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Exploring Farmers' Intentions to Mitigate Climate Change Through the Lens of the Theory of Reasoned Goal Pursuit

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ABSTRACT

Climate change is a major challenge requiring farmers to adopt sustainable practices. As climate policies often depend on voluntary action, understanding what motivates farmers is essential. This study applies the Theory of Reasoned Goal Pursuit (TRGP) to assess key factors influencing Hungarian farmers' intentions to mitigate climate change, including Active Procurement Goals (APGs), Active Approval Goals (AAGs), Attitude (ATT), Subjective Norms (NOR), Motivation (MOT), Perceived Behavioral Control (PBC), and Intention (INT). Using a sample of 301 farmers from the Hungarian Farm Accounting Data Network (FADN) and Partial Least Squares Structural Equation Modeling (PLS-SEM), the study finds that APGs strongly predict ATT and MOT, while AAGs influence NOR. ATT influences MOT to a greater extent than NOR, while MOT and PBC have a strong effect on INT. ATT also mediates the information between APGs and MOT, while NOR has a weak mediating effect between AAGs and MOT. These insights support policies promoting subsidies, climate adaptation strategies, sustainable legislation, digital decision-making tools, and technical training to help farmers adopt climate-friendly practices.

1 | Introduction

Agriculture is one of the sectors most vulnerable to severe climatic events, as escalating atmospheric concentrations of greenhouse gases have reached unprecedented levels over the past few centuries, significantly impairing agricultural productivity (Verma et al. 2025).

Changes in the timing and quantity of precipitation (Zong et al. 2022) can disrupt the compatibility of crop varieties with their agroecosystems, reduce input-use efficiency, modify pest and disease management requirements, and accelerate soil organic matter turnover (Zabel et al. 2014). These climatic challenges also pose direct threats to food security in many regions worldwide (Mase et al. 2017), especially in developing countries heavily dependent on subsistence agriculture (Karki et al. 2020). In these nations, climate change disproportionately affects rural and marginalized populations, potentially intensifying poverty, inequality, and conflict, which may subsequently hinder economic growth and development potential (Hallegatte et al. 2018).

Springmann et al. (2016) suggest that by 2050, climate change will result in a 3.2% decrease in the world food supply per capita. Furthermore, by 2070, water supplies are expected to diminish by 20%, and the proportion of water-stressed regions is projected to rise from 19% to 35%, adversely affecting numerous socio-ecological systems (Hamam et al. 2024).

Agriculture's economic reliance on climate (Austin et al. 2020) thus presents issues regarding farmers' flexibility within certain technological and regulatory frameworks both locally and globally (Li et al. 2021). Agricultural activity also significantly contributes to climate change (Ortiz et al. 2021). It accounts for around 30% of global greenhouse gas emissions (Laborde et al. 2021), primarily attributable to the extraction of natural resources (McCauley and Hefron 2018). Nonetheless, it possesses significant potential to alleviate climate change by employing strategies that include low-greenhouse-gas (GHG) management techniques (Verma et al. 2025), minimizing pesticide and fertilizer use, enhancing carbon sinks, modifying irrigation practices, and decreasing fuel consumption in agricultural activities (Di Vita et al. 2017).

Efficient adaptation in the agricultural sector—defined as the modifications of socioeconomic and ecological systems in response to actual or anticipated climate variability and its impacts (Smit and Pilifosova 2003)—is crucial for mitigating vulnerability and the adverse consequences of climate change (Zobeidi et al. 2021).

Recognizing the urgency of this challenge, Europe has made significant strides in climate policy reform, exemplified by initiatives such as the European Green Deal (European Commission 2021) and the Fit for 55 package (Schlacke et al. 2022). These frameworks aim to pave the way toward achieving carbon neutrality (Ringel et al. 2021), underscoring Europe's commitment to sustainable development.

However, despite these advancements, uncertainties and concerns regarding the feasibility and implementation of adaptation and mitigation strategies persist (Salvia et al. 2021).

Although numerous agricultural adaptation techniques have been proposed to mitigate the effects of climate change, their effectiveness depends on the active engagement of the agricultural community. Such engagement is strongly influenced by farmers' attitudes (Wheeler et al. 2021), which play a critical role in shaping their willingness to adopt adaptive measures.

Incremental adaptation, characterized by the gradual evolution of activities and behaviors in response to ongoing climatic hazards, can mitigate the detrimental effects or enhance the potential benefits of climate change (Di Vita, Califano, et al. 2024; Di Vita, Zanchini, et al. 2024).

As such, understanding and fostering farmers' adaptive behaviors and the motivations that drive them to adopt sustainable practices is essential for formulating effective climate change response strategies and assisting local agricultural systems in implementing suitable adaptation measures (Hamam et al. 2022, 2023). This is crucial for achieving agricultural and food security (Fadina and Barjolle 2018) and for enhancing the socioeconomic resilience of farming communities (Amir et al. 2020).

Moreover, farmers, as the implementers of adaptation policies and programs, significantly influence their execution and effectiveness; thus, neglecting behavioral aspects may result in ineffective and inefficient policies (Brown et al. 2021). Consequently, the significance of comprehending the psychological factors that shape behavior must not be overlooked in formulating coping strategies for the agricultural sector (Raimondo, Spina, Chinnici, et al. 2024).

Given the current ex-ante evaluation tools for assessing the behavioral and psychological determinants of farmers' decision-making (Huber et al. 2018), this study provides an original and timely contribution to the field of agricultural and environmental economics. Specifically, it advances the understanding of how psychological constructs—such as goals, attitudes, and motivational drivers—shape Hungarian farmers' intentions to engage in climate change mitigation practices.

What makes this research particularly innovative is the application of the Theory of Reasoned Goal Pursuit (TRGP; Ajzen and Kruglanski 2019)—a relatively new theoretical framework that integrates the Theory of Planned Behavior (TPB) with Goal Systems Theory (GST)—to the agricultural context.

This theory provides a more nuanced and predictive understanding of the cognitive and motivational mechanisms that drive farmers' actions in complex and long-term contexts (Ajzen and Kruglanski 2019; Cai et al. 2024), enabling a more dynamic analysis of sustainable behaviors compared to traditional models. Moreover, it introduces an operational distinction between procurement-related goals and approval-related goals, thereby enhancing its explanatory power for complex decisions typical of sustainable agricultural strategies, which require intentional planning and a balance between personal motivations and external pressures related to climate change mitigation.

To the authors' knowledge, this is the first empirical study to employ the TRGP framework to explore farmers' behavioral intentions regarding climate change mitigation.

2 | Theoretical Background and Research Hypotheses

In recent years, growing interest in understanding pro-environmental behavior has led to the development of various theoretical models aimed at elucidating people's decision-making processes (Feola et al. 2015; Arbuckle Jr et al. 2015). Several behavioral theories have been employed to examine the psychological and cognitive mechanisms influencing decisions in the context of environmental adaptation and sustainability (Bagagnan et al. 2019; Sargani et al. 2023).

