accessibility—whether for selling products or purchasing inputs—is a recurring issue in developing countries (Soltani et al., 2014; Ume et al., 2023; Dixit et al., 2024; Bottazzi et al., 2023), but also in highly developed nations such as the United States (Han and Grudens-Schuck, 2022). Institutional and policy-related factors also play a significant role. Subsidy schemes have a demonstrably positive effect on conversion to OA (Mala and Malý, 2013) and are crucial for sustaining organic production (Łuczka and Kalinowski, 2020). However, successful promotion of OA requires a holistic approach (Moschitz et al., 2021). Beyond financial incentives, governments can support OA by facilitating knowledge dissemination through advisory services (Lampach et al., 2020) and reducing administrative burdens, which remain a key obstacle (Lloyd and Stephenson, 2020).

Some barriers are inherent to OA itself. For instance, organic farming often necessitates changes in weed management and increased labour input, both of which can be costly (Lloyd and Stephenson, 2020). Although conventional farms tend to be more productive, subsidies can help offset profitability gaps (Mariel et al., 2021). Moreover, the prospect of higher prices for organic products—such as organic milk compared to conventional milk—is a strong incentive for conversion (Basnet et al., 2018).

In terms of behavioural factors, research has demonstrated that farmers' attitudes, perceived behavioural control, subjective norms, social and moral concerns, and social acceptability all positively influence the decision to adopt organic agriculture (OA) (Xia et al., 2023; Mzoughi, 2011; Zhllima et al., 2021; Läpple and Kelley, 2013; Canavari et al., 2022). Positive attitudes may, in fact, be more influential than the availability of subsidies (Papadopoulos et al., 2018). Läpple and Van Rensburg (2011) found that although environmental attitudes are important across all OA adopters, certain factors differ between early and late adopters.

In light of the studies cited above, we argue that the Theory of Planned Behaviour (TPB) provides a robust framework for understanding how farmers' environmental awareness shapes their actions. According to TPB, behaviour is influenced by three core components: expectations regarding the outcomes of a behaviour ('attitudes'), beliefs about social pressures or norms ('subjective norms'), and perceptions of one's ability to carry out the behaviour ('perceived behavioural control') (Ajzen, 1991). This framework has been widely applied in agricultural research (Daxini et al., 2019; Despotović et al., 2019; Bagheri et al., 2021).

Recent studies employing TPB offer valuable insights into various environmentally friendly farming practices. Anebagilu et al. (2021) examined the influence of knowledge, moral values, and risk tolerance on the intentions of farmers in Chile's Larqui River Basin who had implemented vegetative filter strips. Damalas (2021), studying Greek farmers, identified a negative relationship between perceived risk of financial loss and the intention to reduce pesticide use. Tama et al. (2021) emphasized the need for greater understanding of environmental risks to encourage the adoption of more conservation-oriented farming methods. Cao et al. (2022) argued that farmers' perceptions of human values and moral correctness significantly shape their behaviour. Similarly, Amare and Darr (2023) concluded that farmers are primarily motivated to adopt new agroforestry woodlot techniques by the belief that sustainable practices lead to improved living conditions compared to traditional farming. In the case of Chinese tea farmers, Li et al. (2024) suggested that political engagement is essential to fostering environmental awareness and promoting the widespread adoption of sustainable agricultural practices, such as the use of organic manure.

To date, the determinants and barriers to the adoption of organic agriculture (OA) among farmers have predominantly been examined using logit or multinomial logit models, as well as through qualitative methods such as in-depth interviews. Experimental research exploring farmers' willingness to adopt OA practices remains extremely limited and is virtually absent within the European context (Möhring et al., 2024). Tran et al. (2020) investigated shrimp farmers' preferences regarding contracts for certified organic shrimp production. Liu et al. (2023) demonstrated that preferences for organic rice vary between producers and consumers; while Toiba et al. (2023) focused primarily on contract farming, rather than organic agriculture itself.

To the best of our knowledge, no study has yet analysed farmers' preferences for adopting OA on arable land and/or permanent grasslands within an experimental framework. This gap is particularly striking in light of the EU Green Deal, which sets a target of increasing the share of organic farmland to 25 % by 2030. It is plausible that the current incentives outlined in national strategic plans under the Common Agricultural Policy (CAP) are insufficient or inadequately tailored to farmers' needs. Moreover, understanding the proportion of land that farmers would be willing to convert under various policy scenarios is

crucial for effective implementation across different countries.

The aim of this article is to investigate the preferences of small and medium-sized farmers in Romania regarding the adoption of organic farming on arable and permanent grassland. The objective is to inform and improve existing policy schemes, with particular attention to farmers' environmental awareness. On the incentives side, the study focuses on subsidies, administrative and management support, and opportunities for collective action within the organic farming sector.

The aim of this article is to investigate the preferences of small and medium-sized farmers in Romania regarding the adoption of organic farming on arable and permanent grassland. The objective is to inform and improve existing policy schemes, with particular attention to farmers' environmental consciousness. On the incentives side, the study focuses on subsidies, administrative and management support, and opportunities for collective action within the organic farming sector.

Our further contribution to the literature lies in not only analysing the impact of specific policy attributes on farmers' utility, but also in introducing the concept of farmers' environmental consciousness—grounded in the Theory of Planned Behaviour—to examine whether heightened awareness of environmental issues influences the perceived importance of these policy attributes among the farmers studied. Our work is among the few (Zemo and Termansen, 2022; Kryszak et al., 2025) that employ a hybrid choice model to explore farmers' preferences. This modelling approach enables the direct integration of latent psychological constructs into the choice framework, while accounting for the measurement bias that arises when latent concepts are assessed through indicator variables (Budziński and Czajkowski, 2022). Additionally, we demonstrate that the final specification of a discrete choice model should be determined through a multi-stage process, and that the chosen method of attribute coding significantly affects the interpretation of results.

The remainder of the article is structured as follows. Section 2 describes the data and the experimental design employed in the study. Section 3 outlines the empirical approach, with particular emphasis on the hybrid choice model. Section 4 presents the results, while Section 5 offers a discussion of the findings, followed by concluding remarks and policy implications.

2. Data and methods

2.1. The choice experiment

Discrete choice experiments (DCEs) are a widely used preference elicitation technique that enable researchers to quantify individual preferences by presenting respondents with multiple alternatives across hypothetical scenarios. Grounded in McFadden's (1974) Random Utility Theory (RUT), DCEs assume that individuals select the option that maximizes their perceived utility, which is shaped by both observable and unobservable factors.

In the DCE framework, utility functions are estimated by systematically varying attribute levels across different choice sets. This approach provides quantitative insights into the relative importance of specific attributes in decision-making and facilitates predictions of choice behaviour under varying conditions (see Rockers et al., 2012).

According to RUT, the utility function U_i comprises a deterministic component V_i and a random component ε_i . The deterministic part is observable and typically modelled as a function of attribute levels, while the random component captures unobserved influences—such as omitted variables, individual preference heterogeneity, and measurement error (Batsell and Louviere, 1991; Rockers et al., 2012).

In practice, respondents are asked to choose their preferred option from a set of alternatives, with the assumption that they select the alternative i that yields the highest utility U .

2.2. Selection of attributes and their corresponding levels

The objective of the policy intervention titled “Organic Farming” in Romania's National Strategic Plan for 2023–2027 is to reduce the use of chemical fertilisers, herbicides, and synthetically produced pesticides, maintain low livestock densities, and promote biological pest control methods. In addition to contributing to environmental protection, organic agriculture (OA) is expected to produce food of higher value for consumer health by relying on natural or naturally derived substances.

In this experiment, we aimed to understand the conditions under which farmers—who manage both arable land and permanent grassland—would be willing to convert part of their land to organic farming. We proposed several hypothetical enhancements that could be introduced in future iterations of the intervention (currently referred to as “organic farming”) to incentivize such conversion. Our goal is to determine the proportion of land farmers would be willing to convert if additional measures were implemented.

