Cooperative Entrepreneurship and Climate Change Adaptation Strategies: The Role of Territorial Embeddedness in the Resilience of Agricultural Cooperatives in the Souss-Massa Region (Morocco)

Abstract

This study examines the influence of territorial embeddedness on the capacity of agricultural cooperatives in the Souss-Massa region (Morocco) to develop climate change adaptation strategies and, ultimately, achieve organizational resilience. Drawing on an integrative theoretical framework that combines territorial economics (Pecqueur, 2006; Zimmermann, 2008), organizational resilience theory (Duchek, 2020; Weick & Sutcliffe, 2007), and cooperative entrepreneurship (Draperi, 2012; Defourny & Nyssens, 2017), we propose and test a mediated structural model. Based on a stratified random sample of 152 cooperatives and PLS-SEM estimation (SmartPLS), all five research hypotheses are confirmed. The results indicate that territorial embeddedness strongly predicts territorial social capital ($\beta = 0.624$, $f^2 = 0.638$) and directly influences adaptation strategies ($\beta = 0.499$), while adaptation strategies are the primary determinant of organizational resilience (β = 0.748, f^2 = 1.273). Territorial social capital partially mediates the embeddedness–adaptation relationship (β = 0.196, p = 0.002). These findings advance the literature on territorial economics by integrating a climate resilience dimension and offer actionable recommendations for cooperative managers and public policymakers engaged in territorial climate adaptation strategies.

Keywords: territorial embeddedness, territorial social capital, climate adaptation strategies, organizational resilience, agricultural cooperatives, Souss-Massa, Morocco.

1.1. Introduction

Climate change represents one of the major challenges of the 21st century, disproportionately affecting agriculture-dependent economies, particularly in Africa (FAO, 2023). In Morocco, the Souss-Massa region, recognized as the country's leading agricultural exporting region, is particularly vulnerable to this issue. It faces increasing water stress, a scarcity of groundwater resources, and an intensification of drought episodes (Ministère de l'agriculture, 2024). In this context, agricultural cooperatives emerge as crucial actors. As forms of collective entrepreneurship, they play a fundamental role in structuring the local economic fabric and promoting adaptation practices in the face of climatic hazards.

Territorial embeddedness, defined as the set of links an organization forges with its local environment (networks, social capital, specific resources, territorial identity), is perceived as a potentially decisive factor in the capacity of cooperatives to develop resilience strategies in the face of climatic disruptions (Pecqueur, 2006; Torre & Beuret, 2012). However, the way this embeddedness influences the entrepreneurial resilience of agricultural cooperatives remains underexplored in scientific literature, particularly in the African context. This research aims to fill this gap by answering the central question: *To what extent does territorial embeddedness influence the capacity of agricultural cooperatives in the Souss-Massa region to develop climate change adaptation strategies?*

To do this, our study relies on an integrative theoretical perspective, mobilizing three complementary bodies of literature. First, territorial economics and territorial development approaches, with the works of Pecqueur (2006) on specific territorial resources and Zimmermann (2008) on firm embeddedness, provide the analytical framework for territorial embeddedness. Second, the literature on organizational and territorial resilience (Weick & Sutcliffe, 2007; Martin & Sunley, 2015) offers a framework for understanding the capacity of cooperatives to absorb shocks, adapt, and transform. Finally, works on cooperative entrepreneurship and the social and solidarity economy (Draperi, 2012; Defourny & Nyssens, 2017) allow for an understanding of the specificities of the cooperative model in terms of governance, resource pooling, and community embeddedness, all characteristics influencing resilience to external shocks.

Methodologically, this study adopts a quantitative approach. It is based on a questionnaire survey conducted among a sample of 152 agricultural cooperatives in the Souss-Massa region. The collected data will be analyzed using structural equation modeling based on the PLS-SEM approach, a method suitable for complex models with latent variables and moderate sample sizes.

The results of this research highlight the decisive role of territorial embeddedness in the climate resilience of agricultural cooperatives, while identifying the mediating mechanisms of this relationship. Theoretically, this work contributes to enriching the literature on territorial economics by integrating the dimension of climate resilience. Managerially, it provides concrete avenues for action for cooperative managers and territorial development actors.

1.2. Literature Review and Conceptual Framework

This section explores the theoretical foundations underpinning our research, drawing on three complementary bodies of literature: territorial economics, organizational and territorial resilience, and cooperative entrepreneurship. The integration of these perspectives will allow for the construction of a robust conceptual framework to analyze the role of territorial embeddedness in the resilience of agricultural cooperatives facing climate change.

1.2.1. Territorial Embeddedness and Territorial Economics

Territorial embeddedness is a central concept in territorial economics, referring to the set of material and immaterial links an organization maintains with its host territory (Torre and Beuret, 2012). These links can be economic, social, cultural, or institutional in nature and contribute to shaping the identity and specificity of the organization within its local environment (Zimmermann, 2008).

Pecqueur (2006) highlighted the importance of specific territorial resources as the foundation of territorial development. These resources, whether natural, human, cultural, or institutional, are often non-transferable and confer a competitive advantage to businesses and organizations that manage to mobilize and valorize them. Territorial embeddedness thus allows cooperatives to access these unique resources, transform them into distinctive capabilities, and strengthen their local positioning.

Zimmermann (2008), for his part, deepened the notion of firm embeddedness by identifying different dimensions of this territorial rooting. Embeddedness is not static but results from a dynamic process of interactions between the company and its territory. It integrates relational dimensions (networks of territorial actors), cognitive dimensions (shared knowledge, collective learning), institutional dimensions (local rules, norms, conventions), and identity dimensions (sense of belonging, territorial image). For agricultural cooperatives, strong territorial embeddedness translates into better integration into local value chains, easier access to local markets, and increased legitimacy with local communities.

1.2.2. Organizational and Territorial Resilience

Resilience is the capacity of a system to absorb disturbances, reorganize itself, and continue to function after a shock, or even to transform itself to adapt to new conditions (Weick and Sutcliffe, 2007). In the context of climate change, the resilience of organizations, particularly agricultural cooperatives, has become a major issue.

Weick and Sutcliffe (2007) developed the concept of organizational resilience by studying High Reliability Organizations (HROs). They emphasize the importance of awareness of potential failures, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience, and deferred expertise. These principles enable organizations to detect weak signals, adapt quickly to unforeseen events, and maintain their performance even in crisis situations. For agricultural cooperatives, this implies implementing climate monitoring systems, diversifying activities, and flexibility in production processes.

Beyond organizational resilience, territorial resilience (Martin & Sunley, 2015) emphasizes the capacity of a territory as a whole to cope with external shocks and develop sustainably. The territorial embeddedness of cooperatives contributes to this collective resilience by fostering resource pooling, solidarity among local actors, and the development of endogenous solutions to climate challenges. Resilience is therefore not a simple return to initial equilibrium, but a dynamic capacity for adaptation and transformation in the face of disturbances.

1.2.3. Cooperative Entrepreneurship and the Social and Solidarity Economy

Cooperative entrepreneurship, part of the social and solidarity economy (SSE), is distinguished by its principles of democratic governance (one member, one vote), the primacy of people over capital, and social and environmental objectives (Draperi, 2012). Agricultural cooperatives, in particular, are forms of collective entrepreneurship that allow farmers to pool their means of production, marketing, and research, thereby strengthening their bargaining power and innovation capacity (Defourny and Nyssens, 2017).