To investigate the processes driving adaptation to climate change, numerous studies have relied on well-established theoretical frameworks, such as the Theory of Planned Behavior (TPB) (Masud et al. 2016) or the Protection Motivation Theory (PMT) (Pakmehr et al. 2020).

Since the Theory of Reasoned Goal Pursuit (TRGP) has so far been applied in only a few studies on pro-environmental behaviors and sustainable attitudes (Concari et al. 2023; Islam et al. 2024), this study employs it to propose an expanded theoretical framework that integrates elements of the Theory of Planned Behavior (TPB) (Ajzen 1991) and Goal Systems Theory (GST) to better understand how individuals pursue their goals (Ajzen and Kruglanski 2019).

The decision to adopt the TRGP model stems from the need to overcome certain conceptual limitations of the traditional TPB

(Fishbein and Ajzen 2010), which has reduced predictive power for complex actions and takes a static view of intentions, overlooking the interaction between multiple goals or conflicting motives (Ajzen and Kruglanski 2019; Islam et al. 2024).

Unlike the TPB, which explains behavior in terms of attitudes, subjective norms, and perceived control, the TRGP integrates the role of individual goals and their alignment with intentions, allowing for an understanding not only of whether an individual intends to act but also of the reasons for and direction of their efforts (Locke and Latham 2015; Kruglanski et al. 2015).

Furthermore, compared with the Value-Belief-Norm Theory (VBN), which emphasizes moral values and personal norms, the TRGP provides a more operational and cognitive perspective, illustrating how specific beliefs and goals translate into observable behaviors while also considering perceived constraints.

Similarly, unlike the PMT, which focuses primarily on behavioral responses to perceived threats or risks, the TRGP incorporates positive dimensions such as aspirational goals, social incentives, and individual aspirations, which are essential for understanding sustainable behaviors in complex and multidimensional contexts (Gifford et al. 2018).

In the present study, the direct and indirect pathways among the TRGP variables were examined through mediation analysis to clarify the underlying psychological processes and quantify the indirect influence of personality traits on behavioral intentions.

This approach enabled an in-depth exploration of the psychological and cognitive factors shaping individual intentions, offering a more comprehensive understanding of pro-environmental decision-making and providing empirical evidence to inform adaptation and mitigation strategies in the agricultural sector (Huber et al. 2024).

2.1 | Mediation Analysis

Mediation analysis is a technique that examines the impact of a mediating variable when testing the relationship between two variables (Rijnhart et al. 2021). This mediating variable captures farmers' cognitive processes and provides insights into the mechanisms that drive their intentions (Sarma et al. 2022; Proksch et al. 2024).

Zhao et al. (2010) proposed a decision tree that classifies mediation using a statistical inference approach, taking into account the strength of direct and indirect links between the variables involved.

In a three-variable non-recursive causal framework, five models can be identified—three corresponding to mediation and two to non-mediation: (1) *complementary mediation* occurs when both the mediated effect (a # b) and the direct effect (c) are present and aligned in the same direction; (2) *competitive mediation* occurs when both the mediated effect (a # b) and the direct impact (c) are present but oriented in opposite directions; (3) *indirect-only mediation* occurs when the mediated effect ($a \times b$) is present, but the direct effect is absent; (4) *direct-only non-mediation* occurs when the direct effect (c) is present, but the indirect effect is absent; (5) *non-mediation* without effect occurs when neither the direct nor the indirect effect is present.

The growing popularity of this method in applied research stems from its ability to clarify the relationships between independent and dependent variables, provide a deeper understanding of farmers' decision-making processes, and support the development of targeted strategies to promote sustainable practices (Sidhu et al. 2021; Tama et al. 2023; Mosavian et al. 2023).

This research examines attitudes and subjective norms as mediating factors, as they represent the psychological mechanisms through which external influences are translated into tangible actions.

Attitude mediates the relationship between individual perceptions and behavioral intentions, reflecting a person's positive or negative inclination towards a specific behavior (Ajzen 1991). Subjective norms capture the perceived social expectations that link community values with individual behaviors, shaping intentions according to what is considered socially acceptable or desirable (Fishbein and Ajzen 2010). These variables convey the effect of independent factors on dependent ones while enhancing conceptual understanding, allowing for a deeper exploration of the complex dynamics that shape human decisions and actions, both psychologically and socially.

2.2 | Research Hypotheses

The TRGP model distinguishes between two types of goals: Active Procurement Goals (APGs), aimed at achieving tangible benefits, and Active Approval Goals (AAGs), oriented toward social recognition (Ajzen and Kruglanski 2019). In the agricultural context, APGs concern access to tangible resources, such as seeds, sustainable fertilizers, or irrigation technologies, and may include the desire to ensure farm profitability or maintain land stewardship (Dwomoh et al. 2023). These goals directly support productivity and drive behavioral engagement more strongly than a general positive evaluation.

AAGs, on the other hand, relate to the social dimension, encompassing community recognition or conformity to collective norms; a farmer may thus adopt sustainable practices to gain social approval, even in the absence of explicit expectations from peers (Saleh and Ehlers 2025).

Integrating practical and social goals allows for capturing motivations often overlooked by classical models, providing a more comprehensive understanding of agricultural behavior. Climate change mitigation practices, for instance, may be adopted not only out of personal conviction but also to obtain subsidies, certifications, or community recognition (van Asseldonk et al. 2023; Muench et al. 2024).

A fundamental principle of the TRGP is that goals must be active at the time of decision-making in order to meaningfully influence behavioral intentions (Ajzen and Kruglanski 2019). This distinction differentiates APGs from attitudes, which reflect evaluations of the favorability or unfavorability of a behavior based on expected outcomes, and AAGs from subjective norms, which represent external perceptions of the expectations of significant others. However, although conceptually distinct, APGs and attitudes, as well as AAGs and subjective norms, can interact in practice: the activation of specific goals can strengthen evaluative beliefs, while strong attitudes or perceived norms can stimulate or intensify the corresponding goals (Ajzen and Kruglanski 2019).