Given that this experiment represents a potential policy instrument within the framework of Romania's new EU Common Agricultural Policy (CAP) programming period, and is aligned with the OA component, the selection of attributes must be carefully considered. Attributes and their respective levels should be both relevant to the proposed OA policy and applicable within the Romanian agricultural context.

We therefore adopted an informed and comprehensive approach to attribute selection, drawing on evidence from a literature and document review, focus group discussions, and a pilot study. The literature review focused on recent research in organic farming and sustainable agriculture, with particular attention given to the European Union's Common Agricultural Policy (CAP) and its support schemes for organic farming activities. This first source was instrumental in identifying the most critical features—such as subsidies—that may influence farm-level decision-making regarding organic farming.

To complement the literature review, a one-day focus group was organised in Alba Iulia, Romania, in collaboration with representatives from the “December 1, 1918” University of Alba Iulia. Participants included farmers, agricultural experts from the regional agricultural department, and stakeholders engaged in organic farming practices in Alba County. Through a series of open-ended questions posed by the interviewers, the focus group provided deeper insights into the current state of organic agriculture (OA) in Romania. Stakeholders shared their experiences, knowledge, preferences, and priorities related to organic farming practices.

The third source of input was a pilot study conducted with three farmers. Collectively, these three sources of information offered valuable data and rich insights into the factors influencing farmers' decisions to adopt organic farming.

By analysing these sources, we identified key attributes of organic farming that shape farmers' preferences. These attributes were incorporated into the experimental design to ensure relevance, validity, and generalisability within the Romanian context. Our approach led to the identification of five attributes with significant potential to influence farmers' preferences: 1) percentage of arable land converted to organic, 2) percentage of permanent grassland converted to organic, 3) free advisory support, 4) collective action in organic farming, and 5) additional payment.

Following Mamine et al. (2020), we categorise these attributes into obligations (the first two) and incentives (the remaining three). The attributes and their corresponding levels are presented in Table 1 below.

Conversion of arable land to organic production has become increasingly common in recent years. Globally, the area under organic cultivation expanded from 11 million hectares in 1999 to 72.3 million hectares by 2019 (Jahantab et al., 2023). Moreover, several studies suggest that the economic performance of organic farms is comparable to that of conventional farms (see, for example, Offermann and Nieberg, 2000; Eltun et al., 2002; Mahoney et al., 2004), with some evidence indicating that organic farming can be even more profitable (see Acs

Table 1

Attributes and levels.

Attributes	Levels
Percentage of arable land to be converted to organic farming system	- o 0 %^a - o 25 % - o 50 % - o 100 %
Percentage of permanent grassland to be converted to organic farming system	- o 0 %^a - o 25 % - o 50 % - o 100 %
Free advisory support	- o No advisory support available; - o Information support; - o Professional support;
Collective actions in organic farming	- o Individual action only; - o Collective certification; - o Collective certification, marketing, purchasing of inputs and sales;
Additional payment for conversion period (€/ha)	- o €0 - o + €145 - o + €325 - o + €500

^a Selecting the option “0 % of land converted” indicates that the farmer is either already applying, or intends to apply, agricultural practices consistent with organic farming—such as the use of natural fertilisers and crop rotation—without entering into a formal organic farming contract or obtaining product certification.

et al., 2007).

Accordingly, the percentage of arable land to be converted to organic was included as the first attribute in our experimental design, as it is a critical factor in assessing farmers' willingness and readiness to transition from conventional to organic farming practices. This attribute was presented to farmers as a voluntary option, structured across four levels: 0 %, 25 %, 50 %, and 100 % of arable land converted to organic farming in accordance with the OA CAP programme requirements. Selecting the “0 % of land converted” option indicates that the farmer is already applying, or intends to apply, certain organic practices—such as the use of natural fertilisers and crop rotation—without entering into a formal organic farming contract or obtaining product certification. The remaining levels reflect increasing degrees of commitment, with farmers opting to convert 25 %, 50 %, or the entirety (100 %) of their arable land to organic production. These gradations allow us to evaluate the extent to which farmers are willing to adopt organic practices, which is essential for gauging the feasibility of widespread organic farming adoption among small and medium-sized farms in Romania. In experimental studies, farmers are increasingly asked not only about contract parameters, but also about the proportion of land they are willing to enrol (Latacz-Lohmann and Breustedt, 2019; Vaissière et al., 2018).

In parallel with the first attribute, the second attribute concerns the conversion of permanent grassland to organic systems. Currently, permanent grassland—comprising meadows and pastures primarily used for grazing organic livestock—accounts for 42.2 % of the area under organic farming and 12.2 % of total permanent grassland in the EU-27 (Calabro and Vieri, 2024). As with arable land, this attribute was presented to farmers as a voluntary option, structured across four levels: 0 %, 25 %, 50 %, and 100 % of permanent grassland converted to organic farming. These levels allow farmers to indicate the extent to which they are willing to convert their grassland to meet the improved OA CAP programme requirements.

Farmers who are willing to convert to organic agriculture (OA) are often encouraged to convert the entire farm—or at least the whole

production system—in order to maintain traceability and comply with crop rotation requirements. Consequently, mixing conventional and organic farming systems within a single farm is often considered practically problematic. However, our approach takes into account the specific characteristics of farms in Central and Eastern Europe (including Romania), which are marked by pronounced land fragmentation in both usage and ownership (Hartvigsen, 2014). In these regions, agricultural land is frequently distributed across multiple, non-contiguous plots. This spatial separation enables farmers to convert part of their land to OA while continuing conventional practices on other plots. Such a fragmented structure provides an opportunity to experiment with OA on a smaller scale before committing to full conversion. By offering the option for partial conversion, we aim not only to accommodate farmers' risk-aversion strategies but also to reflect the unique farming conditions of the study region.

The experiment underscored the significance of non-financial incentives—such as advisory support and collective action—as complementary mechanisms to enhance the adoption of organic farming practices. Consequently, these two elements were incorporated as attributes in the study. The advisory support attribute pertains specifically to free extension services. Advisory support, predominantly provided by government agencies (Kansime et al., 2019), has traditionally been offered to farmers at no cost. Funding for these services typically comes from public institutions or international donors, although commercial agricultural input suppliers also commonly provide basic advisory services free of charge (Ingram, 2008; Sutherland et al., 2013; Prager et al., 2016). Despite these precedents, the advisory infrastructure in Romania remains underdeveloped. As highlighted during focus group discussions, farmers often face challenges accessing advisors, including the need to travel long distances. A more robust extension system could potentially be established by the state administration in the future. The scope of advisory support may range from basic informational services to more comprehensive assistance, including help with administrative procedures and expert agro-technical guidance. Accordingly, this attribute was categorised into three levels: (a) no advisory support available, (b) provision of general information on the requirements and opportunities of organic farming, and (c) professional support covering both administrative and technical aspects of conversion and ongoing organic practices.

The fourth attribute in our experiment concerns collective action in organic farming, defined as a group of farmers—either formal or informal—collaborating to achieve shared objectives. One key advantage of collective action is the reduction of transaction costs during the conversion phase, as farmers can jointly apply for organic certification (Solfanelli et al., 2021). In more advanced forms, collective action may encompass joint marketing, sales, and input procurement, with responsibilities distributed among members. During focus group discussions, farmers interested in converting to OA expressed concerns about their limited bargaining power when selling products or purchasing inputs, suggesting that greater integration could be beneficial. To reflect these dynamics, the attribute was presented at three levels: (a) individual action only, (b) collective certification, and (c) collective certification combined with joint marketing, purchasing, and sales.