According to Draperi (2012), the SSE offers an alternative model to capitalism, based on cooperation, solidarity, and the pursuit of positive social impact. Agricultural cooperatives, as SSE actors, are intrinsically linked to their territory and their members. This proximity fosters the emergence of territorial social capital, understood as the set of resources (trust, norms, networks) that facilitate coordination and cooperation among territorial actors (Nahapiet and Ghoshal, 1998). This social capital is an essential mediator between territorial embeddedness and resilience, as it allows cooperatives to mobilize support, share knowledge, and implement collective actions in the face of climate change.

1.3. Model and Hypotheses

Based on this literature review, we propose a conceptual framework that postulates that the territorial embeddedness of agricultural cooperatives influences their capacity to develop climate change adaptation strategies and, ultimately, their resilience. This relationship is mediated by territorial social capital.

The conceptual framework integrates the following dimensions:

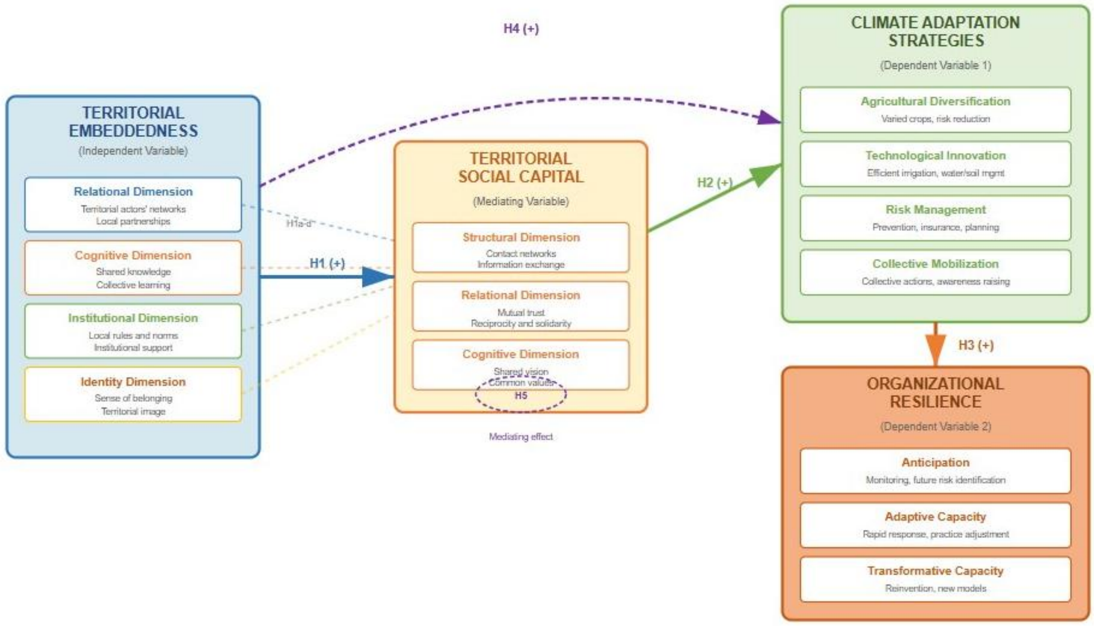
- Territorial Embeddedness: A multidimensional construct integrating the relational, cognitive, institutional, and identity dimensions of cooperatives with their territory (Zimmermann, 2008).
- Territorial Social Capital: The set of resources derived from relationship networks, trust, and shared norms within the territory, facilitating cooperation and collective action (Nahapiet and Ghoshal, 1998).
- Climate Adaptation Strategies: Actions implemented by cooperatives to cope with the impacts of climate change (crop diversification, adoption of efficient irrigation techniques, risk management) (Below et al., 2012).
- Organizational Resilience: The capacity of cooperatives to absorb climatic shocks, adapt, and transform to maintain their viability and sustainable development (Weick and Sutcliffe, 2007).

The hypothetical model of this research suggests that territorial embeddedness, by fostering the development of territorial social capital, strengthens the capacity of agricultural cooperatives to implement effective adaptation strategies, thereby leading to greater resilience to climate change. The dimensions of territorial embeddedness (relational, cognitive, institutional, and identity) are assumed to have distinct effects on the formation of social capital and the adoption of adaptation strategies. To this end, we propose testing the following hypotheses:

- H1: Territorial embeddedness positively and significantly influences the territorial social capital of agricultural cooperatives.
- H2: Territorial social capital positively and significantly influences the climate adaptation strategies of agricultural cooperatives.
- H3: Climate adaptation strategies positively and significantly influence the organizational resilience of agricultural cooperatives.
- H4: Territorial embeddedness positively and significantly influences the climate adaptation strategies of agricultural cooperatives.
- H5: Territorial social capital mediates the relationship between territorial embeddedness and climate adaptation strategies.

The set of concepts mobilized and the corresponding hypothetical relationships can be formalized through the hypothetical model below.

Figure 1: Hypothetical Model



Source: Authors

1.4. Methods

This section details the methodological approach adopted to answer the research question on the influence of territorial embeddedness on the resilience of agricultural cooperatives facing climate change in the Souss-Massa region.

1.4.1. Research Approach and Design

This study adopts a quantitative approach, favoring the collection and analysis of numerical data to test hypothetical relationships between variables (Creswell and Creswell, 2018). The research design is descriptive and explanatory, aiming to describe the characteristics of the cooperatives studied and to explain the causal links between territorial embeddedness, social capital, adaptation strategies, and organizational resilience. A questionnaire survey was chosen as the main data collection method, allowing for the questioning of a representative sample of agricultural cooperatives.

1.4.2. Field, Population, and Sampling

The target population of this study comprises all active agricultural cooperatives in the Souss-Massa region. With 2,265 cooperatives bringing together 24,492 members and a total paid-up capital of MAD 218,759,592 (ODCO, 2025), this region constitutes a particularly relevant field of investigation. It is characterized by a dual vulnerability: on the one hand, a strong dependence on agriculture, particularly greenhouse horticulture, argan cultivation, citrus production, and livestock farming, and, on the other hand, an increasing exposure to the impacts of climate change, reflected in structural water stress and a growing frequency of drought episodes (Ministry of Agriculture, 2024).

The population spans six provinces and prefectures with contrasting socio-economic and agro-ecological profiles, thereby justifying the adoption of a sampling strategy capable of capturing this territorial heterogeneity.

To determine a statistically robust sample size, a pilot study was conducted prior to the main survey, involving approximately thirty cooperatives representative of the different provinces of the region. The purpose of this exploratory phase was to estimate the variance of the variable of interest, namely, a composite index measuring the degree of territorial embeddedness of cooperatives, and to calibrate the precision parameters required for determining the final sample size.