In this context, the present study posits that active procurement goals (APGs), as precursors of farmers' attitudes (Menozzi et al. 2015) and motivations (Concari et al. 2023), can significantly shape their intentions to adopt climate change mitigation practices (Niles et al. 2016). The following hypotheses are proposed:

H1a. *Active Procurement goals (APGs) have a direct and positive impact on attitude in decision-making aimed at reducing the negative impacts of climate change.*

H1b. *Active Procurement goals (APGs) have a direct and positive impact on motivation in decision-making aimed at reducing the negative impacts of climate change.*

Furthermore, as AAGs act as precursors of social pressure (Ajzen and Kruglanski 2019), a correlation between AAGs and subjective norm within the model is proposed. Research has demonstrated the impact of social approval on farmers' motivation (Concari et al. 2023). Therefore, prioritizing AAGs may enhance their motivation to adopt climate-friendly agricultural practices. Based on this, the following hypotheses are proposed:

H2a. *Active approval goals (AAGs) have a direct impact on subjective norms in decision-making aimed at reducing the negative impacts of climate change.*

H2b. *Active approval goals (AAGs) have a direct impact on motivation in decision-making aimed at reducing the negative impacts of climate change.*

Attitude reflects an individual's psychological inclination toward a specific behavior and is shaped by information, beliefs, values, and emotions (Razali et al. 2020). A favorable attitude toward a specific behavior is associated with a stronger intention to engage in that behavior and the actual performance of effective actions (Wang et al. 2019). Since attitudes influence farmers' intentions to engage in sustainable farming initiatives (López-Mosquera and Sánchez 2012) and intrinsic motivation to participate in climate change-related actions (Juma-Michilena et al. 2023), the following hypotheses are proposed:

H3a. *Attitude has a direct impact on motivation in decision-making aimed at reducing the negative impacts of climate change.*

H3b. *Attitude mediates the effect of APGs on motivation in decision-making aimed at reducing the negative impacts of climate change.*

Subjective norms stem from normative beliefs (Wauters et al. 2010) and emphasize the social pressure that individuals perceive (Razali et al. 2020). Numerous studies highlight the impact of social acceptability on farmers' intentions to adopt environmentally sustainable agricultural practices (Cao et al. 2022).

Moreover, social identity is considered a pivotal factor that can stimulate motivational energy by enhancing perceived self-efficacy in the face of risk (Lo 2013).

Subjective norms, originally external, may transform into intrinsic incentives through a gradual internalization process, as acknowledged in social psychology and Self-Determination Theory (SDT) (Deci and Ryan 2012). Initially, individuals may be driven to adopt certain actions due to social pressure to gain approval or avoid disapproval, exemplifying the direct effect of the active approval goals (AAGs). Therefore, the hypotheses are proposed:

H4a. *Subjective norms have a direct impact on motivation in decision-making aimed at reducing the negative impacts of climate change.*

H4b. *Subjective norms mediate the effect of AAGs on motivation in decision-making aimed at reducing the negative impacts of climate change.*

Motivation is a crucial driver of intention (Ölander and ThØgersen 1995). It can be explained by goals, dispositions, and perceived social standards (Concari et al. 2023; Islam et al. 2024).

Given that individual motivations represent a key component of behavioral change (Nes et al. 2009) and typically drive mitigation initiatives (Flaherty et al. 2019), the following hypothesis is proposed:

H5. *Motivation has a direct impact on intention in decision-making aimed at reducing the negative impacts of climate change.*

Perceived behavioral control derives from control beliefs (Wauters et al. 2010) and explains the relationship between intention and behavior based on individuals' perceptions of their ability to engage in problem-solving (Haden et al. 2012).

Several studies (Wang et al. 2019; Yuriev et al. 2020) demonstrate that PBC has a significant correlation with pro-environmental behavior, suggesting that a higher perceived capacity to implement sustainable agricultural practices for mitigating climate change effects is associated with a stronger intention to adopt such practices (Maleksaeidi and Keshavarz 2019).

PBC serves as a crucial determinant in predicting intention and behavior (Ajzen 1991); therefore, the proposed hypothesis is:

H6. *Perceived Behavioral Control (PBC) has a direct impact on intention in decision-making aimed at reducing the negative impacts of climate change.*

3 | Materials and Methods

3.1 | Study Area

Hungary has a typical continental climate, featuring hot, arid summers and frigid winters. The nation is susceptible to floods and droughts owing to insufficient reservoir capacity and inadequate water level management. Data reveal that Hungary's irrigated land is well below the economically viable investment threshold of 6.5%, now standing at approximately 2%–2.5% (Süle et al. 2024).

The most recent data from the Hungarian Central Statistical Office indicates that around 5% of the utilised agricultural area (UAA) in Hungary is deemed irrigable, equating to approximately 258,000 ha. Approximately 60% of this area, or over 154,000 ha, was irrigated between June 2022 and June 2023. Nonetheless, when considering the entire national UAA, the irrigated area accounts for only 3% of the total. The proportion of irrigated land in Hungary varies between 3% and 5% of the Utilized Agricultural Area (UAA), contingent upon whether the total agricultural area or only the technically irrigable area is considered.

Considering that agroecosystems occupy over 80% of its territory, the agricultural sector's sensitivity to climate change is exceedingly high, requiring adaptation measures.

The study area is concentrated in 16 counties in Hungary (Figure 1): County of Baranya; County of Borsod-Abaúj-Zemplén; County of Bács-Kiskun; County of Békés; Csongrád; County of Fejér; County of Győr-Moson-Sopron; County of Hajdú-Bihar; County of Heves; County of Jász-Nagykun-Szolnok; County of Pest; County of Somogy; County of Szabolcs-Szatmár-Bereg; County of Tolna; County of Vas; County of Zala.

The selection of counties was based on strategic and pragmatic factors to assure the methodological integrity and empirical relevance of the sample. We aimed to include regions that represent a diverse array of socioeconomic, topographical, and demographic variables to accurately portray the complexity and variability of the Hungarian agricultural industry. This decision allowed us to include diverse farm typologies, production systems, and geographical locations while maintaining the internal consistency of the study design. The counties were chosen not just for their agricultural significance but also for their capacity to exemplify a balanced integration of more developed regions and those with marginal features. The objective was to construct a sample that, while not entirely statistically representative of the nation, was sufficiently diversified to provide generalizable and valuable insights for analyzing climate adaptation processes across various agricultural settings. The geographical diversity included in the sample enhances the external validity of the research and its relevance to actual agricultural policy and planning situations.

3.2 | Design and Data Collection

This study employed a cross-sectional research design to investigate the relationship between the Theory of Reasoned Goal Pursuit (TRGP) constructs and farmers' intentions to adopt climate-friendly agricultural practices.

Data were collected in January and February 2024 using structured interviews through online questionnaires, depending on participants' preferences and availability. Direct interviews were carried out across 16 Hungarian counties by trained interviewers to obtain data on climate change adaptation strategies at the farm level.

Farmers were pre-selected from those included in the Hungarian Farm Accountancy Data Network (FADN), a representative information system that collects asset, financial, and income information from farms annually. The comprehensive FADN sample comprises 2109 enterprises.