We also anticipated that Romanian farmers would generally view collective action favourably, despite the persistent issue of distrust in post-socialist contexts (World Values Survey, 2025). Unlike many Western European countries, Romania retains a high prevalence of common pastures—a practice closely linked to the widespread presence of small-scale and semi-subsistence farming. Much of the country's permanent grassland is owned by the state or local communities, playing a vital role in Romania's natural environment, cultural heritage, and rural economy.

A notable example is the *composesorot*, a historic community organisation prevalent in Transylvania and northern Romania, where the ownership and administration of pasture and forest land are collectively managed. Access to these lands is typically restricted, often remaining

¹ Identical to the first attribute, the “0 % of converted land” level implies that the farmer has implemented, or intends to implement, pro-ecological practices—such as the use of natural fertilisers—without entering into a formal organic farming contract or obtaining product certification.

within families for generations. In Alba County, the tradition of communal grazing remains deeply rooted, and despite a decline in active users, the region continues to support extensive communal land areas. These lands serve millions of smallholders and represent a cornerstone of local identity and agricultural practice (Sutcliffe et al., 2013).

The final attribute in our experiment concerns direct financial incentives, specifically additional payments provided during the conversion period. One of the primary barriers to transitioning from conventional to organic farming is the financial strain farmers face during this phase, including yield reductions and increased operational costs associated with organic practices (Jahantab et al., 2023). Insights from qualitative interviews further underscored the need for targeted support during the conversion process.

We assumed that in the post-conversion maintenance period, farmers would continue to receive subsidies at the rates currently specified in the Romanian National Strategic Plan. However, during the conversion period, enhanced financial support may be necessary. At present, the Strategic Plan offers payments of €293 per hectare for arable crops and €143 per hectare for permanent grassland, resulting in an average of €218 per hectare.

To reflect varying levels of financial support, we structured this attribute into four levels.

- (a) €0 per hectare,
- (b) €145 per hectare,
- (c) €325 per hectare, and
- (d) €500 per hectare.

The first level represents a scenario in which farmers opt to forgo financial incentives, relying instead on the long-term economic benefits of OA, such as higher product prices and improved farm performance. The second level offers a lower-than-current payment, acknowledging that some farmers may be willing to convert with minimal financial support. The third and fourth levels represent more attractive compensation than currently available, designed to appeal to farmers who require stronger financial incentives to initiate conversion.

2.3. Experimental design

The final experimental design of our study comprised five attributes with a total of eighteen levels, resulting in 576 possible combinations ($4 \times 4 \times 3 \times 3 \times 3 \times 4$). Since it is impractical to present all possible combinations to respondents, fractional factorial designs are commonly employed to select a manageable subset of alternatives (Mangham et al., 2009). Accordingly, we adopted a fractional design that presents only a subset of the full choice set (Vanniyasingam et al., 2016).

Choice cards were generated using the *dcreate* package in Stata (Hole, 2017), applying a D-efficient design (Farina et al., 2024; Rossi et al., 2024; Bender et al., 2024) with null priors. This approach produced 48 alternatives, excluding status quo options. These alternatives were distributed across 24 choice sets, organised into three blocks. Each block contained eight choice sets, and 150 farmers from the initial sample were randomly assigned to one of the three blocks, with 50 participants per block.

Each choice set consisted of two unlabelled alternatives and a “None of these” option, which served as the status quo (SQ). Selecting this option indicated that the farmer preferred to remain in the current production system rather than adopt either of the presented alternatives. It is important to note that the “0 %” conversion level for arable land and permanent grassland—available within the unlabelled alternatives—signified a willingness to adopt organic practices without formal certification. In contrast, choosing the SQ option reflected a complete lack of interest in changing existing practices. Incorporating the SQ option into the experimental design helps mitigate the risk of forced choices, allowing respondents to express genuine preferences

(Lancsar and Louviere, 2008; Rockers et al., 2012).

Each participating farmer was ultimately presented with nine choice sets, not eight. The ninth set was a duplicate of the second and served as a validity check to assess the consistency of responses. Seven farmers selected different options on the repeated choice card and were excluded from the final sample. As a result, the final sample comprised 143 farmers.² An example of a choice set translated to English is presented in Fig. 1.

2.4. Case study and descriptive statistics

The sample for the discrete choice experiment (DCE) was drawn from a database developed under the FAMFAR project, funded by the Polish National Agency for Academic Exchange in 2019 (FAMFAR, 2022; Czyżewski and Kryszak, 2023). This database contains contact information and farm-level statistics for 900 Romanian farmers who had consented to collaborate with the project team, which included researchers from Alba Iulia University and Poznań University of Economics and Business, alongside experienced enumerators affiliated with the Romanian Farm Accountancy Data Network (FADN). A random sample was selected from a subset of crops, livestock, and mixed farms—classified according to the EU FADN typology—that possessed both arable land and pasture in Alba County which is a prevalent farming model in the region. Farmers were contacted by phone to obtain consent for participation in the DCE. Those who declined were replaced by other eligible respondents from the same subset. Subsequently, trained enumerators conducted face-to-face interviews using a paper-based survey instrument. These interviews were carried out on-site with farmers who had agreed to participate in the study.

The survey was conducted between June and November 2023 in Alba County, situated in central-western Romania (Fig. 2). According to official data (Alba County Council, 2024), Alba County covers an area of 6242 km², accounting for approximately 2.6 % of Romania's national territory.

In Alba County, the total agricultural area spans 324,853 ha, comprising 130,087 ha of arable land, 118,162 ha of pasture, 71,007 ha of hayfields, 4656 ha of vineyards, and 931 ha of orchards (Alba County Council, 2024). Among the arable crops, maize dominates with 58 % of the cultivated area, followed by wheat (14 %) and sunflowers (11 %).

The survey was structured in three distinct phases. The first phase employed a Discrete Choice Experiment (DCE) to assess farmers' preferences. In the second phase, a structured questionnaire was used to gather socio-demographic and economic data about the respondents and their farms (Table 2). The third phase involved evaluating farmers' attitudes toward environmentally friendly agricultural practices through 13 statements rated on a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree), with the phrasing adapted from Menozzi et al. (2015) (see Table 3).

Regarding the sample's age distribution, over 53 % of respondents were older than 50 years, with an average age of 50. The majority of participants were male (65.03 %), and more than 20 % held a Bachelor's or Master's degree. Additionally, 44.76 % had formal agricultural training. The study primarily targeted small and medium-sized farms in Alba County, with 34.27 % of surveyed farms occupying 5 ha or less. Despite their size, these farms demonstrated a strong market orientation,

² Although the sample size may appear modest, it exceeds that of many Discrete Choice Experiment (DCE) studies targeting farming populations, which often rely on samples of approximately 100 respondents (Chèze et al., 2020). In the Central and Eastern European context—particularly when focusing on small and medium-sized farms—reaching farmers via online surveys presents considerable challenges due to limited digital engagement and unfamiliarity with this type of survey. Consequently, the data collection was conducted through face-to-face interviews—a method that, while ensuring higher response quality and engagement, inherently limits the scale of data collection.

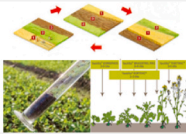
Attribute	Alternative 1	Alternative 2	Alternative 3
<i>Ecological arable land</i> Percentage of arable land to be converted to organic farming. 	0% - Pro-ecological practices (natural fertilizers, fertilization plan, crop rotation) without formal certification 	100% 	None of these
<i>Permanent organic grassland</i> Percentage of permanent grassland to be converted to organic farming. 	25% 	0% - Pro-ecological practices without formal certification 	
<i>Free advisory support</i> 	No advisory support possible 	Professional support on administrative and technical issues related to conversion to organic farming and its implementation can be provided. 	
<i>Collective action in organic farming</i> 	Collective certification possible 	Only individual action is possible 	
<i>Payment for the conversion period (in €/ha)</i> 	+ €325 EUR 	+ €500 	

Fig. 1. An example of the choice card.

with an average of 78.17 % of production intended for sale. The average weekly family workload on the farm was 93 h, indicating the presence of at least two full-time workers. Furthermore, 44.06 % of farmers reported membership in an agricultural organisation, suggesting a moderate level of institutional engagement within the sample.