Based on the results of this pilot study, the estimated variance of the variable of interest was Var(x) = 0.2025 (standard deviation $\hat{\sigma} \approx 0.45$, on a normalized Likert scale ranging from 0 to 1). Assuming that the variable follows a normal distribution, an assumption supported by the Central Limit Theorem when the sample size is sufficiently large ($n > 30$), the sample size was calculated using the simple random sampling formula with finite population correction:

$$\boldsymbol{n} = \frac{\boldsymbol{Z}^2{}_{\mathbf{1}-\frac{\alpha}{2}} \times \boldsymbol{Var}(\boldsymbol{x}) \times \boldsymbol{N}}{\boldsymbol{\varepsilon}^2(\boldsymbol{N}-\mathbf{1}) + \boldsymbol{Z}^2{}_{\mathbf{1}-\frac{\alpha}{2}} \times \boldsymbol{Var}(\boldsymbol{x})}$$

In this formula, N denotes the population size (2 265 cooperatives), $Z_{1-\alpha/2} = 1.96$ s the standard normal quantile corresponding to a 95 %, Var(x) is the variance estimated from the pilot study, and $\varepsilon = 0.07$ represents the tolerated margin of error (± 7 %). The numerical application of this formula yields a theoretical sample size of $n_0 \approx 157$ cooperatives. Taking into account an expected response rate of approximately 70 to 80 % (consistent with benchmarks observed in similar surveys conducted in Morocco) and operational constraints related to field accessibility, the final sample size was set at 152 cooperatives, corresponding to an overall sampling fraction of 6.71 %. The table below summarizes the parameters used for sample size determination.

Table 1. Sample Size Determination Parameters

Parameter	Value
Population size (N)	2 265 cooperatives
Estimated pilot variance Var(x)	0.2025 ($\hat{\sigma}$ = 0.45)
Confidence level (1 − α)	95 %
$Z_{1-\alpha/2}$	1.96
Margin of error (ε)	±0.07 (7 %)
Calculated sample size (n_0)	157 cooperatives
Final sample size (n)	152 cooperatives
Overall sampling fraction	6.71 %
Effective margin of error	± 7.95 %

Source: Authors

The sampling method adopted is proportional stratified sampling, with provinces serving as strata. This choice is justified on several grounds. First, the geographical distribution of cooperatives is highly uneven: the province of Tata alone accounts for 40% of all units (907 cooperatives), whereas Inezgane Ait Melloul includes only 63. A purely random sampling approach would risk underrepresenting smaller provinces, thereby compromising the external validity of the findings.

Second, agro-climatic and institutional profiles vary significantly across provinces (argan cultivation in Taroudant and Tiznit, intensive greenhouse farming in the Souss plain, and pastoral livestock systems in Tata) thus warranting the treatment of each province as a distinct sub-universe for comparative analysis.

Proportional allocation ensures that each stratum contributes to the sample in proportion to its actual weight in the population, thereby guaranteeing the territorial representativeness of the sample. The sampling fraction is relatively homogeneous across strata, ranging from 6.35% (Inezgane Ait Melloul) to 6.81% (Tiznit), which eliminates the need for post-stratification weighting during data analysis. Within each stratum, cooperatives were selected through simple random sampling from a sampling frame constructed using lists provided by the Office for the Development of Cooperation (ODCO).

Table 2. Distribution of the sample by provincial stratum

Province / Stratum	N	% Pop.	n	Sampling Rate	Dominant Sectors
Agadir Ida Outanane	207	9.14 %	14	6.76 %	Market gardening / Citrus
Inezgane Ait Melloul	63	2.78 %	4	6.35 %	Market gardening
Chtouka Ait Baha	269	11.88 %	18	6.69 %	Greenhouses / Market gardening
Taroudant	584	25.78 %	39	6.68 %	Argan / Citrus
Tiznit	235	10.38 %	16	6.81 %	Argan / Livestock
Tata	907	40.04 %	61	6.73 %	Livestock / Palm
TOTAL	**2 265**	**100 %**	**152**	**6.71 %**	-

Source: Authors

To be eligible for the survey, a cooperative had to meet the following criteria: be officially registered and active, engage in agricultural activity (production, processing, or marketing) in one of the six provinces of the region, and have at least six months of operational activity to ensure minimal territorial embeddedness. Inactive cooperatives, those undergoing dissolution, or those with non-agricultural vocations were excluded. To compensate for predictable non-responses, a list of replacement cooperatives (representing approximately 10% additional units per stratum) was established using the same random procedure.

1.4.3. Data Collection

Data were collected using a structured questionnaire administered directly to the presidents and managers of agricultural cooperatives. The choice of these respondents is justified by their in-depth knowledge of their cooperative's operations, strategies, and environment. The questionnaire was designed to gather information on the different variables of the study, using validated measurement scales from the scientific literature.

1.4.4. Measurement of Variables

The survey, as presented in Appendix 1, includes adapted and validated measurement scales for the key constructs of the research:

- Territorial Embeddedness: Measured using scales adapted from the works of Zimmermann (2008) and Grossetti and Bès (2003). These scales cover the relational, cognitive, institutional, and identity dimensions of embeddedness.
- Territorial Social Capital: Evaluated based on the work of Nahapiet and Ghoshal (1998), which distinguishes the structural, relational, and cognitive dimensions of social capital.
- Climate Adaptation Strategies: Measured using indicators developed by Below et al. (2012), covering a range of adaptation practices implemented by cooperatives.
- Organizational Resilience: Apprehended through scales adapted from Duchek's (2020) model, which conceptualizes resilience as a dynamic process including anticipation, preparation, response, and adaptation to shocks.

The table below summarizes all the concepts, dimensions, and items used to test the research model.

Table 3. Items retained for operationalizing the concepts

Concepts	Dimensions	Items	Codes
Territorial Embeddedness (TE)	***Relational***	Our cooperative maintains close relationships with other territorial actors (farmers, traders, institutions)	TE_REL1
		We actively participate in professional networks and territorial cooperation platforms	TE_REL2
		Local partnerships are essential for our development	TE_REL3
	Cognitive	Our cooperative shares knowledge and practices with other actors in the territory	TE_C1
		We benefit from technical and agronomic knowledge specific to our region	TE_C2
		Collective learning within the territory enriches our skills	TE_C3
	Institutional	Our cooperative benefits from the support of territorial institutions (local authorities, development agencies)	TE_INS1
		Local rules and norms facilitate our activities and our development	TE_INS2
		We respect and value local institutional conventions and practices	TE_INS3
	Identity	Our cooperative is proud to belong to this territory	TE_ID1
		The territorial identity is an integral part of our image and our positioning	TE_ID2
		The values and culture of our region are reflected in our practices	TE_ID3
Territorial Social Capital (TSC)	***Structural***	Our cooperative has an extensive territorial network of contacts at the territorial level	TSC_S1
		Links between territorial actors facilitate the exchange of information	TSC_S2
		We can quickly mobilize resources thanks to our territorial network	TSC_S3
	Relational	Mutual trust between territorial actors is high	TSC_RL1
		Relationships with local partners are based on reciprocity and solidarity.	TSC_RL2
		Our cooperative maintains strong and lasting ties with the local community	TSC_RL3
	Cognitive	Territorial actors share a common vision of development	TSC_C1
		There is a common language and codes that facilitate cooperation	TSC_C2
		Our territory has shared norms and values that guide collective actions	TSC_C3
Climate Adaptation Strategies (CAS)	***Agricultural Diversification***	Our cooperative encourages crop diversification to reduce climate risks	CAS_AD1
		We introduce crop varieties adapted to changing climatic conditions	CAS_AD2
		The diversification of agricultural activities is part of our resilience strategy.	CAS_AD3