A stratified subsample of farms from the FADN database was selected to address additional thematic questions related to climate change adaptation measures. The stratification was based

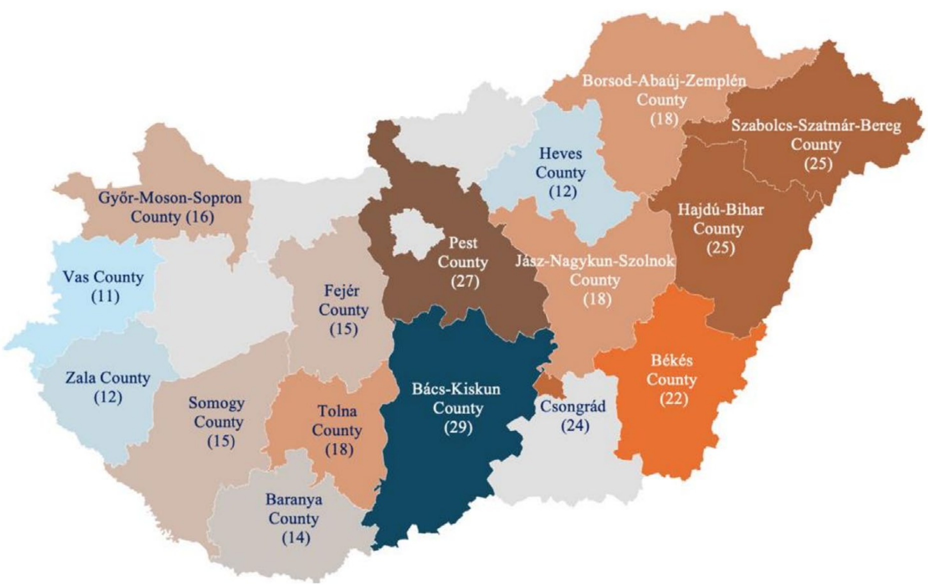

FIGURE 1 | Study area.

on three key criteria: farm type, geographic location (counties), and farm size (Figure 1), resulting in a subsample comprising 14.3% of the total sample, which was deemed sufficient to yield reliable and representative results. To ensure consistency, only farms with a standard output (SO) exceeding €8000 were included in the sample.

Subsequently, 308 farmers were selected, and the final dataset consisted of 301 observations. Descriptive statistics of the sample are reported in Table 1.

3.3 | Questionnaire Structure

The data were collected through a structured questionnaire, developed in two separate phases.

The preliminary phase involved a comprehensive literature review relevant to the TRGP model (Bagagnan et al. 2019). This review provided the basis for deriving initial statements to measure the constructs within the study model and formulate the inquiry items. The second phase focused on assessing content validity to ensure that the operational definitions of the constructs were accurately articulated and that the items accurately captured the conceptual essence of the constructs.

Consequently, a questionnaire was designed and segmented into two distinct sections. The initial section addressed the socio-demographic data of the respondents, including gender, age, education, and farm size in hectares (ha).

The second section addressed the TRGP model, where farmers were asked to respond to items designed to assess their intentions to implement measures aimed at alleviating the effects of climate change.

The questionnaire comprised a total of 21 items adapted from Concari et al. (2023), with three items each for Active Procurement Goals (APGs), Active Approval Goals (AAGs), Attitude (ATT), Subjective Norms (NOR), Motivation (MOT), Perceived Behavioral Control (PBC), and Intention (INT).

The adaptation of the items to the Hungarian agricultural setting followed a methodologically rigorous and precise approach. The procedure began with a bilingual translation and back-translation (English-Hungarian) carried out by linguistic

TABLE 1 | Descriptive statistics of the sample.

Gender	Freq.	%		
Male	272	90.4		
Female	28	9.3		
Tot.	**301**	**100.00**		
Education				
None	14	4.60		
Practical experience	63	20.93		
Intermediate agricultural education	122	40.53		
Higher level of education	102	33.89		
Tot.	**301**	**100.00**		
Age	Mean (SD)	57.7 (12.8)		
Farm size (ha)	Mean (SD)	178.7 (271.1)		
Farm type	Freq.	%	Freq. (FADN)	% (FADN)
Arable crop grower	170	56.48	1083	51.35
Fruit grower	29	9.63	159	7.54
Beef and sheep farmers	22	7.31	174	8.25
Dairy cows	18	5.98	110	5.22
Mixed farm	17	5.65	131	6.21
Poultry farmer	14	4.65	133	6.31
Outdoor vegetable grower	12	3.99	124	5.88
Greenhouse	8	2.66	51	2.42
Pig farmer	7	2.33	70	3.32
Viticulturist	4	1.33	74	3.51
Tot.	**301**	**100.00**	**2109**	**100.00**

specialists to ensure the semantic equivalence of the content. The final step involved a conceptual evaluation conducted by the research team to ensure alignment between the wording of the questions and the theoretical framework of the study. To enhance item clarity and contextual relevance, a pre-test was conducted with a sample of farmers ($n = 15$).

Farmers were asked to express their level of agreement with each statement using a five-point *Likert* scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

The study was conducted in full compliance with the ethical standards established by the Declaration of Helsinki. The research project, including data collection and analysis protocols, received formal approval from the National Agency for Research, Development and Innovation (Hungary) as part of the official grant award process (reference number: KUT-1053-2/PALY-2022).

As part of this approval, full compliance with the European Union's General Data Protection Regulation (GDPR) was explicitly required and confirmed.

The data used in the study was collected and processed by the Institute of Agricultural Economics, the body officially responsible for conducting the Farm Accountancy Information Network (FADN) survey in Hungary.

All participants were required to make the following declaration: "I undertake to use the information provided by AKI Agrárközközgazdasági Intézet Nonprofit Kft., the test farm data provided by me *following* the 2011 CXII Act on the *Right to Informational Self-Determination and Freedom of Information as well as* the provisions of Act CLV of 2016 *on Official Statistics* and I accept the *General Data Protection Regulation* of the European Parliament and of the Council of (EU) 2016/679 (GDPR)". Informed consent was obtained from all participants and/or their legal guardians.

The data were provided to the research team in a fully anonymized format, devoid of any personally identifiable information, thereby ensuring maximum transparency and privacy protection.

Table 2 presents the descriptive statistics (mean and standard deviation) for each variable. Among the constructs, the Active Procurement Goal recorded has the highest mean score (APG1 = 4.07), whereas Perceived Behavioral Control showed the lowest mean score (PBC1 = 2.79).

3.4 | Data Analysis Based on Partial Least Squares-Structural Equation Modeling (PLS-SEM)

Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed in this study. PLS-SEM is a multivariate technique widely used in both experimental and observational settings to analyze food purchase behavior and customer preferences (Raimondo et al. 2022; Raimondo, Spina, Hamam, et al. 2024) as well as to examine the adoption of adaptation strategies (Yazdanpanah et al. 2023).

It is particularly useful in exploratory contexts, when the reference theory is still being developed or is not well defined, or when researchers aim to test new theoretical models or modified versions of existing ones (Hamam et al. 2025).

In this regard, although the TRGP model and the examined reflective constructs are based on a common factor framework—typically more compatible with the covariance-based SEM (CB-SEM)—the use of PLS-SEM is justified on both methodological and practical grounds. Indeed, PLS-SEM is particularly suitable for contexts involving complex models with multiple latent variables and indicators, small to moderate sample sizes, violations of multivariate normality, and a preference for exploratory and predictive approaches over confirmatory ones (Venturini and Mehmetoglu 2019; Hair et al. 2019).