2.5. Environmental consciousness of Romanian farmers

Farmers' environmental consciousness was assessed in the third section of the study (Table 3). This component was designed to capture

key elements of the decision-making process—specifically behavioural intentions—as conceptualized in the Theory of Planned Behaviour (TPB). The latent construct of *environmental consciousness* encompassed not only attitudes, which are commonly emphasized in the literature, but also subjective norms (SN) and perceived behavioural control (PBC), both of which play a critical role in shaping environmentally oriented behaviours. To evaluate the internal consistency of the statements associated with each TPB component, reliability analyses were conducted. The results confirmed that the items formed statistically reliable scales across all constructs, supporting the robustness of the



Fig. 2. Alba County in Romania – physical localization.
Source: Google Earth

Table 2
Descriptive statistics of the final sample.

Variable	Mean	SD	Min	Max
Age	50.007	13.417	24	86
Educationa level (1–7)	4.664	1.132	1	7
Farm area in ha	12.698	18.707	1.49	165
Area insured in ha	1.43	4.56	0	33
Percentage of output sold	78.175	13.313	0	96
Total weekly on-farm workload of family in hours	93.783	51.384	5	250
	Share (%)			
Farm manager older than 50 years	53.15			
Males as farm managers	65.03			
Highly educated farmers	79.03			
Members of agricultural organisation	44.06			
Formal agricultural education	44.76			
Farms with area 5 ha or below	34.27			

measurement framework.

Farmers' attitudes toward the implementation of environmentally friendly agricultural practices were generally positive. The average score across statements 1–4 was approximately 5.55 on the 7-point Likert scale, indicating a favourable disposition. More than half of the respondents agreed or strongly agreed that such practices could enhance both the quality of life (58 % rated '6' or '7') and the quality of the environment (61.5 %). Nearly half of the farmers also strongly agreed that adopting environmentally friendly methods would be economically beneficial for their farms. However, 75 out of 143 farmers strongly agreed that subsidies were essential to ensure the profitability of these practices.

Regarding subjective norms, the perceived pressure to follow predecessors in farm management emerged as the most influential social factor, with an average score of 5.69. Farmers also reported feeling external pressure from various stakeholders, particularly public authorities, to adopt pro-environmental practices.

In terms of perceived behavioural control, farmers generally felt autonomous in their decision-making, with an average score of 5.30.

Nevertheless, confidence in their ability to implement new practices was moderate. Many respondents highlighted the need for technical and administrative support to facilitate the transition to environmentally friendly farming. Notably, only six farmers expressed full confidence in their ability to adopt such practices independently.

3. Modelling approach

3.1. Factor analysis and structural equation model

As stated in Section 2.5, the survey asked farmers to indicate their level of agreement with 13 statements reflecting the three components of the Theory of Planned Behaviour. Technically, it would be feasible to construct three separate latent constructs—attitudes, subjective norms, and perceived behavioural control—since each scale demonstrates reliability according to the Cronbach's alpha criterion. However, incorporating all three aspects into the Hybrid Choice Model (HCM) would substantially increase the number of parameters.

In this study, we hypothesize the existence of a single overarching latent construct: *environmental consciousness*. This construct is presumed to influence responses to all attitudinal statements, as they collectively pertain to farmers' awareness of agri-environmental issues. To test this hypothesis, we conducted factor analysis on all 13 statements and evaluated whether the eigenvalue criterion supports retaining only one factor. For the final HCM, we included only those indicators with factor loadings of 0.6 or higher.³

To further validate this approach, we repeated the factor analysis using a reduced set of items and assessed both the eigenvalue criterion and the Kaiser-Meyer-Olkin (KMO) measure, ensuring the latter

³ As stated by Hair et al. (2019), factor loadings exceeding 0.7 are "considered indicative of well-defined structure and are the goal of any factor analysis." However, loadings of 0.5 or higher are generally regarded as practically significant. For a sample size of $N = 150$, factor loadings of 0.45 or above are statistically significant at the 0.05 level. Therefore, setting a threshold of 0.6 appears to be a reasonable approach, ensuring a strong relationship between each observed variable and its underlying factor.

Table 3

Farmers' responses to statements on environmentally friendly practices within the TPB framework (mean answer and frequency of specific responses).

Theory item	Statements	Mean	1	2	3	4	5	6	7
Attitude (alpha - 0.77)	A1. Implementing pro-environmental farming practices on farm will improve the environmental quality	5.64	0	2	3	13	37	60	28
	A2. Implementing pro-environmental farming practices on farm will improve people life quality	5.65	0	0	5	7	47	58	26
	A3. Implementing pro-environmental farming practices on farm would be profitable for my farm	5.37	0	1	7	26	38	46	25
	A4. Implementing pro-environmental farming practices on farm will be profitable only if associated with subsidies	5.57	0	1	2	18	47	43	32
Subjective norms (alpha - 0.78)	SN1. My friends expect me to implement pro-environmental schemes	5.29	1	2	3	20	53	51	13
	SN2. The public authorities expect me to implement pro-environmental schemes	5.47	2	2	3	13	49	48	26
	SN3. Other farmers and professional associations expect me to implement pro-environmental schemes	5.42	0	3	3	13	57	46	21
	SN4. Consumers (society) expect me to implement pro-environmental schemes	5.42	1	0	2	24	46	48	22
	SN5. I feel that I should follow my predecessors when running a farm	5.69	0	0	1	22	39	40	41
Perceived Behavioural Control (alpha - 0.69)	PBC1. I think that implementing pro-environmental schemes is possible by myself	4.36	1	5	19	57	40	19	2
	PBC2. My skills and knowledge allow me to implement pro-environmental sustainability schemes	4.73	0	1	14	53	37	30	8
	PBC3. Whether I implement pro-environmental schemes is a decision that depends entirely on me	5.30	0	0	7	30	43	39	24
	PBC4. I am able to implement pro-environmental farming practices without technical and administrative support	4.64	0	3	16	45	50	23	6

Note: Responses were measured on a 7-point Likert scale, where 1 = completely disagree and 7 = totally agree.

exceeded the threshold of 0.7. We opted for factor analysis over principal component analysis (PCA), as PCA does not differentiate between shared and unique variance, potentially inflating the explained variance estimates (Preacher and MacCallum, 2003).

3.2. The hybrid choice model

Farmers' decisions to engage in voluntary agricultural practices are influenced not only by 'hard' factors—such as programme attributes—but also by 'soft' factors, including attitudes, beliefs, values, and social norms. These latent psychological constructs play a critical role in shaping behaviour and should therefore be accounted for in stated preference studies. However, latent factors are not directly observable; instead, researchers rely on indicators—typically measured using Likert scales—to approximate them. These indicators are imperfect proxies, as they contain measurement error. Consequently, directly incorporating them into choice models can lead to biased estimates.

To address this issue, we employ a Hybrid Choice Model (HCM), also known as an Integrated Choice and Latent Variable (ICLV) model, as developed by Ben-Akiva et al. (2002). This approach enables explicit control for measurement error and allows for the modelling of unobserved heterogeneity in preferences. While some studies (e.g. Daly et al., 2012) argue that HCM is not subject to endogeneity bias, Budziński and Czajkowski (2022) caution that endogeneity can arise from multiple sources and that the term is often used ambiguously. Their findings suggest that although standard HCMs effectively account for measurement error, they may still suffer from endogeneity bias when omitted variables influence both the latent constructs and the choice outcomes.

The HCM consists of a measurement component, a structural component, and a discrete choice component. Following Zemo and Termanen (2022), Daziano and Budziński (2023), and Mariel et al. (2021), the HCM can be technically described as follows.