	Technological Innovation	Our cooperative adopts water-saving irrigation techniques (drip, micro-sprinkler)	CAS_TI1
		We use technologies to improve water and soil management.	CAS_TI2
		Agricultural innovation is encouraged to adapt to climate challenges	CAS_TI3
	Risk Management	Our cooperative implements climate risk prevention and management systems	CAS_RM1
		We have insurance or mutualization mechanisms for climate-related losses	CAS_RM2
		Anticipatory planning for climate risks is regularly practiced	CAS_RM3
	Collective Mobilization	Our cooperative mobilizes members for collective actions against climate change	CAS_CM1
		Awareness and training programs on climate adaptation are implemented	CAS_CM2
		The collective commitment of members strengthens our capacity to face climate challenges	CAS_CM3
Organizational Resilience (OR)	***Anticipation***	Our cooperative actively monitors climate developments and their potential impacts	OR_ANT1
		We proactively identify future climate risks for our activity	OR_ANT2
		Future climate scenarios are taken into account in our strategic planning	OR_ANT3
	Adaptation	Our cooperative reacts quickly to unforeseen climatic events	OR_AD1
		We adjust our agricultural practices according to climatic conditions	OR_AD2
		Organizational flexibility allows us to adapt to climatic shocks	OR_AD3
	Transformation	Our cooperative is capable of reinventing itself in the face of profound climatic changes	OR_T1
		We explore new business models to ensure our sustainability	OR_T2
		Innovation and change are part of our organizational culture	OR_T3

Source: Authors

1.4.5. Data Analysis

The collected data are analyzed using structural equation modeling based on the PLS-SEM approach. This multivariate statistical method is particularly suitable for complex models involving latent variables (not directly observable) and moderate sample sizes (Hair et al., 2019). PLS-SEM allows for simultaneous testing of direct and indirect relationships between theoretical constructs, thus offering a robust approach to validate the proposed conceptual framework.

The use of PLS-SEM is justified by several advantages in the context of this study:

- Exploration of complex relationships: The method is effective for analyzing models where several latent variables interact, as is the case with territorial embeddedness, social capital, and resilience.

- Management of latent variables: PLS-SEM allows working with theoretical constructs measured by several observable indicators, thus reducing measurement error.
- Prediction and explanation: The main objective of PLS-SEM is the prediction of dependent variables and the explanation of variance, which is consistent with the objectives of this research.

The analyses include the evaluation of the measurement model (reliability and validity of constructs) and the structural model (testing research hypotheses and estimating path coefficients). SmartPLS software will be used to carry out these analyses.

1.5. Results

The descriptive analysis of the 42 indicators mobilized in this study reveals a centroid distribution around the neutral value of the Likert scale (3.00), indicating a moderate, but differentiated, perception of cooperative realities in the Souss-Massa region. The table below presents the descriptive statistics of a representative set of indicators from the four latent constructs.

Table 4. Descriptive statistics of main indicators (n = 152)

Indicator	Mean	Median	Std. Dev.	Min obs.	Max obs.	Skewness
TE_REL1	2.970	3.000	0.834	1.000	5.000	0.270
TE_C1	3.121	3.000	0.956	1.000	5.000	-0.107
TE_INS1	3.202	3.000	0.804	1.000	5.000	-0.268
TE_ID1	3.121	3.000	0.935	1.000	5.000	-0.247
TSC_S1	2.949	3.000	0.783	1.000	5.000	-0.038
TSC_RL1	3.101	3.000	1.000	1.000	5.000	0.040
TSC_C1	2.828	3.000	0.841	1.000	5.000	-0.076
CAS_AD1	2.990	3.000	0.882	1.000	5.000	0.110
CAS_TI1	2.848	3.000	0.845	1.000	5.000	0.195
CAS_RM1	3.000	3.000	0.995	1.000	5.000	0.062
CAS_CM2	3.384	3.000	1.042	1.000	5.000	-0.175
OR_ANT1	2.646	3.000	0.729	1.000	5.000	0.032
OR_AD2	3.333	3.000	0.804	1.000	5.000	-0.210
OR_T1	3.212	3.000	0.902	1.000	5.000	-0.017

Source: Authors, from SmartPLS outputs

Several trends emerge from these statistics. For territorial embeddedness, institutional items (TE_INS1: M = 3.202; TE_INS2: M = 3.273) show the highest means, suggesting that cooperatives perceive relatively favorable territorial institutional support. In contrast, the identity dimension (TE_INS3: M = 2.848) presents the lowest values, indicating room for improvement in symbolic and cultural embeddedness. For adaptation strategies, collective mobilization (CAS_CM2: M = 3.384) stands out most strongly, while technological innovations in irrigation (CAS_TI2: M = 2.778) remain underutilized. Finally, for organizational resilience, rapid adaptation capacity (OR_AD2: M = 3.333) is better established than proactive climate monitoring (OR_ANT1: M = 2.646), signaling a more reactive than proactive approach to climate risk management. All skewness values remain moderate (between -0.27 and 0.35) and the p-values of the Cramér-von Mises test are below the 0.05 threshold for all items, confirming that the distributions deviate from normality, which fully justifies the use of the PLS-SEM method, known to be robust in the absence of multivariate normality (Hair et al., 2019).

In accordance with Hair et al.'s (2019) recommendations for PLS-SEM, the measurement model was evaluated against three criteria: construct reliability, convergent validity, and discriminant validity.

Table 5 summarizes the reliability and convergent validity indicators for the four latent constructs. All constructs largely meet the required thresholds, confirming the robustness of the measurement model.

Table 5. Reliability and Convergent Validity Indicators

Construct	Cronbach's α	ρc (rho_A)	ρc (rho_c)	AVE	Threshold
Territorial Embeddedness (TE)	0.978	0.978	0.980	0.804	> 0.70 / > 0.50
Territorial Social Capital (TSC)	0.970	0.970	0.974	0.806	> 0.70 / > 0.50
Climate Adaptation Strategies (CAS)	0.980	0.980	0.982	0.821	> 0.70 / > 0.50
Organizational Resilience (OR)	0.969	0.970	0.973	0.802	> 0.70 / > 0.50

Source: Authors, from SmartPLS outputs

Cronbach's alpha is greater than 0.96 for all constructs, well above the minimum threshold of 0.70 (Nunnally, 1978). Composite reliability (rho_c) exceeds 0.97 for all constructs, confirming the internal consistency of the measures. The average variance extracted (AVE) ranges between 0.802 (organizational resilience) and 0.821 (climate adaptation strategies), systematically exceeding the 0.50 threshold (Fornell and Larcker, 1981), which attests that the constructs explain more than half of the variance of their respective indicators. The convergent validity of the measurement model is thus fully established. These high values also reflect the quality of the individual loadings visible on the estimated path diagram (Figure 2), where the vast majority of factorial contributions exceed 0.88.

Discriminant validity was evaluated using two complementary criteria: the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT). The Fornell-Larcker criterion requires that the square root of the AVE of each construct be greater than its correlations with all other constructs in the model. The results are presented in Table 6. The HTMT criterion, which is considered a more sensitive indicator of discriminant validity, requires that all HTMT values remain below the threshold of 0.90 (or 0.85 for conceptually similar constructs). The corresponding results are presented in Table 7.

