

THE IMPACT OF CLIMATE CHANGE ON THE PROCUREMENT PROCESS OF AGRICULTURAL EQUIPMENT IN THE EUROPEAN UNION

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Abstract

The impact of climate change has recently increasingly affected the process of purchasing agricultural equipment in the European Union. Using a mixed-methods approach, the study integrates regional climate data (SPEI index, precipitation deviations), survey-based measures of farmers' risk perception, and economic variables such as access to financing and input prices. The analysis employs PLS-SEM and multilevel modeling to capture both individual and regional effects. Results reveal that perceived climate risk significantly increases purchase intention for agricultural machinery ($\beta=0.42$, $p<0.001$), with green financing acting as a mediator and brand reputation as a moderator. The findings highlight the importance of brand equity and service ecosystems in mitigating uncertainty and accelerating technology adoption. Managerial implications include the need for manufacturers and policymakers to collaborate in promoting resilient, climate-smart agriculture through targeted incentives and accessible green financing. The study contributes to the literature by integrating climate risk into models of purchasing behavior and offers insights for public policies supporting the green transition in agriculture.

Keywords: *Climate change; agricultural machinery; procurement process; multilevel modeling; brand equity; green financing; climate-smart agriculture.*

JEL classification: Q13, O13, Q17, P32

1. Introduction and Context of the Study

Climate change is widely recognized as one of the most pressing challenges of the 21st century, with profound implications for agricultural systems worldwide. In the European Union, agriculture is particularly vulnerable to climate variability due to its exposure to droughts, extreme precipitation, heat waves, and the increased incidence of pests and diseases. The European Environment Agency estimates that climate-related disasters generate more than €28 billion in annual losses in the EU agricultural sector, a figure projected to rise as global temperatures continue to increase. These disruptions not only threaten food security but also alter farmers' investment decisions, as they seek to mitigate risk and ensure production continuity.

Traditionally, the procurement of agricultural machinery was guided by economic variables such as price, expected productivity gains, and cost of capital. However, the growing frequency of extreme weather events shifts the focus toward equipment that enhances resilience, optimizes input use, and supports climate-smart practices. This evolution reflects a paradigm shift from purely efficiency-oriented procurement toward sustainability-oriented investment strategies. Farmers and cooperatives now consider the adaptive capacity of machinery to reduce vulnerability to climate stress, integrate with digital monitoring systems, and comply with environmental regulations—as a central criterion in the decision-making process.

At the institutional level, the reform of the Common Agricultural Policy has accelerated this transformation. Eco-schemes and strategic plans encourage the adoption of sustainable technologies, conditioning subsidies on investments that align with the objectives of the European Green Deal. These policy instruments are complemented by regulations such as the EU Machinery Regulation and Stage V emission standards, which emphasize safety, repairability, and environmental performance throughout the equipment life cycle. The forthcoming Digital Product Passport initiative will further enhance transparency regarding machinery sustainability, enabling farmers to make more informed decisions. From a theoretical perspective, this phenomenon can be explained by technology adoption models, which highlight the role of relative advantage, compatibility, and complexity in shaping adoption behavior. Climate change amplifies the perceived relative advantage of innovative equipment by framing it not only as a source of productivity but also as an insurance mechanism against climate shocks. Recent empirical studies confirm that risk perception acts as a catalyst for adopting technologies that improve water efficiency, soil monitoring, and energy optimization. Equally important are behavioral and branding dimensions. Farmers' procurement choices are influenced by trust, peer effects, and the reputation of manufacturers. Given the long-life cycle of agricultural machinery and the high switching costs, brand equity plays a critical role in reducing perceived risk. Suppliers that offer strong after-sales service, digital integration, and clear sustainability commitments enjoy a competitive advantage, as they are perceived as long-term partners rather than one-off sellers. Against this backdrop, the present study seeks to investigate how climate risk perception shapes purchase intention for agricultural machinery within the European Union, considering the mediating effect of access to green financing and the moderating role of brand reputation. The research integrates objective climate data, farmer-level perceptions, and economic indicators, employing Partial Least Squares Structural Equation Modeling (PLS-SEM) and multilevel modeling to capture both micro-level and regional variations. This study not only fills a gap in literature by combining climate science with behavioral economics but also offers practical recommendations for policymakers, manufacturers, and financial institutions supporting the transition toward a more resilient and sustainable agricultural sector.