3.2.1. Measurement component

Indicators (observed variables) are functions of the latent concept of environmental consciousness. We denote farmer i answer to the n -th item on the s -point scale by I_i^n and assume that there exist an unobserved variable $\tilde{I}_i^n$, such that:

$$\tilde{I}_i^n = \zeta_n \mathbf{LV}_i + \xi_i^n \quad (1)$$

where ζ_n is the vector of parameters that measure the impact of the latent variable on the answer to the given indicator question and ξ_i^n is the error term that follows a standard normal distribution. In present case, all indicators are measured on a 1-to-7 Likert scale, so the measurement equations are given using an ordered logit structure.

For a single discrete indicator of environmental consciousness, n , with 7 levels, the structure can be described as follows⁴:

$$I_i^n = \begin{cases} 1 & \text{if } -\infty < \tilde{I}_i^n \leq \tau_{s,1} \\ 2 & \text{if } \tau_{s,1} < \tilde{I}_i^n \leq \tau_{s,2} \\ 3 & \text{if } \tau_{s,2} < \tilde{I}_i^n \leq \tau_{s,3} \\ 4 & \text{if } \tau_{s,3} < \tilde{I}_i^n \leq \tau_{s,4} \\ 5 & \text{if } \tau_{s,4} < \tilde{I}_i^n \leq \tau_{s,5} \\ 6 & \text{if } \tau_{s,5} < \tilde{I}_i^n \leq \tau_{s,6} \\ 7 & \text{if } \tau_{s,6} < \tilde{I}_i^n \leq \infty \end{cases} \quad (2)$$

where $\tau_{s,1}$, $\tau_{s,2}$, $\tau_{s,3}$, $\tau_{s,4}$, $\tau_{s,5}$, and $\tau_{s,6}$ are the threshold parameters that need to be estimated. These thresholds translate the values of the continuous variable, $\tilde{I}_i^n$, to the ordinal one.

The likelihood of the indicator's observed value in an ordered logit structure is given by:

$$L(I_i^n | \tau, \zeta, \mathbf{LV}) = \sum_{s=1}^S I(I_i^n = s) \left[\frac{\exp(\tau_s^n - \zeta_n \mathbf{LV}_i)}{1 + \exp(\tau_s^n - \zeta_n \mathbf{LV}_i)} - \frac{\exp(\tau_{s-1}^n - \zeta_n \mathbf{LV}_i)}{1 + \exp(\tau_{s-1}^n - \zeta_n \mathbf{LV}_i)} \right] \quad (3)$$

where s is the response to indicator n , which ranges from 1 to 7. For a specific individual, the likelihood for all of the observed indicators is given by:

⁴ It should be noted that the number of thresholds differ between indicators since for some indicators there was no respondents who chose options "1" or "2".

$$L(I_i|\tau, \zeta, LV) = \prod_{n=1}^N L(I_i|\tau, \zeta, LV) \quad (4)$$

3.2.2. Structural component

The impact of the socioeconomic characteristics on the latent variable (environmental consciousness) can be denoted as follows:

$$LV_i = \gamma'Z_i + \eta_i \quad (5)$$

where z_i is the vector of characteristics included in the model (education level, total weekly workload, the share of production sold to the market, the area in hectares that is insured), γ' is the vector of parameters to be estimated, and η_i is the error terms that is normally distributed among individuals.

The utility function for alternative j in a choice task t for a farmer i can be described as follows:

$$U_{ijt} = V(X_{ijt}, LV; \beta, \lambda) + \varepsilon_{ijt} \quad (6)$$

where X_{ijt} represents the attributes (with their levels) of the potential policy scheme on organic farming in a given choice situation, LV is the latent variable of environmental consciousness, β is a vector of parameters that captures the impact of the attributes and levels on utility, λ captures the effect of latent variable on utility, and ε_{ijt} is the random component of the utility function.

In the choice model, it is assumed that farmer i maximizes utility, so he/she chooses alternative j in a choice situation t only if $U_{ijt} > U_{ilt}$. The likelihood of the observed sequence of choice for farmer n is given by:

$$L(y_{ijt}|\Omega, \tau; X_{ijt}, LV) = \prod_{t=1}^T \frac{\exp(\beta'X_{ijt} + (\lambda'LV)X_{ijt})}{\sum_i \exp(\beta'X_{ilt} + (\lambda'LV)X_{ilt})} \quad (7)$$

where y_{ijt} is the choice indicator. Finally, the model is estimated by maximum simulated likelihood. The estimation involves maximising the joint likelihood of the sequence of choices and the observed indicators of the latent variable. The log likelihood function for the choice model with indicators of the latent variable in a mixed logit framework is given by:

$$LL = \sum_{i=1}^I \ln \int \int (y_i|\cdot) L(I_n|\cdot) g(\beta|\Omega) g(LV|\cdot) d\beta dLV \quad (8)$$

The model was estimated in R using the Apollo package (Hess and Palma, 2019), employing 500 draws based on modified Latin hypercube sampling. Unlike other studies, we did not proceed directly to a hybrid model, nor did we make any a priori assumptions regarding which parameters should be treated as random. We began with a simple multinomial logit (MNL) model, in which all coefficients were fixed and no latent variables were included. Subsequently, we estimated a series of mixed logit (MXL) models, introducing random parameters incrementally—starting with the alternative-specific constant for the status quo option (ASC-SQ). At each step, we assessed the significance of the standard deviation associated with each parameter, using the MNL estimates as starting values. Parameters with insignificant standard deviations were treated as fixed in subsequent iterations.

This stepwise approach enabled us to maintain control over the model structure and manage its complexity. It also helped minimize the number of random parameters, which can substantially increase computational burden. Importantly, the reliable estimation of random parameters is highly dependent on the number of respondents, as smaller sample sizes may lead to unstable or imprecise estimates. By limiting the number of random parameters to those that were statistically justified, we ensured a more robust and computationally feasible model specification.

After selecting four parameters to be treated as random, we estimated the Hybrid Choice Model (HCM), incorporating both structural and measurement components based on the previously conducted factor

analysis and structural equation modelling (SEM). All random parameters were assumed to follow a normal distribution.

Burton (2019) demonstrated that models incorporating categorical variables are not invariant to the choice of base category when estimating random parameters, unless those parameters are allowed to be correlated. Accordingly, we estimated the final HCM by allowing the random parameters to be correlated. The standard deviations of these random parameters, along with their corresponding standard errors, were calculated using a lower-triangular matrix and a robust covariance matrix.

Finally, we calculated farmers' willingness to accept (WTA) to assess how they value different policy features, including both commitments and incentives. The WTA rates for dummy-coded variables were computed using the following formula:

$$WTA_m^l = - \frac{\beta_m^l}{\beta_{\text{subsidies}}} \quad (9)$$

where β_k^l is a parameter of l level of m attribute and $\beta_{\text{subsidies}}$ is the parameter (mean estimate) related to the subsidies attribute, which is treated as a continuous attribute. We estimate WTA only for parameters that are found to be significant in HCM model. The confidence intervals for WTA estimates were calculated via Delta method.

4. Results and discussion

4.1. Factor analysis and structural equation model

As stated in Section 2, the final set of indicators for environmental consciousness was selected based on factor analysis using the principal factors method (Table 4). In the initial step, all 13 attitudinal statements were included. The eigenvalue for the first factor was 4.844, accounting for 81.83 % of the total variance. The eigenvalues for all remaining factors were below 1, indicating—according to the Kaiser criterion—that only one factor should be retained for further analysis.

The Kaiser-Meyer-Olkin (KMO) measure was 0.85, indicating that the data were well-suited for factor analysis. The reliability coefficient of the Cronbach's alpha scale was 0.878, suggesting high internal consistency. We then selected seven indicators with the highest factor loadings (≥ 0.6) and conducted a second round of factor analysis. The KMO value remained high at 0.798, and all selected indicators exhibited factor loadings above 0.6. The Cronbach's alpha for this refined set was 0.853, confirming strong reliability and internal consistency.