This study aimed to examine the behavioral mechanisms suggested by the TRGP in the context of climate change adaptation (Yazdanpanah et al. 2023), thereby making the application of PLS-SEM methodologically sound and justified (Hair et al. 2017).

This method enables reliable modeling of reflective constructs even under conditions that may hinder the effectiveness of CB-SEM, while providing strong capabilities for estimating complex structural relationships (Hair et al. 2022).

PLS-SEM consists of an internal structural model and an external measurement model. The internal model examines the relationships among latent constructs, which in PLS-SEM are treated as components rather than as common factors. The external model analyzes the relationships between latent variables (or latent constructs) and their indicators (Venturini and Mehmetoglu 2019).

Following the assessment of indicator reliability (factor loadings > 0.5) (Venturini and Mehmetoglu 2019), internal consistency was evaluated using indices such as Cronbach's alpha, Dillon-Goldstein's rho (DG), and rho_A, with values above 0.6 considered acceptable in exploratory studies.

The reliability of the items was assessed by evaluating the value of Cronbach's alpha coefficient (CA). Alpha values between 0.6 and 0.7, as well as 0.8, are considered acceptable, while values of 0.8 or higher indicate good to excellent reliability (Nguyen et al. 2020). Because Cronbach's alpha tends to underestimate internal consistency reliability, Dillon-Goldstein's rho and rho_A are often used in practice (Venturini and Mehmetoglu 2019).

Moreover, Cohen's f^2 values were calculated to assess the individual influence of each independent variable on the dependent variable through the increase in explained variance (R^2) within the model (Cohen 1988). The interpretive criteria suggest that a f^2 value below 0.02 signifies a negligible or null effect, values between 0.15 and 0.35 denote a moderate effect, and values above 0.35 indicate a substantial effect.

The convergent and discriminant validity of the measurement model was subsequently assessed.

TABLE 2 | Descriptive statistics of items.

Construct	Item	Statement	Mean	St. dev.
Active Procurement Goals (APGs)	APG1	Slowing the rise in global temperatures is important to me	4.07	0.80
	APG2	It is important that the farm I lead contributes to reducing global temperatures by making the right choices	3.71	0.96
	APG3	I am convinced that I can personally contribute to reducing global temperature increase	3.61	0.95
Active Approval Goals (AAGs)	AAG4	It is important to me that my colleagues support my actions to slow global temperature increase	3.64	0.91
	AAG5	It is important to me that my friends support my actions to slow global temperature rise	3.53	0.94
	AAG6	It is important to me that my family supports my actions to slow the global temperature increase	3.82	0.86
Attitude (ATT)	ATT1	My actions to reduce the impact of climate change are good	3.36	0.90
	ATT2	My actions to reduce the effects of climate change are pleasant for me	3.74	0.80
	ATT3	My actions to reduce the impact of climate change are useful	3.50	0.90
Subjective Norms (NOR)	NOR1	The people/groups I care about are making the right choices to reduce the negative impacts of climate change	3.53	0.94
	NOR2	The people/groups I care about think I am making the right choices to reduce the negative impacts of climate change	3.51	0.79
	NOR3	People/groups that are important to me believe that all producers should make appropriate decisions to reduce the negative impacts of climate change	3.60	0.94
Motivation (MOT)	MOT1	I am satisfied that I can take appropriate measures to reduce the negative effects of global temperature rise	3.61	0.95
	MOT2	I am pleased to be able to take appropriate measures to reduce the negative effects of global warming	3.67	0.88
	MOT3	I am proud to be able to take appropriate measures to reduce the negative effects of global warming	3.57	0.95
Perceived Behavioral Control (PBC)	PBC1	If I wanted to, I could take all necessary measures to reduce the negative effects of rising temperatures	2.79	1.06
	PBC2	The measures I have taken to reduce the negative effects of rising temperatures are the result of conscious consideration	3.55	0.96
	PBC3	I can get the support of all my colleagues to support my actions to reduce the negative effects of rising temperatures	3.30	0.98
Intention (INT)	INT1	I expect to be able to systematically take action to reduce the negative effects of global warming	3.50	0.90
	INT2	I will regularly take decisions to reduce the negative effects of global warming	3.53	0.86
	INT3	I intend to take regular decisions to reduce the negative impacts of global warming	3.71	0.87

Convergent validity is confirmed when the average extracted variance (AVE) for a construct is equal to or greater than 0.5. Discriminant validity was assessed using the Fornell and Larcker (1981) criterion (Table A1), which entails comparing the square root of the Average Variance Extracted (AVE) to the correlations among the latent constructs (Venturini and Mehmetoglu 2019). This indicates the extent to which a construct is distinct from others based on empirical evidence (Hair et al. 2017). An additional check of discriminant validity was performed using the Heterotrait-Monotrait (HTMT) ratio (Table A2).

Finally, common method bias was assessed by analyzing collinearity among constructs using variance inflation factors (VIFs) (Hamam et al. 2025). The VIF values for all variables were below 3, indicating no substantial collinearity among the constructs (Süle et al. 2024) (Table A3).

TABLE 3 | Factor loadings, Cronbach's α, rho A, and DG of the measurement model.

	MOT	APGs	AAGs	ATT	PBC	NOR	INT
MOT1	0.904						
MOT2	0.857						
MOT3	0.891						
APG1		0.774					
APG2		0.875					
APG3		0.863					
AAG1			0.846				
AAG2			0.817				
AAG3			0.855				
ATT1				0.859			
ATT2				0.774			
ATT3				0.836			
PBC1					0.635		
PBC2					0.850		
PBC3					0.852		
NOR1						0.809	
NOR2						0.828	
NOR3						0.833	
INT1							0.842
INT2							0.893
INT3							0.820
Cronbach	0.860	0.791	0.791	0.762	0.686	0.763	0.811
DG	0.915	0.876	0.877	0.863	0.826	0.864	0.888
rho_A	0.861	0.819	0.796	0.765	0.726	0.763	0.815

Abbreviations: AAGs, Active Approval Goals; APG, Active Procurement Goals; ATT, Attitude; INT, Intention; MOT, Motivation; NOR, Subjective Norms; PBC, Perceived Behavioral Control.

Statistical analyses were performed using Stata 18 (StataCorp LP, College Station, TX, USA) and SmartPLS 4.

4 | Results

4.1 | PLS-SEM Output

4.1.1 | The Measurement Model Results

The outcomes derived from the measurement model are reported in Table 3. To evaluate the model's validity (Venturini and Mehmetoglu 2019), we first analyzed the relationships between latent variables and their corresponding items, emphasizing indicator reliability with factor loadings of 0.5 or above. All 21 items were retained since their factor loadings exceeded the threshold of 0.5.