Table 6. Discriminant validity - Fornell-Larcker criterion

Construct	AVE	CAS	OR	TE	TSC
Climate Adaptation Strategies (CAS)	**0.821**	**0.906**			
Organizational Resilience (OR)	**0.802**	0.748	**0.896**		
Territorial Embeddedness (TE)	**0.804**	0.695	0.590	**0.897**	
Territorial Social Capital (TSC)	**0.806**	0.625	0.484	0.624	**0.898**

Source: Authors, from SmartPLS outputs

The Fornell-Larcker criterion is fully met: for each construct, the square root of its AVE (shown in bold on the diagonal) exceeds all inter-construct correlations. For instance, the square root of the AVE of Territorial Embeddedness is 0.897, which is greater than its correlations with Territorial Social Capital (0.624), Climate Adaptation Strategies (0.695), and Organizational Resilience (0.590).

Table 7. Discriminant validity – Heterotrait-Monotrait ratio (HTMT)

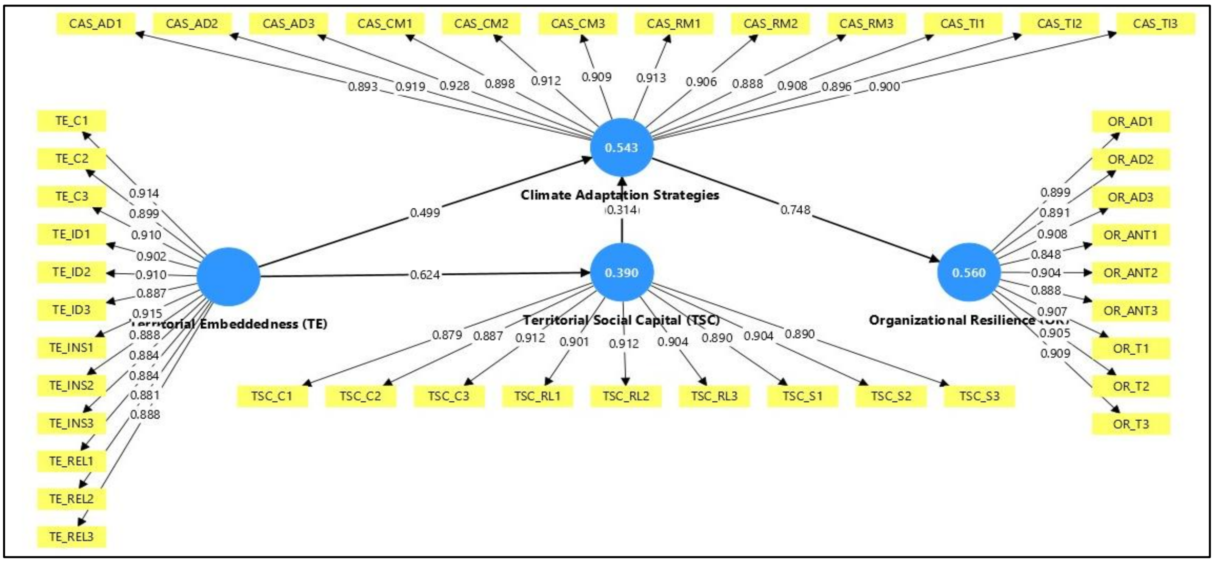
Construct pair	HTMT
Organizational Resilience (OR) ↔ Climate Adaptation Strategies (CAS)	**0.766**
Territorial Embeddedness (TE) ↔ Climate Adaptation Strategies (CAS)	**0.708**
Territorial Embeddedness (TE) ↔ Organizational Resilience (OR)	**0.603**
Territorial Social Capital (TSC) ↔ Climate Adaptation Strategies (CAS)	**0.641**
Territorial Social Capital (TSC) ↔ Organizational Resilience (OR)	**0.497**
Territorial Social Capital (TSC) ↔ Territorial Embeddedness (TE)	**0.639**

Source: Authors, from SmartPLS outputs

All HTMT values are well below the 0.90 threshold, with the highest value being 0.766 (OR ↔ CAS). These results confirm that all constructs are empirically distinct from one another. Taken together, the Fornell-Larcker and HTMT criteria consistently establish discriminant validity: each construct captures a unique and non-redundant dimension within the measurement model.

After validating the measurement model, the evaluation of the structural model focused on estimating the path coefficients (β), their statistical significance (via bootstrapping with 5,000 subsamples), and the effect sizes (f^2). Figure 2 presents the estimated path diagram.

Figure 2: Estimated path diagram (SmartPLS) - Path coefficients and R²



Source: Authors, from SmartPLS outputs

The diagram reveals R^2 values of 0.543 for climate adaptation strategies and 0.560 for organizational resilience, indicating that the model explains 54.3% and 56.0% of the variance of these two endogenous constructs, respectively. These values are considered moderate to substantial according to Cohen's (1988) criteria, which demonstrates a good explanatory power of the overall model. Territorial social capital, for its part, shows an R^2 of 0.390, meaning that 39% of its variance is explained by territorial embeddedness.

Prior to testing the structural model, collinearity among the predictor constructs was assessed using the Variance Inflation Factor (VIF). Values exceeding 5 are generally considered indicative of problematic collinearity (Hair et al., 2019). As shown in Table 8, all VIF values are well below this threshold, Territorial Embeddedness (TE) and Territorial Social Capital (TSC) both yield a VIF of 1.638 with respect to Climate Adaptation Strategies, while CAS records a VIF of 1.000 as a predictor of Organizational Resilience, and TE a VIF of 1.000 as a predictor of Territorial Social Capital. These results confirm the absence of multicollinearity issues in the inner model, ensuring the reliability of the path coefficient estimates.

Table 8. Collinearity statistics (VIF) – Inner model matrix

Construct	CAS	OR	TE	TSC
Climate Adaptation Strategies (CAS)	-	**1.000**	-	-
Organizational Resilience (OR)	-	-	-	-
Territorial Embeddedness (TE)	**1.638**	-	-	**1.000**
Territorial Social Capital (TSC)	**1.638**	-	-	-

Source: Authors, from SmartPLS outputs

Table 9. Path coefficients - Bootstrapping results (5,000 subsamples)

Relation	Hypotheses	β (O)	Mean	Std. Dev.	T-stat	p-value
TE → TSC	**H1**	**0.624**	0.626	0.037	20.195	**0.000**
TSC → CAS	**H2**	**0.314**	0.314	0.095	3.291	**0.000**
CAS → OR	**H3**	**0.748**	0.750	0.037	20.195	**0.000**
TE → CAS	**H4**	**0.499**	0.500	0.078	6.443	**0.000**

Source: Authors, from SmartPLS outputs

All four hypothesized direct relationships are statistically significant at the 1% level. The relationship between climate adaptation strategies and organizational resilience (H3: $\beta = 0.748$; $T = 20.195$; $p < 0.001$) emerges as the strongest in the model, highlighting the central role played by adaptive practices in building the resilience of cooperatives.

Territorial embeddedness exerts a substantial direct influence on both territorial social capital (H1: $\beta = 0.624$; $T = 20.195$; $p < 0.001$) and climate adaptation strategies (H4: $\beta = 0.499$; $T = 6.443$; $p < 0.001$). The relationship between territorial social capital and adaptation strategies (H2: $\beta = 0.314$; $T = 3.291$; $p < 0.001$) is statistically significant but of lower magnitude, suggesting a complementary effect alongside the direct influence of territorial embeddedness.