These results support our hypothesis that a more general latent

Table 4
Results of factor analysis.

Indicator	Factor loadings (1 step)	Factor loadings (2 step)
	Factor1	Factor1
A1	0.7087	0.754
A2	0.6068	0.643
A3	0.7150	0.650
A4	0.5229	
SN1	0.6955	0.745
SN2	0.6918	0.703
SN3	0.6165	0.619
SN4	0.5842	
SN5	0.4760	
PBC1	0.5893	
PBC2	0.7066	0.632
PBC3	0.4099	
PBC4	0.5142	
Kaiser-Meyer-Olkin measure	0.8501	0.798
Eigenvalue (Factor 1)	4.8443	3.236
Proportion of variance explained (Factor 1)	81.83 %	93.48 %
Scale reliability coefficient	0.878	0.853

construct—environmental consciousness—may underlie indicators reflecting various aspects of attitudes, subjective norms, and perceived behavioural control. Table S1 in the Supplementary Material presents the structural equation model (SEM), in which environmental consciousness is represented by the seven selected indicators. The model also includes socio-economic characteristics, retaining only those that significantly influence the latent variable. All coefficients in this final SEM are highly significant at the 0.01 level. This model is subsequently incorporated into the HCM for joint estimation alongside the discrete choice component.⁵

4.2. Choice models results

4.2.1. Multinomial logit models and mixed logit model

As outlined in Section 3.2, we employed a multistep modelling strategy to ensure robust and reliable results from the selection models. Initially, we estimated two multinomial logit models (MNL_a and MNL_b; see Tables S2 and S3 in the Supplementary Material), in which the attribute concerning the percentage of land to be converted to organic farming was specified either as a continuous variable (MNL_a) or as dummy-coded categories (MNL_b). Both models yielded consistent findings regarding the significance and magnitude of effects associated with support mechanisms, collective action, and subsidy attributes.

The results from MNL_a indicate that farmers evaluated higher proportions of land conversion to organic farming negatively—suggesting that perceived benefits diminish as the level of commitment increases. This pattern was evident for both arable land and permanent grassland. However, this specification does not allow us to determine whether farmers would be willing to convert even a small portion of their land. It is plausible that farmers are receptive to partial conversion while simultaneously resistant to full-scale adoption.

The results from MNL_b support this hypothesis, particularly for arable land. The parameters associated with converting 25 % and 50 % of arable land are positive and statistically significant, indicating that farmers prefer partial conversion over remaining without formal organic certification. In contrast, full conversion (100 %) of arable land is associated with a significant negative parameter, reflecting a clear aversion to complete transition. For permanent grassland, the more granular specification reveals that converting 25 % has no significant effect on farmers' utility, whereas higher conversion levels (50 % and 100 %) are negatively evaluated, leading to a reduction in perceived utility.

Building on the insights gained from dummy coding the conversion attributes—an approach that proved more informative—we proceeded to estimate a mixed logit model (MXL), which accommodates random parameter variation across respondents. Following the procedure outlined in Section 3.2, we specified the following parameters as random: the alternative-specific constant for the status quo (ASC-SQ), conversion of 25 % and 100 % of permanent grassland to organic farming, and additional subsidies.

The significant standard deviations associated with these random parameters indicate substantial heterogeneity among farmers. Specifically, respondents exhibited diverse preferences regarding the maintenance of the status quo, as well as varying attitudes toward the

conversion of permanent grassland to organic farming and the provision of subsidies. This heterogeneity underscores the importance of accounting for individual-level variation in modelling farmers' decision-making processes.

4.2.2. Hybrid choice model

In the final step, we estimated the hybrid model (Table 5), incorporating the latent construct of *environmental consciousness* based on the seven indicators identified through factor analysis. The interpretation begins with the measurement and structural components, followed by the discrete choice component.

In the measurement component, all seven indicators exhibit highly significant coefficients ($p < 0.01$), with positive signs as expected. This confirms that the latent construct of environmental consciousness is effectively captured by the selected indicators. Notably, the strongest associations are observed for the first statements reflecting attitudes (A1) and subjective norms (SN1), suggesting these dimensions are particularly influential in shaping the latent variable.

The structural component of the hybrid model reveals that *environmental consciousness* is positively associated with higher levels of education, total weekly workload, and the extent of insured agricultural area. These findings suggest that individuals with greater educational attainment may possess more comprehensive knowledge of climate change and its implications for agriculture. Additionally, the positive relationships with workload and crop insurance coverage serve as proxies for farmers' engagement in agricultural activities. Farmers who dedicate more time to farming and rely predominantly on agricultural income are more likely to insure their crops—an indicator of risk awareness—which in turn reflects a heightened environmental consciousness.

Conversely, the proportion of farm output sold on the market exhibits a negative relationship with the latent variable. This suggests that market-oriented farmers may prioritize economic performance over environmental considerations, potentially due to the pressures of profitability and competition. Overall, the results underscore that deeper involvement in agriculture tends to foster greater environmental awareness, while commercial orientation may dilute it.

The main part of Table 5 presents the results of the discrete choice component. The negative and statistically significant coefficient of the alternative-specific constant for the status quo (ASC-SQ) indicates a general inclination among farmers to move away from current practices. This suggests a willingness to consider organic farming options, at least informal or non-certified methods. Farmers may perceive both environmental and long-term economic advantages in adopting such practices, even in the absence of formal contractual commitments. However, the significant and relatively large standard deviation of the ASC parameter highlights substantial heterogeneity in preferences across the sample. This variation underscores that while many farmers are open to change, others remain resistant. Notably, 13 farmers consistently selected the status quo in every choice task, identifying them as *protest respondents*—individuals potentially opposed to the premise of change or skeptical of the alternatives presented.⁶

The analysis of the parameters associated with the proposed commitments for conversion to organic farming yields results consistent with those of the mixed logit model (see Table S3 in the Supplementary Material). Farmers exhibit a clear preference for converting 25 % or 50

⁵ Given the relative complexity of our model and the modest sample size ($N = 143$), with measurement and structural components identified at the respondent level, we also present an alternative specification in Table S3 of the Supplementary Material. In this version, the latent variable is simplified to represent *attitudes* only, measured by three indicators. This reduced model includes substantially fewer parameters (47 in total), making it more parsimonious. Despite the simplified structure, the results remain consistent in terms of the magnitude and significance of key parameters. Notably, the negative interaction effect between the latent variable and subsidies remains statistically significant, reinforcing the robustness of our findings.

⁶ Barrio and Loureiro (2013) emphasize that the decision to exclude protest respondents from the sample can substantially influence model outcomes, particularly when the proportion of protestors is considerable. To assess the robustness of our findings, we present additional HCM estimates in the Supplementary Material (Table S4) for a subsample excluding protest respondents. The results remain broadly consistent with those of the full sample, suggesting that the inclusion or exclusion of protestors does not materially alter the main conclusions of the analysis.

Table 5

The results of hybrid choice models.