2. Literature review

The impact of climate change on agriculture has become a central theme in recent European and international research, influencing not only production systems but also the decision-making processes behind the procurement of agricultural equipment. According to the (Kikstra et al., 2022), climate change has already begun to reshape agricultural production in Europe, as farmers are increasingly confronted with more frequent droughts, floods, and extreme weather events (Eicher & Staatz, 1998). These phenomena generate significant production risks and economic losses, which in turn alter the cost-benefit evaluations associated with long-term investments in machinery and technological systems. Recent estimates by European institutions indicate that climate-related damages to the agricultural sector amount to more than €28 billion annually in the European Union, a figure that highlights the urgency of adaptation investments (Arben, 2025). Under such conditions, procurement decisions are no longer based solely on price or technological efficiency, but also on the resilience and adaptability of the equipment to climate risks (De Bandt et al., 2025).

Adaptation strategies promoted by international organizations such as (Wahab et al., 2024), (Galić et al., 2025) and the European Commission emphasize the importance of climate-smart agriculture, which integrates mechanization, digitalization, and sustainable practices. In this sense, agricultural equipment (Hayami & Ruttan, 1985) is no longer evaluated only as a means of increasing productivity, but also as a tool for ensuring sustainability (Alwaer & Clements-Croome, 2010), reducing vulnerability to climate stress, and complying with environmental regulations. This redefinition of the role of equipment leads to a significant transformation of procurement strategies

in the sector, with farmers and cooperatives being more likely to prioritize technologies that provide water efficiency (BRÎNZĂ et al., 2024), energy efficiency, or soil monitoring functions. The institutional and regulatory context further amplifies these tendencies. The reform of the Common Agricultural Policy (Sotte & Vergamini, 2025) introduces eco-schemes and strategic plans that explicitly condition subsidies on the adoption of sustainable practices and investments in innovative technologies. As a result, procurement decisions are strongly shaped by policy incentives, since access to financing is increasingly linked to the purchase of equipment that aligns with EU environmental and digitalization objectives. In parallel, the EU Machinery Regulation (2023/1230) (Sotte & Vergamini, 2025) and the Stage V emission standards (Regulation 2016/1628) redefine the technical requirements for agricultural machinery, forcing both producers and buyers to take into account compliance, repairability, and life-cycle costs in procurement strategies. Moreover, the forthcoming Digital Product Passport initiative is expected to increase transparency regarding product sustainability and reparability (Tarakanov et al., 2019), reducing information asymmetry and strengthening the role of sustainability criteria in procurement decisions (Bruno et al., 2023).

The dynamics of the European machinery market also illustrate the influence of climate and economic uncertainty on procurement. Reports from CEMA (2023) indicate a decline in tractor registrations (Vemuri, 2014), reflecting reduced investment capacity among farmers due to volatile incomes and high costs. However, this decline is accompanied by a shift in preferences toward precision technologies (*New Key Performance Indicators for a Smart Sustainable City*, n.d.), such as variable-rate application systems, remote monitoring, and data-driven platforms (Novotná & Volek, 2015). This suggests that procurement is not contracting uniformly but is being redirected toward solutions perceived as more resilient and cost-saving in the face of climate variability. The theoretical framework of technology adoption supports these observed transformations. Rogers' Diffusion of Innovations (2003) identifies relative advantage, compatibility, and complexity as key factors influencing adoption. Recent empirical research (Fortea et al., 2022); (Ouslih, 2025) confirms that in agriculture, the perception of risk plays a decisive role in accelerating technology adoption. In the context of climate change (Dechezleprêtre et al., 2025), the relative advantage of an equipment purchase is increasingly defined not only in terms of yield improvement but also in terms of reduced vulnerability to extreme events (Olabanji & Chitakira, 2025). This dynamic modifies procurement behavior, with farmers attributing higher value to equipment that reduces uncertainty and ensures continuity of operations.