All analyzed constructs demonstrated Cronbach's alpha and rho_A values exceeding 0.6, while Dillon-Goldstein's rho (DG) coefficient exceeded 0.8, indicating satisfactory internal consistency (Yang et al. 2022). Additionally, constructs with AVE values above 0.5 were confirmed to exhibit convergent validity (Carlson and Herdman 2012).

The constructs demonstrated sufficient discriminant validity, as the square root of the Average Variance Extracted (AVE) values exceeded the correlations with other constructs, in accordance with the Fornell and Larcker's (1981) criterion (Table A1).

The HTMT findings (Table A2) indicated that all values were substantially below 1. Moreover, the HTMT ratios indicated that all values were within the key threshold of 0.90, thereby confirming the discriminant validity of the reflective constructs (Henseler et al. 2014).

4.1.2 | The Structural Model Results

The results of the direct and indirect effects of the structural model are shown in Table 4 and illustrated in Figure 2. Latent constructs are represented by ovals, while the hypothesized relationships among the constructs are depicted with arrows.

TABLE 4 | Results of the structural model.

Hypotheses	Path	Path coefficient	*p*	f^2	Effect	Result
H1a	APGs ➜ ATT	0.677	< 0.001***	0.845	Direct	Supported
H1b	APGs ➜MOT	0.468	< 0.001***	0.315	Direct	Supported
H2a	AAGs ➜ NOR	0.657	< 0.001***	0.761	Direct	Supported
H2b	AAGs ➜ MOT	0.088	0.074*	0.011	Direct	Supported
H3a	ATT ➜ MOT	0.288	< 0.001***	0.118	Direct	Supported
H3b	APGs ➜ ATT ➜ MOT	0.195	< 0.001***		Indirect	Supported
H4a	NOR ➜ MOT	0.101	0.029**	0.016	Direct	Supported
H4b	AAGs ➜ NOR ➜ MOT	0.066	0.030**		Indirect	Supported
H5	MOT ➜ INT	0.401	< 0.001***	0.239	Direct	Supported
H6	PBC ➜ INT	0.457	< 0.001***	0.312	Direct	Supported

Note: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

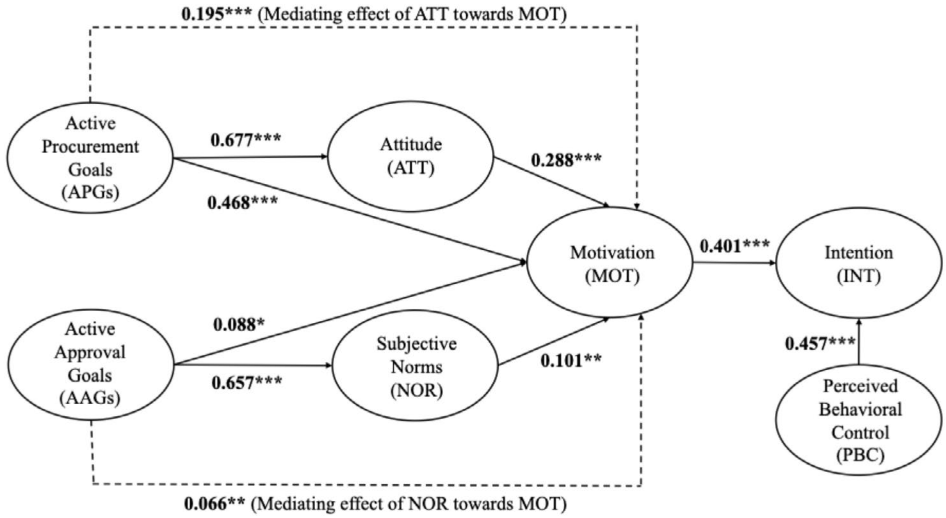

FIGURE 2 | Graph of structural model results. Direct effects are marked with continuous lines and indirect effects are marked with dashed lines; *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

The path coefficients reflect the strength and direction of the direct relationship between constructs, whereas the R^2 value assesses the predictive adequacy of the structural model. The findings validate all hypotheses regarding the relationships among the constructs, as indicated by a *p* value below 0.1.

The R^2 value of 0.60 indicates that the proposed structural model has a strong predictive capacity for intentions. Moreover, all path coefficients followed the expected trajectory, further supporting the model's reliability.

The findings of the structural model indicated that APGs and AAGs serve as predictors for ATT (H1a; $\beta = 0.677$; $p < 0.001$) and NOR (H2a; $\beta = 0.657$; $p < 0.001$), respectively. Both also emerged as predictors of MOT. Specifically, APGs demonstrate a much stronger predictive weight on MOT (H1b; $\beta = 0.468$; $p < 0.001$) compared to the predictive capacity of AAGs on MOT (H2b; $\beta = 0.088$; $p < 0.10$). Likewise, the constructs ATT and NOR emerge as significant predictors of MOT. Specifically, ATT has a higher impact on MOT (H3a; $\beta = 0.288$; $p < 0.001$) than NOR does (H4a; $\beta = 0.101$; $p < 0.05$).

Ultimately, both MOT (H5; $\beta = 0.401$; $p < 0.001$) and PBC (H6; $\beta = 0.457$; $p < 0.001$) emerged as significant predictor factors of farmers' INT to implement measures aimed at reducing the impacts of climate change in agriculture.

Subsequent findings relate to the indirect effects of the mediating variables ATT and NOR. While the indirect effect hypothesis is supported by both findings, ATT mediates the relationship between APGs and MOT (H3b; $\beta = 0.195$, $p < 0.001$) more strongly than NOR mediates the relationship between AAGs and MOT (H4b; $\beta = 0.066$, $p < 0.05$).

This outcome may be explained by the notion that favorable pro-environmental attitudes are often deeply ingrained and closely linked to personal values, thereby fostering a more enduring and stable motivation. Conversely, subjective norms often have a diminished impact in areas where judgments are seen as reflections of individual convictions, such as those about climate adaptation. Moreover, ideas opposing environmental sustainability may be less entrenched or inadequately disseminated across society, thus diminishing the efficacy of normative influences.

The Sobel test results corroborated the mediating functions of the variables. ATT was identified as a mediator in the relationship between APGs and MOT ($z = 5.577$; SE = 0.035; $p < 0.001$). Likewise, NOR mediated the relationship between AAGs and MOT ($z = 2.172$; SE = 0.030; $p < 0.05$).

According to Cohen (1988), some observable effects are characterized by their strength. The impact of APGs on ATT ($f^2 = 0.845$) and that of AAGs on NOR ($f^2 = 0.761$) is deemed significant, according to the standard categorization (Table 4). The findings unequivocally corroborate the predictions of the TRGP model, which posits that objectives serve as pivotal drivers in the development of both attitudinal and subjective norms. The prominence of these effects underscores the importance of goal representation in the cognitive processes that govern action.