Discrete choice component							
	Mean	Main effects WTA	Standard deviations	Interactions Environmental consciousness			
ASC-SQ (none option)	-8.626*** (1.382)		7.203*** (1.372)	0.253	(0.202)		
25% of arable land in organic agriculture	0.531** (0.217)	-174.9 [-370.1;20.3]	-	-	-		
50% of arable land in organic agriculture	0.700*** (0.168)	-230.7 [-459.5;-1.9]	-	-	-		
100% of arable land in organic agriculture	-0.470** (0.208)	154.9 [-15.7; 325.5]	-	-	-		
25% of grassland in organic agriculture	-0.086 (0.315)		1.356*** (0.391)	0.090	(0.157)		
50% of grassland in organic agriculture	-0.534*** (0.194)	175.9 [-0.4; 352.2]	-	-	-		
100% of grassland in organic agriculture	-0.771* (0.425)	253.9 [20.5; 487.4]	1.197*** (0.272)	-0.085	(0.195)		
Basic (informational) support	0.146 (0.150)		-	-	-		
Professional support	0.799*** (0.129)	-263.2 [-504.02;-22.5]	-	-	-		
Collective certification	-0.410** (0.158)	135.1 [-19.4; 289.2]	-	-	-		
Collective certification, marketing, purchases and sales	0.102 (0.109)		-	-	-		
Additional subsidies	0.003* (0.002)		0.007*** (0.001)	-0.001*	-0.006		
Structural component							
Environmental consciousness drivers							
Education	0.421*** (0.112)						
Workload	0.005** (0.002)						
Share of production sold	-0.015** (0.006)						
Area insured	0.052*** (0.015)						
Measurement component							
	Indicators (I_n) of environmental consciousness	Threshold 1	Threshold 2	Threshold 3	Threshold 4	Threshold 5	Threshold 6
$I_1 - A1$	1.884*** (0.387)		-4.140*** (1.244)	-2.820** (1.246)	-0.756 (1.191)	1.781 (1.286)	5.011*** (1.537)
$I_2 - A2$	1.324*** (0.286)			-2.683*** (0.986)	-1.551* (0.917)	1.307 (0.940)	3.933*** (1.074)
$I_3 - A3$	1.340*** (0.225)		-4.429*** (1.345)	-2.068** (0.864)	0.190 (0.843)	1.901** (0.868)	4.015*** (0.917)
$I_4 - SN1$	1.596*** (0.337)	-4.970** (1.342)	-3.591*** (1.097)	-2.522** (0.996)	-0.112 (0.950)	2.622** (1.016)	5.575*** (1.171)
$I_5 - SN2$	1.509*** (0.370)	-3.934** (1.169)	-3.040*** (1.034)	-2.254** (0.989)	-0.554 (0.880)	2.062** (0.924)	4.298*** (1.019)
$I_6 - SN3$	1.093*** (0.255)		-3.219*** (1.844)	-2.378*** (0.748)	-0.845 (0.695)	1.742** (0.693)	3.763*** (0.767)
$I_7 - PBC2$	1.378*** (0.243)		-4.499*** (1.372)	-1.214 (0.878)	1.812** (0.886)	3.454*** (0.955)	5.675*** (1.089)
Number of farmers	143						
Number of observations	1144						
LL (start)	-2481.49						
LL (final)	-1972.04						
AIC	4090.08						
BIC	4306.36						
Estimated parameters	73						

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

% of their arable land to organic practices, with the effect being more pronounced at the 50 % level. These options are favoured over maintaining the status quo (0 % conversion), which reflects only informal organic practices. However, there is limited interest in converting 100 % of arable land, likely due to farmers' aversion to risk and the perceived uncertainty associated with full-scale conversion.

The situation is more nuanced for permanent grassland. The mean effect of converting 25 % of grassland is statistically insignificant, while the coefficients for 50 % and 100 % conversion levels are significantly negative. This suggests that, on average, farmers are reluctant to convert larger portions of their permanent grassland. Nonetheless, the significant standard deviations for the 25 % and 100 % levels indicate considerable heterogeneity within the sample. Some farmers may be open to converting a small portion—or even the entirety—of their grassland, reflecting diverse attitudes and risk profiles.

Regarding support mechanisms, basic informational support does not significantly influence farmers' utility compared to the absence of support. Despite the underdeveloped advisory infrastructure in Romania, basic support is not attractive for farmers, given the widespread availability of basic agricultural information online. In contrast, more advanced forms of support—such as administrative assistance and professional agro-technical guidance—are viewed favourably. These findings underscore a pressing need for the dissemination of specialized expertise and tailored support services to facilitate the adoption of environmentally sustainable farming practices.

Our findings indicate that collective actions—such as joint certification, marketing, and cooperative buying and selling—do not significantly enhance farmers' utility, while sole collective certification is even negatively perceived. This suggests a general reluctance among farmers to engage in cooperative arrangements. Notably, this result contrasts with insights from the focus group discussions, where participants identified the lack of cooperation as a key challenge in local agriculture. This apparent contradiction—recognizing the problem yet resisting the solution—warrants further exploration.

One plausible explanation lies in the broader institutional and socio-economic context. The Common Agricultural Policy (CAP) has become a cornerstone of Romanian farmers' economic stability, fostering a reliance on its financial mechanisms. This dependency has been intensified by market liberalization and structural changes in rural economies. However, farmers often perceive that subsidies linked to common land are difficult to access or manage effectively. [Sutcliffe et al. \(2013\)](#) and [Wegener et al. \(2011\)](#) highlight two critical barriers: (1) community organizations frequently lack the administrative capacity to navigate CAP instruments, and (2) agricultural policy information is not disseminated efficiently. These issues contribute to a perception that collective land use and subsidy-based farming are incompatible, leading to increased 'quasi-privatization' and the fragmentation of communal pastures—ultimately undermining traditional cooperative practices. It is also possible that focus group participants had a more nuanced understanding of CAP support mechanisms available to farmers' associations

than the broader sample. This disparity in awareness may explain why cooperation is acknowledged as important in theory but undervalued in practice.

In the HCM model, the average effect of the *subsidy* attribute was positive and statistically significant at the 0.1 level, indicating that financial support is generally perceived as a motivating factor for the adoption of organic farming practices. However, the large and highly significant standard deviation associated with the subsidy parameter reveals substantial heterogeneity in farmers' responses. This suggests that while subsidies are an important driver for some farmers, others may place less emphasis on financial incentives.

To further explore the heterogeneity of farmers' preferences, we introduced interaction terms between the latent construct and the random coefficients in the model. Contrary to expectations, higher levels of environmental consciousness do not significantly increase farmers' likelihood of moving away from the status quo. Similarly, this latent trait does not mitigate farmers' negative preferences regarding the conversion of permanent grassland to organic farming. These findings suggest that environmental consciousness alone may not be sufficient to overcome perceived risks or barriers associated with certain types of land conversion.

However, the interaction between environmental consciousness and the *subsidy* attribute is both significant and negative. This indicates that farmers with stronger environmental convictions place less emphasis on financial incentives and are more willing to adopt organic practices even at lower subsidy levels. Their motivation appears to be driven more by intrinsic values or the belief in the long-term viability and profitability of organic farming, rather than by external financial support.

The willingness-to-accept (WTA) estimates provide nuanced insights into farmers' preferences regarding conversion to organic farming. Farmers generally value *partial conversion* positively, indicating that they may not expect additional payments and, in some cases, might even forgo part of the subsidy. For *full conversion* of arable land, the average WTA is €155 per hectare, suggesting that the current subsidy rate of €293 per hectare offered during the conversion period is more than sufficient to incentivize adoption.

In contrast, the situation for *permanent grassland* is markedly different. Here, the existing subsidy of €143 per hectare appears inadequate. For full conversion, farmers would require an average of €253.9 per hectare—an increase of approximately 77.6 %. Even for 50 % conversion, the average WTA stands at €175.9 per hectare, which is 23 % above the current rate. These figures underscore the need for a differentiated subsidy approach that reflects the specific challenges and perceived risks associated with converting permanent grassland.

The WTA estimates also highlight the high value farmers place on *advanced advisory* support, which is estimated at €263.2 per hectare. This suggests that farmers would be willing to accept lower conversion subsidies if professional agro-technical assistance and administrative support were provided. Conversely, *collective certification* is viewed unfavourably, as reflected in a positive WTA value of €135.1 per hectare—indicating that farmers would require higher subsidies to participate in collective arrangements.