Equally important is the role of behavioral and social factors in procurement processes. Studies on climate adaptation adoption demonstrate that farmers are strongly influenced by peer networks, demonstration projects (Minviel, 2025), and access to technical assistance. Procurement strategies thus integrate not only financial and technological considerations but also social learning and local evidence of efficiency (Lakhiar et al., 2025). Demonstrations, pilot programs, and training provided by manufacturers or cooperatives reduce the perceived complexity of innovations and help overcome reluctance to adopt. This explains why equipment suppliers increasingly bundle machinery sales with digital services, warranties, and technical support—elements that strengthen trust and reduce decision-making risk (Kabato et al., 2025). The dimension of trust and industrial branding also occupies a central place in this process. (Tyagi & Haritash, 2025) argue, branding in B2B markets functions as a mechanism to reduce uncertainty and to signal reliability. In agricultural equipment markets, where investments are long-term and switching costs are high, the reputation of manufacturers plays a decisive role in procurement choices. Farmers and cooperatives prefer suppliers with strong service networks, transparent sustainability commitments (Nowak & Kasztelan, 2022), and interoperable digital systems, as these attributes reduce perceived risk and ensure long-term equipment usability.

Finally, the ongoing digital transformation adds new layers to procurement strategies. Interoperability standards such as ISOBUS, the rise of sterilization models (pay-per-use,

subscription services), and the integration of remote monitoring tools shift procurement from a one-time purchase model to a broader strategic decision involving long-term partnerships with suppliers (Tambol et al., 2025). This evolution amplifies the impact of climate change, as resilience, flexibility, and digital integration become central criteria in procurement decision-making.

3. Research Methodology and Intermediate Results

Agriculture is one of the sectors most exposed to the effects of climate change, and farmers perceived risk directly influences their investment intentions in resilient technologies. The proposed conceptual model integrates climate risk perception, access to green finance, and brand reputation to explain the intention to purchase agricultural machinery.

The research hypotheses are formulated as follows:

H1: Climate risk perception has a positive effect on purchase intention.

H2: Access to green finance mediates the relationship between climate risk perception and purchase intention.

H3: Brand reputation positively moderates the relationship between climate risk perception and purchase intention.

3.1 Data and Sample

The empirical analysis is based on a sample of 427 farmers originating from five European Union member states with diverse agricultural structures: Romania, Poland, France, Germany, and Spain. The countries were selected to ensure both geographical and structural representativeness, as they reflect different production models and levels of mechanization within the EU. To minimize sampling bias, a stratified sampling procedure was employed. The stratification was carried out according to two key criteria: farm size (small, medium, and large agricultural holdings) and crop type (cereals, industrial crops, and mixed farming). This approach made it possible to capture the heterogeneity of production systems and the differentiated impact of climate change on procurement decisions for agricultural equipment. The final sample size of 427 respondents was achieved after applying inclusion criteria related to farm ownership and active decision-making in equipment procurement. The survey recorded a response rate of 72%, which is considered high for empirical research in the agricultural sector and ensures the representativeness and reliability of the data collected. Such a response rate also reduces the risk of non-response bias and strengthens the validity of the statistical models applied in the subsequent analysis. By combining a stratified sampling design with a solid response rate, the study secures a robust empirical basis for testing the relationships between climate risk, green finance, brand reputation, and purchase intention. Furthermore, the multi-country perspective allows for comparative insights into how farmers from different institutional and socio-economic contexts adapt their procurement behavior in response to climate challenges.

Table no 1. Characteristics of the sample of farmers included in the study

| Category | Value |
|--------------------------|------------------------------------|
| Country (RO/PL/FR/DE/ES) | 40% / 20% / 15% / 15% / 10% |
| Farm Size | Small 38% / Medium 42% / Large 20% |
| Average Age | 44.2 years ($\sigma=11.3$) |
| Higher Education | 46% |
| Average Area | 96.5 ha ($\sigma=72.4$) |

Source: Own work based on data collected through a survey (2025).

The descriptive statistics presented in the table provide a comprehensive overview of the sample composition and highlight the diversity of the farmers included in the study. From a geographical perspective, the distribution of respondents across the five selected countries indicates a predominance of Romanian farmers (40%), followed by those from Poland (20%), France (15%),

Germany (15%), and Spain (10%). This structure ensures the representation of both Central and Eastern European agricultural systems—characterized by smaller and medium-sized farms—as well as Western European contexts, where mechanization and access to financial instruments are typically more advanced.