The impact of APGs on MOT is of moderate to high magnitude ($f^2 = 0.315$), indicating that goal-directed planning considerably influences motivational activation, although to a lesser degree than attitude.

The predictive efficacy of MOT on INT ($f^2 = 0.139$) and PBC on INT ($f^2 = 0.312$) is classified as moderate. This suggests that, although not predominant, these variables significantly impact behavioral intention, according to the theoretical paradigm.

The influence of ATT on MOT is modest to moderate ($f^2 = 0.118$). This indicates that attitude plays a role in the motivational process, although it is not the primary factor. Motivation appears to be influenced by multiple factors, with attitude occupying a subordinate position.

Instead, the direct impact of AAGs on MOT is statistically significant but very small ($f^2 = 0.011$), suggesting that the influence of self-assigned goals on motivation may be weak. Similarly, the direct effect of NOR on MOT, although significant ($f^2 = 0.016$), is modest, indicating that norms alone have a limited impact on motivation and may exert their influence in combination with other, more relevant factors within the model.

These findings highlight the importance of considering the overall context. Although measurable effects of individual factors exist, elements such as attitudes toward environmental practices or goal-oriented planning may play a more decisive role in guiding farmers' actions in everyday practice.

5 | Discussion

This study employs the TRGP model developed by Ajzen and Kruglanski (2019) to elucidate the determinants affecting Hungarian farmers' intentions to engage in initiatives that alleviate the adverse effects of climate change. Although the data indicate a generally favorable intention to undertake initiatives to mitigate the effects of climate change, the results of the study underscore the need to promote effective initiatives to increase farmers' inclination toward sustainable farming practices, as reported in recent studies (Spina et al. 2024).

It is essential to illustrate the adverse effects of conventional agricultural practices on the environment to heighten the pressure on farmers to address climate change and to underscore the importance of environmental protection, thereby enabling farmers to develop an internalized comprehension of these issues.

However, to effectively advocate for climate change mitigation strategies as innovative pro-environmental paradigms, a thorough comprehension of the psychological factors that affect farmers' intentions is crucial (Hornsey and Fielding 2020).

This study's results indicate that the TRGP model can be effectively replicated, showing that the path coefficients are stable and correspond to the proposed hypotheses. Additionally, farmers' intentions can be elucidated directly through the effect of motivation (Nes et al. 2009). This underscores the importance of fostering intrinsic and extrinsic motivational drivers to encourage sustainable agricultural practices (Savelli and Murmura 2023).

Motivation is seen as a crucial aspect in forecasting behavior (Nguyen et al. 2019) and in elucidating the engagement or lack thereof in pro-environmental initiatives (Rainear and Christensen 2017). Intrinsic motivations are crucial for fostering environmentally sustainable behaviors (Ingram et al. 2013), as they pertain to the individual and social contexts in which the farmer functions, encompassing personal competencies, self-efficacy, skills, and psychological and attitudinal factors (Niles et al. 2016).

Nonetheless, the literature suggests a tenuous connection between risk perception stemming from climate change effects and the impetus for adaptive measures (Lo 2013).

Individuals may choose to disregard the potentially severe repercussions of climate change, exhibiting no impetus to act, even when they are well educated and cognizant of impending threats (Norgaard 2011). For instance, heightened communications of imminent calamities may deter efforts to combat climate change (Moser and Dilling 2011). The awareness of climate risk may be inadequate to drive adaptation (Shmueli et al. 2019).

The findings also indicate that attitude not only directly influences motivation but also indirectly affects intention, while serving as a mediating construct in the transmission of information from APG to MOT. This outcome is expected, given that behavioral theory indicates that attitude significantly influences intention and action, especially for environmental and climate change issues (Frank et al. 2011).

The results further corroborate the findings of Concari et al. (2023) that APGs exert a substantial direct influence on attitude and motivation, as well as an indirect influence on intention.

According to the TRGP model, individuals are inclined to develop more favorable attitudes toward certain behaviors when the perceived advantages seem highly probable (Concari et al. 2023; Islam et al. 2024). Farmers may undertake measures to combat climate change only if they see it as a method to diminish its effects on their crops.

Farmers' attitudes toward climate change adaptation appear to be shaped by their belief systems and perceived risks (Arbuckle Jr et al. 2015). Farmers directly impacted by natural catastrophes, such as droughts and floods, may recognize heightened economic risks associated with climate change, making them more inclined to experiment with, assess, and eventually implement more resilient agricultural techniques (Laborde et al. 2021). Consequently, farmers' heightened awareness of susceptibility and severity is expected to enhance their motivation to adopt preventative measures (Wang et al. 2019).

This study's findings reveal that, although subjective norms have a significant effect on farmers' motivation (Ovais et al. 2024), their overall impact is rather limited. Although the literature suggests that individuals generally tend to conform to others' expectations or to what is perceived as socially desirable (Shen et al. 2006; Zeweld et al. 2017), the limited impact of subjective norms on farmers' motivation can be explained by the fact that they primarily base their decisions on personal beliefs, direct experiences, and practical considerations rather than solely on social pressures. In contexts where individual judgment and goal-oriented planning play a predominant role, social norms tend to exert a secondary influence, even though previous research has shown that social risk-processing mechanisms—including social influences (Bagheri et al. 2019), social identity (Frank et al. 2011), and social trust (Short 1984)—can mediate the relationship between risk perception and behavioral responses to climate change.

Farmers' motivation is heightened when they see robust societal and political backing for the advancement of sustainable practices aimed at addressing climate change (Savari and Damaneh 2022). The efficacy of subjective norms in incentivizing farmers may fluctuate depending on the presence of other motivators (Zhu et al. 2021).

Although AAGs are considered determinants of behavioral change (Ajzen and Kruglanski 2019) and have a significant effect on motivation, their overall impact is limited, as is the indirect effect mediated by subjective norms, consistent with the findings of Concari et al. (2023). This suggests that, while AAGs contribute to motivation, both directly and through subjective norms, their influence is relatively modest, highlighting the importance of considering the combined effects of multiple factors in shaping motivation.

Finally, it was found that the positive direct link between perceived behavioral control (PBC) and intention indicates that farmers' readiness to undertake measures to mitigate the effects of climate change is a significant determinant of intention (Buelow and Cradock-Henry 2018).

Perceived capability and self-efficacy are widely recognized as key determinants influencing both the intention to adopt and the actual adoption of behaviors connected to climate change (Locke and Latham 2015). The research underscores the complex relationship between PBC and intention, often leading to a discrepancy between people's intentions and their actual behavior, influenced by multiple socio-cognitive variables (Buelow and Cradock-Henry 2018).

The relationship between PBC, intention, and actual behavior is often complex and shaped by multiple factors. Individuals may overestimate or underestimate their level of control, resulting in a misalignment between intentions and actions (Ajzen 1991). Furthermore, unforeseen external barriers—such as fiscal constraints, strict regulations, or unfavorable weather conditions—may hinder the implementation of pro-environmental actions, even when individuals possess strong intentions (Moser 2014).