Table 10. Effect Size Matrix

Predictor	→ CAS	→ OR	→ TE	→ TSC
Climate Adaptation Strategies	-	1.273	-	-
Territorial Embeddedness	0.333	-	-	0.638
Territorial Social Capital	0.131	-	-	-

Source: Authors, from SmartPLS outputs

The f^2 values further corroborate and refine these findings. The effect of territorial embeddedness on territorial social capital is very large ($f^2 = 0.638$), indicating a decisive contribution. Its effect on adaptation strategies is moderate to strong ($f^2 = 0.333$), whereas the effect of territorial social capital on adaptation strategies remains weak ($f^2 = 0.131$). By contrast, the effect of adaptation strategies on organizational resilience is exceptionally high ($f^2 = 1.273$), placing this relationship in the category of very large effects according to Cohen's conventions.

The predictive relevance of the structural model was assessed using PLSPredict, following the procedure recommended by Shmueli et al. (2019). This technique applies a 10-fold cross-validation procedure that generates out-of-sample predictions for each endogenous indicator. The Q^2 predict statistic is computed as:

$$\mathbf{Q^2 = 1 - (SSE\_CV / SSE\_Mean)}$$

Where SSE_CV is the sum of squared prediction errors from cross-validation and SSE_mean is the baseline error obtained by using the mean as the predictor. A Q^2 value greater than zero indicates that the model has predictive relevance. Following Shmueli et al. (2019), Q^2 values of 0.25, 0.50, and 0.75 represent small, medium, and large predictive accuracy, respectively.

Table 11. Predictive Relevance – Q² Predict (10-fold cross-validation)

Construct	Indicator	Q² Predict	Interpretation
Territorial Social Capital (TSC)	**Aggregate**	**0.356**	**Moderate**
Climate Adaptation Strategies (CAS)	**Aggregate**	**0.513**	**Moderate to large**
Organizational Resilience (OR)	**Aggregate**	**0.542**	**Moderate to large**
Territorial Social Capital (TSC)	TSC_S1	0.341	Moderate
	TSC_S2	0.290	Moderate
	TSC_S3	0.268	Moderate
	TSC_RL1	0.292	Moderate
	TSC_RL2	0.311	Moderate
	TSC_RL3	0.243	Moderate
	TSC_C1	0.283	Moderate
	TSC_C2	0.200	Moderate
	TSC_C3	0.305	Moderate
Climate Adaptation Strategies (CAS)	CAS_AD1	0.388	Moderate
	CAS_AD2	0.387	Moderate
	CAS_AD3	0.500	Moderate to large
	CAS_TI1	0.418	Moderate
	CAS_TI2	0.429	Moderate
	CAS_TI3	0.361	Moderate
	CAS_RM1	0.394	Moderate
	CAS_RM2	0.431	Moderate
	CAS_RM3	0.429	Moderate
	CAS_CM1	0.409	Moderate
	CAS_CM2	0.440	Moderate
	CAS_CM3	0.375	Moderate
Organizational Resilience (OR)	OR_ANT1	0.344	Moderate
	OR_ANT2	0.469	Moderate
	OR_ANT3	0.382	Moderate
	OR_AD1	0.394	Moderate
	OR_AD2	0.355	Moderate
	OR_AD3	0.484	Moderate
	OR_T1	0.510	Moderate to large
	OR_T2	0.454	Moderate
	OR_T3	0.440	Moderate

Source: Authors, from SmartPLS outputs

The results, presented in Table 11, demonstrate that all three endogenous constructs exhibit positive and meaningful Q² values. The aggregate Q² for Territorial Social Capital (TSC) stands at 0.356, reflecting moderate predictive accuracy of the TE → TSC path. The aggregate Q² for Climate Adaptation Strategies (CAS) reaches 0.513, and for Organizational Resilience (OR) reaches 0.542, both indicating moderate to large predictive power. At the indicator level, all individual Q² values are positive and range from 0.200 (TSC_C2) to 0.510 (OR_T1), confirming that the model produces meaningful out-of-sample predictions across all measurement dimensions. These results corroborate the in-sample findings and establish the structural model's predictive validity.

Table 12. Specific Indirect Effects – Mediation Test (Bootstrapping)

Indirect Path	β (O)	Mean	Std. Dev.	T-stat	p-val.	Sig.
TE → CAS → OR	**0.374**	0.376	0.067	5.613	**0.000**	***
TSC → CAS → OR	**0.235**	0.235	0.070	3.372	**0.001**	**
TE → TSC → CAS → OR (Full path)	**0.146**	0.148	0.048	3.082	**0.002**	**
TE → TSC → CAS (mediation H5)	**0.196**	0.197	0.064	3.051	**0.002**	**

Source: Authors, from SmartPLS outputs

The analysis of indirect effects allows for testing the mediation hypothesis (H5). The indirect path TE → TSC → CAS is statistically significant (β = 0.196; T = 3.051; p = 0.002), confirming that territorial social capital partially mediates the relationship between territorial embeddedness and climate adaptation strategies. This mediation is characterized as partial since the direct effect TE → CAS remains significant (β = 0.499; p < 0.001), indicating that territorial embeddedness operates both directly and indirectly through the accumulation of social capital.

Moreover, the total indirect effect TE → CAS → OR (β = 0.374; p < 0.001) and the full sequential path TE → TSC → CAS → OR (β = 0.146; p = 0.002) confirm the existence of a robust causal chain linking territorial embeddedness to organizational resilience, with adaptation strategies acting as the central transmission mechanism.

Overall, all five hypotheses formulated in the conceptual model are supported by the empirical evidence. These results delineate a coherent and robust framework in which territorial embeddedness constitutes the entry point of the cooperative resilience process, influencing both adaptation strategies directly (β = 0.499) and indirectly through the formation of territorial social capital (β = 0.624 → 0.196). In turn, adaptation strategies play a decisive mediating role in fostering organizational resilience (β = 0.748).

Table 13. Summary of Hypothesis Testing

Hypothesis	Tested Relation	β	T-stat	p-val.	Result
H1	Territorial Embeddedness → Territorial Social Capital	**0.624**	20.195	**0.000**	**Supported**
H2	Territorial Social Capital → Adaptation Strategies	**0.314**	3.291	**0.000**	**Supported**
H3	Adaptation Strategies → Organizational Resilience	**0.748**	20.195	**0.000**	**Supported**
H4	Territorial Embeddedness → Adaptation Strategies	**0.499**	6.443	**0.000**	**Supported**
H5	TE → TSC → CAS (mediation)	**0.196**	3.051	**0.002**	**Supported (partial)**

Source: Authors, from SmartPLS outputs

1.6. Discussion

The findings of this study provide novel empirical insights into the mechanisms through which territorial embeddedness shapes the capacity of agricultural cooperatives in the Souss-Massa region to cope with climate change. This section discusses these results in light of the existing literature, highlighting their theoretical contributions, managerial implications, and limitations.

The confirmation of H1 (β = 0.624; f^2 = 0.638) constitutes one of the most salient findings of this study. It establishes that territorial embeddedness is a major determinant of the formation of territorial social capital within agricultural cooperatives in Souss-Massa. This result aligns with the seminal work of Zimmermann (2008), who emphasized the multidimensional nature of embeddedness (relational, cognitive, institutional, and identity-based) as the foundation of organizations' territorial advantage. It also corroborates the argument advanced by Pecqueur (2006), according to which specific territorial resources can only be effectively leveraged when organizations maintain dense and differentiated linkages with their local environment.