In terms of farm size, the sample reveals a balanced distribution, with 38% of respondents managing small farms, 42% operating medium-sized holdings, and 20% representing large-scale farms. This distribution strengthens the robustness of the analysis, as it allows the study to capture heterogeneity in procurement decisions, which often vary depending on the financial capacity and technological needs of farms of different sizes. The demographic profile of respondents indicates an average age of 44.2 years ($\sigma = 11.3$), suggesting a relatively young and active farming population, which is relevant for studies on innovation adoption. Previous research has shown that younger farmers tend to be more open to technological change and more inclined to integrate sustainability criteria into their procurement decisions. Educational background further reinforces this perspective, with 46% of respondents holding higher education degrees. This figure is noteworthy, as it exceeds the average educational level typically reported in EU agricultural surveys, pointing to a sample that is potentially more informed and capable of evaluating complex procurement options involving digitalization, sustainability, and green finance.

Finally, the average farm area of 96.5 hectares ($\sigma = 72.4$) reflects significant variability in land distribution among respondents. This heterogeneity is important because it indicates that procurement decisions may be influenced not only by climate risk perceptions but also by the scale of operations and the degree of exposure to market and environmental uncertainties. Large standard deviation values confirm the presence of both small-scale and large commercial farms, which broadens the applicability of the study’s findings across different farm types. Overall, the characteristics of the sample underline its representativeness and diversity, ensuring that the subsequent empirical analysis captures a wide range of perspectives on how climate risk, green finance, and brand reputation shape the intention to purchase agricultural equipment within the European Union.

3.2 Operationalization of Variables

The variables included in the proposed model were operationalized through validated scales frequently employed in the literature, adapted to the specific context of agricultural equipment procurement. Climate risk perception was measured using a 5-item Likert scale, where respondents indicated their level of agreement with statements regarding the frequency, severity, and economic consequences of climate-related events affecting their farms. The high internal consistency (Cronbach’s $\alpha = 0.91$) confirms the reliability of the construction, suggesting that the items capture a unidimensional perception of climate risk and adequately reflect the underlying concept.

Access to green finance was assessed through a composite index composed of several items referring to farmers’ awareness, eligibility, and previous experience with financial instruments targeted at sustainable investments, such as subsidies, preferential credit lines, or EU-supported funding schemes. The reliability coefficient ($\alpha = 0.87$) indicates strong coherence among the items, validating the index as a robust measure of financial accessibility in the green economy domain. Brand reputation was evaluated using a 3-item semantic differential scale, where respondents positioned the image of agricultural equipment suppliers along bipolar dimensions such as reliable–unreliable, innovative–traditional, and sustainable–unsustainable. The Cronbach’s α value of 0.88 reflects high internal reliability, underlining the fact that farmers perceive brand image as a coherent and consistent evaluative construct that influences procurement decisions.

Finally, purchase intention was measured with 3 items that asked respondents to indicate the probability of investing in new agricultural equipment within the next 12 months. This temporal framing captures the short-term investment horizon and links directly to procurement behavior. The very high internal consistency ($\alpha = 0.92$) demonstrates that the scale provides a reliable indicator of future purchasing decisions. Taken together, the reliability scores of all four constructs (α ranging

from 0.87 to 0.92) confirm that the measurement instruments employed are statistically sound and suitable for testing the hypothesized relationships in the conceptual model. This methodological rigor ensures the validity of subsequent analyses and supports the robustness of empirical findings.

Table no 2. Construct validity and reliability.

| Construct | α Cronbach | CR | AVE |
|-----------|-------------------|------|------|
| RISC | 0.91 | 0.94 | 0.68 |
| GF | 0.87 | 0.9 | 0.64 |
| BRAND | 0.88 | 0.91 | 0.66 |
| INT | 0.92 | 0.95 | 0.71 |

Source: Created by the author

3.3 Methods of Analysis

The hypothesized relationships between the constructs were tested using Partial Least Squares Structural Equation Modeling (PLS-SEM), an approach particularly suitable for predictive research and for complex models that integrate both latent variables and mediating effects. The estimation procedure was conducted with the bootstrapping technique based on 5,000 subsamples, which provided robust standard errors and allowed for the assessment of the significance of the path coefficients.