The mean estimates of WTAs are all within payment vector which adds to their plausibility (Glenk et al., 2024). However, it is important to interpret these results with caution due to the relatively wide confidence intervals associated with the WTA estimates (cf. Table 5). Moreover, as discussed earlier, subsidies are not universally perceived as critical drivers of engagement in organic farming, and their valuation varies significantly across the sample. The generally high levels of *environmental consciousness* among respondents appear to reduce their reliance on financial incentives. Additionally, the prevalence of *small-scale farms* in the sample suggests that many farmers may have supplementary income sources, making them more receptive to lower subsidy levels.

5. Discussion

Our analysis reveals a cautious stance among Romanian farmers regarding conversion to the organic agriculture (OA) system. For *arable land*, farmers show a preference for *partial conversion*, while *permanent grassland* is largely excluded from their interest in organic transition. This reluctance may stem from perceived financial and market-related barriers, as highlighted by Popovici et al. (2022), who note that Romanian farmers often doubt the profitability of organic farming due to limited access to financing and markets. Such conservative behaviour is not unique to Romania; Lienhoop and Brouwer (2015) found similar resistance among German farmers, who expressed strong disutility toward enrolling large portions of their land in afforestation programs—albeit in a different policy context.

Regarding *advisory* support, our findings align with existing literature emphasizing the importance of free services in facilitating behavioural change among farmers (Hasler et al., 2019; Lampach et al., 2020; Schomers et al., 2015). Prior studies underscore the dual role of advisory support in disseminating knowledge (Lampach et al., 2020) and reducing administrative burdens (Lloyd and Stephenson, 2020). However, our results suggest that *only professional* support—such as tailored agro-technical assistance and administrative help—has a meaningful impact on farmers' decisions. In contrast, *basic informational* support appears to generate deadweight loss, offering little added value for surveyed farmers. Romania's exceptionally high fiber penetration rate (96.5 % of households) ensures that even rural farmers can easily obtain basic information online, diminishing the utility of generic advisory services.

The negative perception of *collective certification* and the lack of impact of *stronger integration* further reflect deep-rooted mistrust and reluctance to cooperate—traits commonly observed in post-socialist societies (Möller et al., 2018). Although Solfanelli et al. (2021) argue that prior experience in coordinated groups can foster interest in collective certification, this dynamic appears ineffective in the Romanian context. Despite the continued prevalence of *common pastures*, farmers remain hesitant to engage in cooperative schemes, suggesting that structural and cultural barriers to collaboration persist.

Despotović et al. (2019) emphasize the importance of incorporating behavioural factors into the design of effective agri-environmental policies. However, empirical evidence on the influence of environmental attitudes on farmers' participation—or intention to participate—in agri-environmental programmes remains mixed. As noted by Schaub et al. (2023), previous studies often report non-significant effects. For instance, Cullen et al. (2020) and Giovanopoulou et al. (2011) found a positive relationship between environmental attitudes and participation in agri-environmental schemes, while Huber et al. (2021) and Thomas et al. (2019) reported no significant impact of environmental awareness.

Our findings contribute to this debate by showing that *environmental consciousness* significantly influences the valuation of the *subsidy* attribute, but does not affect preferences for other contract features. This outcome is particularly noteworthy given that our study examined environmental consciousness specifically within the context of agricultural practices—an approach that typically enhances the likelihood of detecting significant behavioural effects (Schaub et al., 2023).

Interestingly, our results diverge from those of Zemo and Termansen (2022), who used the concept of *environmental identity* to explain preference heterogeneity among Danish farmers regarding investments in renewable energy. Their study found that environmental identity not only reduced the demand for subsidies—consistent with our findings—but also influenced a broader range of contract attributes.

The specificity of our results may be attributed to the characteristics of our sample, which consisted primarily of small and medium-sized farmers for whom agriculture may be not the sole economic activity or income source. For these farmers, the link between environmental beliefs and agricultural choices may be less direct, as decisions are shaped by a broader set of livelihood considerations.

6. Conclusions

This study investigates the preferences of Romanian farmers regarding the conversion of their land to organic agriculture. Specifically, we assess the potential proportion of arable land and permanent grassland that could be converted, and identify the most valued features of an improved organic farming contract. Additionally, we examine how farmers' environmental consciousness influences their evaluation of policy attributes.

Our findings indicate a general willingness among farmers to move away from conventional practices, albeit rather informally or only on a small scale. Preferences for converting arable land are relatively homogeneous: most farmers are open to converting up to 50 % of their land, while full conversion is viewed unfavourably. In contrast, conversion of permanent grassland is broadly resisted, with higher subsidies deemed necessary to incentivize participation.

Farmers expressed a strong preference for professional advisory support, while showing limited interest in collective action mechanisms—an unexpected result given the emphasis on collective certification during focus group discussions. Environmental consciousness was found to influence only the subsidy attribute: more environmentally conscious farmers were willing to accept lower payments. This supports the hypothesis suggested by the article's title, though it is notable that other contract features were unaffected by this factor.

We also found that farmers favour the provision of professional advisory support, while showing limited interest in various forms of collective action within organic agriculture (OA). This is somewhat unexpected, given the emphasis placed on collective certification during focus group discussions. Greater environmental consciousness was shown to influence the subsidy attribute—more environmentally conscious farmers were willing to accept lower payments. This finding supports the hypothesis proposed in the title of the article, although it is worth noting that environmental consciousness did not affect other attributes included in the experiment.

Future research could explore additional behavioural dimensions of farmers' decision-making. Given that farmers—particularly in post-socialist countries—tend to be risk-averse, and OA is often perceived as a risky endeavour, it would be valuable to examine how risk preferences shape their willingness to engage in OA. Moreover, combining quantitative methods with qualitative analysis could offer deeper insight into the underlying motivations that deter farmers from converting to organic practices. Considering the significant role of livestock production in Romania, further investigation into farmers' interest in organic livestock farming would also be worthwhile.

Our findings underscore the importance of extension services. The successful implementation of OA, especially in countries where it remains underdeveloped, depends on the availability of professional support that is both accessible and reliable. Enhanced access to information and advisory services can help lower the barriers to adoption (Möhring et al., 2024; Lampach et al., 2020). Romania should therefore invest in strengthening its public extension service infrastructure. Currently, advisory institutions operate at the county level, but they are often difficult to access—particularly for small-scale farms. These institutions should receive increased financial support and establish branches at more local levels (e.g. within major communities), closer to the farmers themselves. Alternatively, farmers could be reimbursed or subsidised for the costs of private consultancy.

Educational initiatives are also needed to raise environmental consciousness among farmers. Our results suggest that as environmental consciousness increases, the need for financial compensation diminishes. Fostering stronger intrinsic motivation for environmentally sustainable practices—such as OA—would be advantageous from a public policy perspective.

Another area requiring attention from policymakers is the promotion of collaboration, which could generate localised spatial spillover effects (Mannaf et al., 2023). Despite clear evidence that cooperation yields

benefits for farmers, there remains considerable reluctance to engage in collective actions, particularly in the newer EU Member States. Highlighting the advantages and showcasing successful examples of cooperation could help shift farmers' attitudes. In addition to reducing costs, collaboration can help farmers refine organic practices to better suit specific local contexts. Farmers who perceive a greater availability of information within their local networks are more likely to adopt organic agriculture (Wollni and Andersson, 2014). One practical approach could be to design joint initiatives with more tangible benefits—for example, offering investment support for machinery purchases to farmers transitioning to OA, with increased funding available for those participating in collective forms, such as producer groups.

CRediT authorship contribution statement

Łukasz Kryszak: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Bazyli Czyżewski:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization. **Andreea Muntean:** Writing – review & editing, Writing – original draft, Validation, Investigation, Conceptualization. **Egzon Bajrami:** Writing – original draft, Validation, Methodology, Conceptualization.

Declaration of competing interest

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

Acknowledgments

This research was financed by National Science Center, Poland, Grant number: 2021/41/B/HS4/02433.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jenvman.2025.127159>.

Data availability

Data will be made available on request.

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