In agriculture, even a farmer highly motivated to adopt sustainable practices may encounter external barriers that hinder the practical implementation of such techniques. Moreover, the TPB does not operate in isolation; it interacts with other socio-psychological variables, including subjective norms and attitudes, which may enhance or diminish its influence on intention and conduct (Fishbein and Ajzen 2010). A thorough understanding of the psychological processes governing the sense of control is crucial for developing more effective interventions. Such interventions should enhance farmers' motivation and remove both material and psychological barriers that impede the transition from intention to action.

5.1 | Implications

This paper provides significant theoretical and practical implications. By highlighting the roles of attitudes and subjective norms, the study underscores a comprehensive framework encompassing social, environmental, and structural elements in promoting sustainable agriculture.

Being the first empirical application of TRGP among Hungarian farmers, it provides a novel basis for future research on the psychological drivers of environmental resilience in agriculture. The findings indicate that enhancing motivation through education and supportive policies is crucial for promoting sustainable management; thus, improving farmers' competencies may increase their intention to adopt mitigation practices.

These findings are valuable for policymakers, as educational programs can raise environmental awareness and policies can incentivize sustainable practices to support agriculture at both national and regional levels.

Adoption can be further encouraged through consultation and outreach that address APGs, which focus on tangible benefits such as energy savings, and the AAGs, which are based on social recognition. APGs can be strengthened via training and economic incentives, while AAGs may be fostered by sharing community success stories and offering recognition or rewards. Combining both strategies can activate complementary motivations, thereby enhancing outreach effectiveness and promoting sustainable behavior.

However, the adoption of climate change mitigation behaviors does not depend solely on psychological factors. Although the TRGP provides a useful framework for understanding the cognitive and motivational determinants of behavior, internal motivation alone is not sufficient to translate intentions into concrete actions. It is therefore essential to consider the structural and institutional barriers that may hinder the implementation of sustainable practices.

In the agricultural sector, technical, informational, and economic obstacles—such as a lack of financial resources, inadequate technologies, and limited access to advisory services—reduce the potential for innovation, particularly in small-scale farms (Lamichhane et al. 2022). Contractual constraints and market dynamics can keep farmers tied to traditional practices, while fragmented political structures, influential lobbies, and limited institutional capacity to implement policies reduce the effectiveness of support measures (Schewe and Stuart 2017; Kabir et al. 2024; Kundu et al. 2024). Socio-cultural factors, including traditional norms, gender roles, and community relationships, can also shape responses to climate policies, either facilitating or hindering change (Whitton and Carmichael 2025).

Overcoming these obstacles requires flexible, context-sensitive policies that integrate economic, technical, and educational support. Only a multi-level governance approach, based on the active participation of stakeholders, can promote widespread and lasting adoption of mitigation practices.

5.2 | Limitations and Future Research

While the study offers interesting insights into farmers' intentions to engage in climate change mitigation activities, several limitations should be considered to guide future research. As the study is limited to one country, the results should be interpreted with caution. Farmers' goals may vary by location or situation, highlighting the importance of including additional regions.

Future research could replicate the model on specific crops or agricultural sectors for comparative analyses, thereby enhancing understanding of sustainable practices in diverse contexts. Broader questions on risk perception and the inclusion of a representative European sample could further enrich the findings.

Furthermore, climate mitigation behaviors are diverse and influenced by specific factors. Merging them into a single category risks oversimplifying distinct motivations and challenges, potentially reducing the effectiveness of intervention strategies. A more nuanced analysis of individual behaviors would support more targeted policy development.

Though the TRGP is conceptually strong, it may be less effective in contexts involving automatic, habitual, or emotionally driven actions. Additionally, cultural variations and external constraints may limit its applicability, while methodological challenges in measuring constructs could affect its practical utility.

Moreover, in the present study, respondents evaluated the importance of their goals, but it was not possible to verify whether these goals were actually active during decisions related to climate change mitigation practices. This limitation may constrain the understanding of the motivational processes that the TRGP aims to explain, as perceiving a goal as important does not necessarily mean it is cognitively and motivationally active. For future research, it would be valuable to adopt strategies that can directly measure goal activation, such as cognitive priming procedures to stimulate specific goals before assessing intentions, or collecting longitudinal or daily data through diaries or digital applications to monitor goal activation in real-life contexts. Additional insights could be obtained using psychophysiological measures or think-aloud techniques during the decision-making process, in order to evaluate the relevance and salience of goals at the moment of choice.

Additionally, farmers' decisions are influenced not only by their goals but also by factors such as risk perception, vulnerability, self-efficacy, and past experiences. Incorporating these factors could enhance the explanatory power of the TRGP framework. Furthermore, although PLS-SEM is robust to non-normal data, such non-normality may still affect the accuracy of the estimate. As this study assesses intentions rather than actual behavior, future research should investigate real or self-reported actions to gain a more comprehensive understanding.

Finally, since the study focuses on intentions rather than the actual adoption of practices, the results may overestimate the true impact and may not fully reflect concrete mitigation actions. To obtain a more accurate assessment of the effects of the factors examined, future research could incorporate data on self-reported or directly observed practices, or develop models that explicitly account for the intention–behavior gap.

6 | Conclusion

This study investigates Hungarian farmers' intentions to adopt actions aimed at reducing the risks of climate change by experimentally examining the constructs of the TRGP model. It offers critical and additional insights into the psychological factors that influence intentions, highlighting the mediating roles of attitude and subjective norms.

While the TPB serves as the most comprehensive and coherent quantitative theoretical framework in social psychology for analyzing behavior in terms of goals and motivations, the TRGP extends this foundation by providing a more robust explanation of pro-environmental conduct.

This study represents the first application of the TRGP model to forecast farmers' intentions toward climate change mitigation efforts. In addition, the findings derived from the PLS-SEM model enhance the current literature by confirming consistent relationships among the components of the TRGP framework.

The results provide concrete guidance for policymakers seeking to promote sustainable agriculture. Specifically, training programs can enhance farmers' environmental awareness, while economic incentives and technical support can facilitate the adoption of pro-environmental practices by reducing key operational barriers. Moreover, interventions targeting different motivations, such as tangible benefits or social recognition, can be combined to increase policy effectiveness, encouraging sustainable behaviors and generating both environmental and socioeconomic benefits in the agricultural sector.

Author Contributions

Manal Hamam: conceptualization; methodology; software; formal analysis; data curation; writing – original draft preparation; writing – reviewing and editing. Giuseppe Di Vita: validation; writing – reviewing and editing; visualization; supervision. Raffaella Pergamo: validation; visualization. Sabina Aliyeva: conceptualization; writing – original draft preparation. József Tóth: validation; investigation; resources; data curation; visualization; supervision; project administration; funding acquisition.

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The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Data S1:** sd70458-sup-0001-supinfo.docx.