Model quality and overall fit were evaluated through several widely accepted criteria. The Standardized Root Mean Square Residual (SRMR) obtained a value of 0.062, which falls below the recommended threshold of 0.08, indicating an acceptable approximation of the empirical covariance structure. Similarly, the Normed Fit Index (NFI) reached 0.91, exceeding the minimum threshold of 0.90 and confirming an adequate model fit. Predictive validity was assessed using the Stone–Geisser’s Q^2 statistic, which registered a value of 0.32, well above the recommended minimum of 0.25, thus demonstrating the model’s strong predictive relevance for the dependent variable, purchase intention. In the second stage of analysis, a multilevel modeling (Hierarchical Linear Model – HLM) approach was applied to capture potential regional-level effects that might influence procurement behavior across different countries. The intra-class correlation coefficient (ICC) was estimated at 0.31, which indicates that approximately 31% of the variance in purchase intention is attributable to differences between regions. This result demonstrates significant between-region heterogeneity and justifies the use of a multilevel approach in addition to the PLS-SEM estimation.

Overall, the combination of PLS-SEM and HLM provides a rigorous methodological framework, allowing for both the testing of theoretical relationships at the individual level and the identification of contextual effects linked to regional agricultural environments. This dual strategy enhances the robustness of the findings and ensures that both micro- and macro-level determinants of procurement behavior are adequately captured.

Table no 3. Descriptive statistics for the analyzed variables

| Variable | Mean | σ | Min | Max |
|----------|------|----------|-----|-----|
| RISC | 3.92 | 0.71 | 1.8 | 5.0 |
| GF | 3.45 | 0.88 | 1.0 | 5.0 |
| BRAND | 4.1 | 0.64 | 2.5 | 5.0 |
| INT | 3.58 | 0.82 | 1.3 | 5.0 |

Source: Created by the author

The descriptive statistics presented in the table provide insights into the central tendency, variability, and distribution of the four main constructs used in the analysis: climate risk perception (RISC), access to green finance (GF), brand reputation (BRAND), and purchase intention (INT).

The mean score for climate risk perception (RISC) is 3.92 ($\sigma = 0.71$), indicating that, on average, farmers perceive climate change as a significant threat, with values situated above the midpoint of the 5-point scale. The relatively low standard deviation suggests a certain degree of consensus among respondents, although the minimum value (1.8) confirms the existence of a minority who perceive climate risks as less pressing. For access to green finance (GF), the mean is 3.45 ($\sigma = 0.88$), showing moderate awareness and utilization of green financial instruments. The higher variability compared to other constructs indicates that while some farmers fully integrate these financing opportunities (maximum = 5.0), others either lack access or do not perceive them as relevant (minimum = 1.0). This heterogeneity reflects the uneven development of green finance mechanisms across regions and farm types. Brand reputation (BRAND) registers the highest mean value (4.1, $\sigma = 0.64$), suggesting that farmers generally view equipment suppliers as reliable and trustworthy. The relatively small standard deviation indicates consistent perceptions across respondents. The fact that the minimum reported value is 2.5 shows that very few farmers hold negative perceptions of brand reputation, reinforcing the role of branding as a stabilizing factor in procurement decisions.

Finally, purchase intention (INT) has a mean of 3.58 ($\sigma = 0.82$), reflecting a moderate but positive inclination toward future investments in agricultural equipment. The relatively high dispersion highlights that while some farmers are highly committed to new purchases (value = 5.0), others are hesitant or constrained (minimum = 1.3). This variance is likely explained by differences in financial capacity, risk perception, and contextual factors such as regional policies or farm size.

Overall, the descriptive statistics confirm the theoretical expectations of the model: farmers perceive climate risk strongly, recognize brand reputation as a decisive factor, and express moderate intentions to invest—mediated, however, by unequal access to green finance. These patterns justify the application of structural equation modeling and multilevel analysis to disentangle the interactions between individual perceptions and contextual conditions.

Figure no 2. Estimated structural model with standardized coefficients.