The very large effect size (f^2 = 0.638) suggests that, in the specific context of Souss-Massa, territorial embeddedness exerts a quasi-structuring influence on the emergence of social capital. This can be explained by the region's distinctive features: the historical interdependence among agricultural actors (argan value chains, irrigation cooperatives), the density of institutional networks (ODCO, chambers of agriculture, regional development agencies), and the strong territorial identity associated with geographically indicated products (argan oil, Taliouine saffron), all of which create a fertile ground for the development of social capital. These characteristics resonate with the industrial atmospheres described by Alfred Marshall and the cooperative districts analyzed by Becattini (1990), where geographical and cultural proximity amplify network externalities.

These findings are consistent with the work of El Moutaoukil and Chakir (2021), who, based on a PLS analysis of agricultural cooperatives in the Agadir region, demonstrate that territorial governance and socio-spatial innovation are significantly driven by the density of relational and cognitive ties that cooperatives maintain with their territory. This empirical continuity between territorial governance, embeddedness, and social capital underscores the robustness of the mechanisms identified in the present study.

The confirmation of H5 through the analysis of indirect effects ($\beta = 0.196$; $p = 0.002$) validates the existence of a mediating mechanism between territorial embeddedness and adaptation strategies, as theorized by Nahapiet and Ghoshal (1998). However, the mediation is partial: the direct effect of embeddedness on adaptation strategies remains both significant and substantial ($\beta = 0.499$; $p < 0.001$). This duality of channels warrants further interpretation.

The direct pathway (H4) reflects the capacity of territorial embeddedness to generate privileged access to local resources without necessarily transiting through social capital: knowledge of local agro-pedological specificities, mastery of context-adapted irrigation technologies (such as drip irrigation widely developed in the Souss plain), and access to territorially anchored institutional funding schemes (Plan Maroc Vert, Génération Green).

By contrast, the indirect pathway, via social capital (H1 + H2), reflects a process of collective mobilization: networks of trust and reciprocity (characteristic of well-embedded cooperatives) facilitate the diffusion of adaptive best practices, collective learning, and resource pooling in response to climate risks. These two channels are complementary and correspond, respectively, to the structural and relational dimensions of organizational resilience as conceptualized by Duchek (2020).

In this regard, Chakir and El Moutaoukil (2022), in their study on the economic valorization of the city of Agadir, show that the most territorially embedded actors are also those that most effectively mobilize collective resources for innovation. This finding complements our model by suggesting that territorial embeddedness, beyond its direct effects on adaptation, acts as a catalyst for territorial collective intelligence.

The relationship between adaptation strategies and organizational resilience (H3: $\beta = 0.748$; $f^2 = 1.273$; $p < 0.001$) is the most robust result of the model. It confirms Duchek's (2020) conceptualization of resilience as a dynamic process encompassing anticipation, response, and transformation.

From an empirical perspective, the relatively low mean scores observed for technological items (CAS_TI2: $M = 2.778$) contrast with the strong overall impact of adaptation strategies on resilience. This suggests substantial room for improvement: cooperatives that enhance their technological adoption (irrigation systems, agricultural digitalization) could significantly strengthen their overall resilience. These findings extend the work of Below et al. (2012) on the determinants of adaptation strategies in Africa.

The relatively modest effect of territorial social capital on adaptation strategies (H2: $\beta = 0.314$; $f^2 = 0.131$), compared to the direct effect of embeddedness, can likely be explained by the institutional fragmentation observed in certain provinces (Tata, Tiznit), where inter-cooperative collaboration networks remain weakly formalized. This result nuances the conclusions of Putnam (1993) regarding the centrality of social capital in collective action.

More broadly, Chakir and Azzahidi (2023), in their analysis of the mediating role of territorial social capital between territorial economic intelligence and social innovation in Agadir, show that the knowledge absorption capacity of territorial actors amplifies the effect of social capital on innovation. Transposed to our model, this finding suggests that cooperatives with stronger organizational learning capacities derive greater benefits from their social capital in deploying more sophisticated adaptation strategies, particularly in the technological dimension, where performance scores remain comparatively low.

1.7. Conclusion

From a theoretical standpoint, this study makes three main contributions to the literature on territorial economics and organizational resilience.

First, it operationalizes and empirically tests an integrative model that links, within a SEM-PLS framework, three bodies of literature that have thus far remained only weakly connected: territorial economics (Pecqueur, 2006; Zimmermann, 2008), organizational resilience (Duchek, 2020; Weick & Sutcliffe, 2007), and cooperative entrepreneurship (Draperi, 2012). The validation of this model represents a significant step forward in formalizing the mechanisms underpinning resilience in social and solidarity economy (SSE) organizations.

Second, the study generates original data on Moroccan agricultural cooperatives, an underexplored empirical setting in the international literature on climate resilience, thereby enriching comparative research on climate adaptation in North Africa and the Mediterranean region.

Third, by disentangling the direct and indirect effects of territorial embeddedness, the study identifies two distinct logics of adaptation: a direct resource-access logic and a socially constructed resilience logic mediated through collective capital. This distinction opens promising avenues for future comparative research across territories.

The findings of this study offer several actionable insights for cooperative managers, support organizations, and public policymakers. For cooperative leaders, priority should be given to strengthening the institutional and identity dimensions of territorial embeddedness, which exhibit lower scores than the relational and cognitive dimensions. Concretely, this entails reinforcing partnerships with territorial institutions (ODCO, ANDZOA, Chambers of Agriculture), promoting geographical indication schemes (PGI, territorial labels), and formalizing collective climate intelligence and monitoring practices.

For public authorities, the results advocate for a territorial approach to agricultural climate adaptation, rather than a purely sectoral or individual-based perspective. Public policies would benefit from investing in the strengthening of local cooperative ecosystems, particularly through supporting inter-cooperative exchange platforms, providing training in water-efficient irrigation technologies, and developing collective climate insurance mechanisms. These recommendations are consistent with the strategic orientations of the Plan Maroc Vert (Génération Green 2020–2030), while emphasizing the critical importance of territorial and cooperative dimensions in the implementation of national climate adaptation strategies.

Despite the robustness of the findings, several limitations should be acknowledged. The cross-sectional nature of the survey does not allow for the establishment of strict causal relationships; longitudinal studies would be necessary to capture the temporal dynamics of the resilience process. The sample size (n = 152) limits the statistical power of certain subgroup analyses. The reliance on a single respondent per cooperative may introduce common method bias, although the results of Harman’s single-factor test suggest that this bias remains limited. Finally, the study focuses on a single Moroccan region; comparative inter-regional or cross-country research would be needed to assess the external validity of the proposed model and to identify contextual factors that may moderate these relationships.

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Appendix 1. Research Questionnaire

Cooperative Entrepreneurship and Climate Change Adaptation Strategies:
The Role of Territorial Embeddedness in the Resilience of Agricultural Cooperatives
Souss-Massa Region — Morocco

CONFIDENTIALITY & ETHICS NOTICE

This questionnaire is part of scientific research conducted by researchers at Ibn Zohr University (Agadir, Morocco). Its purpose is to better understand the role of territorial embeddedness in the climate adaptation strategies and organizational resilience of agricultural cooperatives in the Souss-Massa region.