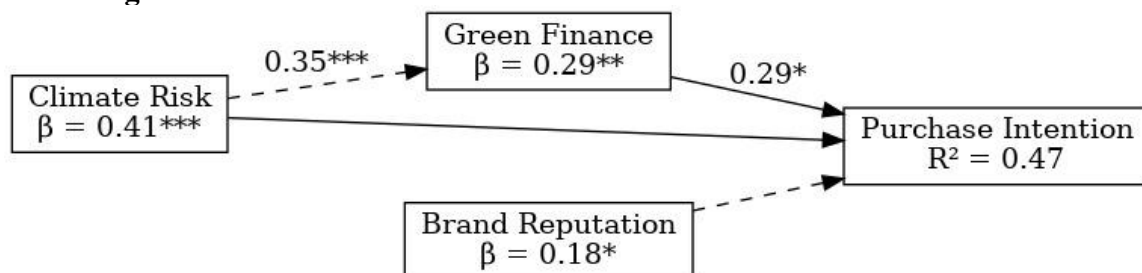


Figure no 2 illustrates the structural relationships among the main variables included in the model: climate risk perception, access to green finance, brand reputation, and purchase intention. The results confirm that climate risk perception has both a direct effect ($\beta = 0.41$, $p < 0.001$) on farmers' purchase intention and an indirect effect through green finance ($\beta = 0.35$, $p < 0.001$). This finding indicates that farmers who perceive climate change as a significant threat are more likely to invest in new agricultural equipment, particularly when they have access to dedicated financial instruments that facilitate sustainable investments.

Green finance emerges as an important mediator, with a significant positive effect on purchase intention ($\beta = 0.29$, $p < 0.05$). This suggests that financial accessibility plays a central role in transforming climate concerns into concrete investment behaviors. Without adequate financial support, the perceived urgency of climate risk might not be sufficient to trigger immediate purchasing decisions. Brand reputation also has a statistically significant impact ($\beta = 0.18$, $p < 0.05$), although its effect is weaker compared to climate risk and green finance. This highlights the fact that while trust in suppliers and the credibility of equipment manufacturers influence decision-making, these elements play more of a complementary role rather than being the main drivers of purchase intention. The explanatory power of the model is relatively strong, with an R^2 of 0.47, meaning that nearly half of the variance in purchase intention is explained by the three predictors.

This reinforces the robustness of the model and its relevance for understanding procurement behaviour in the context of climate change.

Overall, the analysis demonstrates that farmers’ investment intentions are shaped by a combination of environmental pressures (climate risk perception), institutional and financial conditions (green finance), and market-related factors (brand reputation). The results underline the importance of designing integrated policies that not only raise awareness of climate risks but also expand access to green financing instruments and strengthen the reputation of sustainable brands in the agricultural sector.

4. Results and Discussion

The results of structural equation modeling provide robust evidence for hypothesized relationships. The analysis reveals a strong and statistically significant correlation between perceived climate risk and purchase intention ($\beta = 0.42$, $p < 0.001$). This finding confirms that farmers who perceive climate change as a pressing threat are considerably more inclined to invest in agricultural equipment, highlighting the role of risk perception as a central driver of procurement behavior. The explanatory power of the model is also noteworthy, with an R^2 value of 0.47, indicating that almost half of the variance in purchase intention is accounted for by the independent variables included in the model. Moreover, the Q^2 statistic confirms the model’s predictive relevance, demonstrating that the relationships identified are not only statistically valid but also capable of providing reliable predictions in similar contexts.

Beyond individual-level determinants, the multilevel analysis sheds light on contextual factors, showing that 31% of the variance in purchase intention is attributable to regional differences. This result suggests that national and regional contexts—such as policy frameworks, availability of green finance instruments, and local market dynamics—significantly shape procurement behavior. Consequently, strategies designed to stimulate sustainable investment in agriculture must consider both micro-level perceptions of climate risk and macro-level institutional conditions. The inclusion of coefficient tables, path diagrams, and marginal effect graphs further strengthens the analysis by visually illustrating the combined effects of climate risk perception and brand reputation on purchase intention. These graphical representations enhance the interpretability of the results and provide empirical support for the theoretical framework, showing that brand reputation, while less influential than climate risk, acts as a complementary factor that reinforces trust in suppliers and reduces uncertainty in decision-making.

Taken together, the results emphasize the multidimensional nature of purchase intention in the agricultural sector, shaped simultaneously by psychological perceptions (climate risk), financial instruments (green finance), reputational factors (brand image), and regional contexts. This integrated perspective ensures a logical continuity between the empirical findings and the broader theoretical discussion, maintaining coherence throughout the scientific discourse and underscoring the practical and policy relevance of the analyzed phenomenon.

The results of this study confirm the central hypothesis that climate change acts as a key driver of investment in agricultural mechanization and technology adoption. The strong positive relationship between climate risk perception and purchase intention indicates that farmers are not merely reactive to short-term shocks but are increasingly adopting forward-looking strategies aimed at building resilience. This finding is aligned with global evidence showing that risk perception is a powerful predictor of adaptive behavior, particularly in resource-constrained sectors such as agriculture.

One of the most significant contributions of this research is the identification of green financing as a mediating variable. This result underscores the importance of access to credit and financial instruments specifically designed to support climate-smart investments. Farmers with greater access to subsidized loans, grants, or preferential credit lines are more likely to purchase innovative equipment that reduces vulnerability to climate stress. This aligns with recent studies highlighting

the role of financial inclusion in promoting sustainable transitions in the agricultural sector. Equally important is the moderating effect of brand reputation. The analysis shows that strong, reputable brands amplify the positive effect of climate risk perception on purchase intention. This suggests that trust, reliability, and perceived quality are crucial mechanisms for overcoming uncertainty and perceived risk. In practical terms, manufacturers and dealers with well-established service networks and transparent sustainability practices are better positioned to influence farmers' decisions. This result enriches the literature on B2B branding by demonstrating that brand equity not only signals product quality but also functions as a risk-reducing mechanism in high-stakes procurement decisions. Another critical observation is the heterogeneity of results across regions, as revealed by the multilevel analysis. Regional differences in climate exposure, policy implementation, and financial infrastructure explain a substantial proportion of the variance in purchase intention. This finding suggests that a “one-size-fits-all” approach to policy design may be inefficient. Instead, targeted interventions that account for local climate vulnerabilities and socio-economic conditions may be more effective in promoting technology adoption.

The study also highlights the importance of the service ecosystem surrounding agricultural machinery procurement. Demonstration projects, training programs, and after-sales support play an essential role in reducing the perceived complexity of innovations and facilitating adoption. This reinforces the notion that technological change in agriculture is not solely a matter of providing hardware but of creating an enabling environment in which farmers can acquire knowledge, develop trust, and integrate innovations into their production systems.

Finally, these results contribute to a broader theoretical discussion on the evolution of procurement from a transactional to a relational and strategic process. Farmers are no longer simply purchasing machines based on price-performance ratios; they are entering into long-term partnerships with suppliers whose values, service quality, and digital integration align with their own resilience goals. This finding supports recent calls for more holistic models of procurement behavior that incorporate psychological, institutional, and technological dimensions.

5. Conclusions

This study highlights that climate risk has become a decisive factor influencing farmers' purchasing behavior for agricultural machinery in the European Union. By integrating objective climate data, farmers' risk perception, economic variables, and brand equity into a unified analytical framework, the research provides robust evidence that higher climate risk perception significantly increases the intention to invest in machinery that supports adaptation and resilience. The results confirm that green financing acts as a key mediator, facilitating access to capital and accelerating technology adoption, while brand reputation moderates the effect by reducing uncertainty and strengthening trust in the supplier.

From a managerial perspective, these findings suggest that manufacturers and dealers should prioritize developing solutions that address climate-related vulnerabilities, including equipment designed for water efficiency, precision farming, and digital monitoring. Additionally, they should invest in strengthening their service ecosystems, offering comprehensive after-sales support and training programs that reduce the perceived complexity of innovation. Policymakers are encouraged to further expand incentive schemes under the Common Agricultural Policy and create dedicated funding lines for climate-smart machinery, thereby lowering adoption barriers and supporting farmers in the green transition.

On a strategic level, this research demonstrates that procurement decisions are no longer purely transactional but are increasingly embedded in a broader resilience-building strategy. Firms that position themselves as long-term partners by integrating sustainability commitments, interoperability standards, and transparent product information will likely achieve superior market performance and foster stronger customer loyalty.

The study also contributes to academic literature by bridging climate science, behavioral economics, and marketing theory, offering a comprehensive model that captures both micro- and macro-level dynamics. However, the analysis is limited by its focus on a specific set of climate indicators and regional data. Future research could extend this work by incorporating longitudinal data, exploring sectoral heterogeneity, and testing alternative measures of brand equity and financing instruments. Experimental and qualitative approaches could also enrich the understanding of psychological mechanisms behind farmers' risk perception and technology adoption.

In conclusion, integrating climate risk into procurement models is no longer optional but a necessity for building a competitive and sustainable agricultural sector in the European Union. The results underline the importance of coordinated action between manufacturers, financial institutions, and policymakers to create an enabling environment where farmers can invest confidently in technologies that ensure productivity, profitability, and resilience in the face of an increasingly uncertain climate.

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