Participation is entirely voluntary. You may withdraw from the survey at any time without any negative consequences. All responses are strictly anonymous and confidential: no nominative data will be published, and individual responses will never be disclosed to any third party. The data collected will be used exclusively for scientific research purposes and will be processed in aggregate form only.

By completing this questionnaire, you consent to the anonymous use of your responses for research purposes. If you have any questions about this study, please contact the research team.

Estimated completion time: 15–20 minutes.

Part I – Cooperative and Respondent Identification

Please complete the information below. Responses to this section are optional but help contextualize the results.

Variable	Response
Name of cooperative (optional)	___________________________
Province / Prefecture	☐ Agadir ☐ Inezgane ☐ Chtouka ☐ Taroudant ☐ Tiznit ☐ Tata
Main agricultural sector	☐ Horticulture ☐ Argan ☐ Citrus ☐ Livestock ☐ Date palm ☐ Other
Cooperative size (nb. members)	☐ < 10 ☐ 10-30 ☐ 31-50 ☐ > 50 members
Year of creation	Year: ____ Experience (years): ____
Gender of respondent	☐ Male ☐ Female
Role in cooperative	___________________________

Part II – Research Constructs

For each statement below, please indicate to what extent you agree or disagree using the following 5-point Likert scale:

1 – Strongly Disagree	2 – Disagree	3 – Neutral	4 – Agree	5 – Strongly Agree

Section A – Territorial Embeddedness (TE)

A.1 – Relational Dimension

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
TE_REL1	Our cooperative maintains close relationships with other territorial actors (farmers, traders, institutions).	☐	☐	☐	☐	☐
TE_REL2	We actively participate in professional networks and territorial cooperation platforms.	☐	☐	☐	☐	☐
TE_REL3	Local partnerships are essential for the development of our cooperative.	☐	☐	☐	☐	☐

A.2 – Cognitive Dimension

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
TE_C1	Our cooperative shares knowledge and practices with other actors in the territory.	☐	☐	☐	☐	☐
TE_C2	We benefit from technical and agronomic knowledge specific to our region.	☐	☐	☐	☐	☐
TE_C3	Collective learning within the territory enriches our skills.	☐	☐	☐	☐	☐

A.3 – Institutional Dimension

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
TE_INS1	Our cooperative benefits from the support of territorial institutions (local authorities, development agencies).	☐	☐	☐	☐	☐
TE_INS2	Local rules and norms facilitate our activities and development.	☐	☐	☐	☐	☐
TE_INS3	We respect and actively valorize local institutional conventions and practices.	☐	☐	☐	☐	☐

A.4 – Identity Dimension

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
TE_ID1	Our cooperative is proud to belong to this territory.	☐	☐	☐	☐	☐
TE_ID2	The territorial identity is an integral part of our image and our positioning.	☐	☐	☐	☐	☐
TE_ID3	The values and culture of our region are reflected in our practices.	☐	☐	☐	☐	☐

Section B – Territorial Social Capital (TSC)

B.1 – Structural Dimension

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
TSC_S1	Our cooperative has an extensive network of contacts at the territorial level.	☐	☐	☐	☐	☐
TSC_S2	Links between territorial actors facilitate the exchange of information.	☐	☐	☐	☐	☐
TSC_S3	We can quickly mobilize resources thanks to our territorial network.	☐	☐	☐	☐	☐

B.2 – Relational Dimension

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
TSC_RL1	Mutual trust between territorial actors is high.	☐	☐	☐	☐	☐
TSC_RL2	Relationships with local partners are based on reciprocity and solidarity.	☐	☐	☐	☐	☐
TSC_RL3	Our cooperative maintains strong and lasting ties with the local community.	☐	☐	☐	☐	☐

B.3 – Cognitive Dimension

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
TSC_C1	Territorial actors share a common vision of development.	☐	☐	☐	☐	☐
TSC_C2	There is a common language and shared codes that facilitate cooperation.	☐	☐	☐	☐	☐
TSC_C3	Our territory has shared norms and values that guide collective actions.	☐	☐	☐	☐	☐

Section C – Climate Adaptation Strategies (CAS)

C.1 – Agricultural Diversification

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
CAS_AD1	Our cooperative encourages crop diversification to reduce climate risks.	☐	☐	☐	☐	☐
CAS_AD2	We introduce crop varieties adapted to changing climatic conditions.	☐	☐	☐	☐	☐
CAS_AD3	The diversification of agricultural activities is part of our resilience strategy.	☐	☐	☐	☐	☐

C.2 – Technological Innovation

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
CAS_TI1	Our cooperative adopts water-saving irrigation techniques (drip, micro-sprinkler).	☐	☐	☐	☐	☐
CAS_TI2	We use technologies to improve water and soil management.	☐	☐	☐	☐	☐
CAS_TI3	Agricultural innovation is encouraged to adapt to climate challenges.	☐	☐	☐	☐	☐

C.3 – Risk Management

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
CAS_RM1	Our cooperative implements climate risk prevention and management systems.	☐	☐	☐	☐	☐
CAS_RM2	We have insurance or mutualization mechanisms for climate-related losses.	☐	☐	☐	☐	☐
CAS_RM3	Anticipatory planning for climate risks is regularly practiced.	☐	☐	☐	☐	☐

C.4 – Collective Mobilization

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
CAS_CM1	Our cooperative mobilizes members for collective actions against climate change.	☐	☐	☐	☐	☐
CAS_CM2	Awareness and training programs on climate adaptation are implemented.	☐	☐	☐	☐	☐
CAS_CM3	The collective commitment of members strengthens our capacity to face climate challenges.	☐	☐	☐	☐	☐

Section D – Organizational Resilience (OR)

D.1 – Anticipation

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
OR_ANT1	Our cooperative actively monitors climate developments and their potential impacts.	☐	☐	☐	☐	☐
OR_ANT2	We proactively identify future climate risks for our activity.	☐	☐	☐	☐	☐
OR_ANT3	Future climate scenarios are taken into account in our strategic planning.	☐	☐	☐	☐	☐

D.2 – Adaptive Capacity

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
OR_AD1	Our cooperative reacts quickly to unforeseen climatic events.	☐	☐	☐	☐	☐
OR_AD2	We adjust our agricultural practices according to climatic conditions.	☐	☐	☐	☐	☐
OR_AD3	Organizational flexibility allows us to adapt to climatic shocks.	☐	☐	☐	☐	☐

D.3 – Transformative Capacity

Code	Statement	1 SD	2 D	3 N	4 A	5 SA
OR_T1	Our cooperative is capable of reinventing itself in the face of profound climatic changes.	☐	☐	☐	☐	☐
OR_T2	We explore new business models to ensure our sustainability.	☐	☐	☐	☐	☐
OR_T3	Innovation and change are part of our organizational culture.	☐	☐	☐	☐	☐

Thank you very much for your participation!

Your contribution is invaluable for understanding the challenges facing agricultural cooperatives in the Souss-Massa region and for developing concrete recommendations to improve climate resilience.

The results of this study will be made available to the cooperative sector upon request. For any questions or comments, please contact the team research.