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How is climate change risk perception shaped? The role of risk framing, external incentives and personal norms in agriculture

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ABSTRACT

Arable farmers' perceptions of climate change risks are shaped by a complex interaction of individual values, economic pressures, and external incentives. Using the Value-Belief-Norm (VBN) theory, this study extends the climate change risk management literature by examining how factors such as risk framing, knowledge support, and economic incentives relate to these perceptions. Using qualitative data from 9 expert interviews, 16 focus groups, and 59 semi-structured interviews with Dutch arable farmers, the study explores how arable farmers shape their climate change risk perceptions through a dynamic interplay of personal values, economic pressures, and external incentives. Participants associated different framings of climate change—as a threat or an opportunity—with differences in risk appraisal and reported decision-making. Participants described external incentives as more useful when they aligned with personal norms and made responses financially and institutionally feasible. Participants' retrospective accounts linked perceived risk salience to experience, adaptation outcomes, and broader structural conditions; the cross-sectional design does not establish observed change over time. The study highlights the importance of understanding these interacting influences for designing context-sensitive climate adaptation strategies. The findings suggest that predictable financial, technical, and institutional support may make adaptation responses more feasible, but do not guarantee behaviour.

Keywords:
Decision-making, climate change, risk perception, personal norms, external incentives, agriculture

JEL classification:

D81 — Criteria for Decision-Making under Risk and Uncertainty

Q54 — Climate; Natural Disasters and Their Management; Global Warming

D91 — Micro-Based Behavioral Economics: Role and Effects of Psychological, Emotional, Social, and Cognitive Factors on Decision Making

1. INTRODUCTION

After an unusually wet spring and a patchy summer in 2024, Dutch arable farmers faced delayed sowing and saturated fields that narrowed workable windows for planting and harvest (KNMI, 2023). Price swings in staple crops underscored how quickly weather shocks can travel through markets (Potato News Today, 2024). In early 2025, a court ruling compelling the government to meet nitrogen targets intensified debate over how to frame environmental risk in farming (AP News, 2025). The IPCC describes such compound weather–market pressures as rising risks for European agriculture (IPCC, 2022). This study speaks to that divide by examining how framing interacts with farmers' values, beliefs, and incentives to shape what counts as climate risk in day-to-day decisions. We explore how arable farmers construct climate-risk perceptions, focusing on risk framing (opportunity vs. threat), personal values and norms, and external incentives, building on recent evidence that framing influences farmers' support for climate policies and sustainable practices (Byfuglien et al., 2025). Guided by Value–Belief–Norm (VBN) theory, we ask: *"How do arable farmers shape their climate-change risk perceptions?"* Although the RQ focuses on climate-risk perception, the analysis also examines how farmers describe the persistence of risk salience and the conditions under which perceived responsibility and personal norms are translated into adaptation intention. These constructs are treated as analytically distinct rather than as interchangeable stages or direct measures of actual behaviour.

Perception matters because it channels adaptation and mitigation choices in agriculture (van Valkengoed et al., 2024). Coping appraisals and perceived control are central to the risk–action link (Grothmann & Patt, 2005). Climatic trends are defined over multi-decadal baselines (IPCC, 2021). Judgments are filtered through socio-cognitive appraisals and social context (van der Linden, 2015). Perceptions include beliefs about reality, causes, and consequences of climate change (van Valkengoed et al., 2021). Access to information shapes how people evaluate climate risks (Whitmarsh & Capstick, 2018). Socio-demographic factors also influence interpretation and engagement (Ruiz et al., 2020). In farming, near-term shocks often feel more salient than slow trends (Weber, 2010). European assessments highlight how extremes and cascading impacts amplify agricultural vulnerability (IPCC, 2022). Seasonal timing makes anomalies especially consequential for planting and harvest decisions (Hansen et al., 2012). Even neighbours may form divergent views from the same events (Simelton et al., 2013). These interpretations affect yield strategies, water choices, and soil management on the ground (Fosu-Mensah et al., 2012), a pattern also observed in recent studies integrating farmers' perceptions into climate risk assessments in data-scarce agricultural contexts (Serrao et al., 2025).

Tail risks—low-probability, high-impact extremes—heighten vulnerability and can quickly overwhelm farm-level buffers (IPCC, 2022). Physical encounters with shocks, such as prolonged drought or intense rainfall, make short-term local variation more psychologically salient than gradual trends (Lehner & Stocker, 2015). For arable farmers, this subjectivity is consequential because livelihoods hinge on weather-sensitive decisions about crops, water, soils, and pest management (Fosu-Mensah et al., 2012). When tail risks cascade through input, processing, and

retail stages, supply chains become fragile and losses propagate beyond the farm gate (IPCC, 2022). Understanding this heterogeneity in risk perception is therefore essential for policy design: public interpretation of climate signals can facilitate or hinder implementation of measures in agriculture (Parsons & Nielsen, 2021). Notably, spatial distance from impacts is a weak predictor of perception, allowing divergent views to persist even within small areas (Parsons & Nielsen, 2021), as also documented in recent empirical work on farmers' climate-risk perceptions and adaptive vulnerability in semi-arid systems (Amosah et al., 2026) .

The VBN framework describes a theoretical pathway from values to beliefs (including awareness of consequences (AC) and perceived responsibility (PR)), to personal norms [1]and intention (Stern et al., 1999). Personal norms link moral obligation to pro-environmental behavior[2] (Stern, 2000). In environmental psychology, AC and PR are proximal drivers of personal norms (Hansla et al., 2008). Values, which can be biospheric, altruistic, and egoistic, systematically shape environmental priorities (de Groot & Steg, 2008). Personal norms can operate as an internal compass for action (de Groot & Thøgersen, 2021). Willingness to act depends on perceived manageability of the problem and one's response options (Xie et al., 2019). VBN pathways have been validated with latent-variable modeling (van Riper & Kyle, 2014), and meta-analytic evidence consolidates these determinants across studies (Bamberg & Möser, 2007). Acceptance of policy instruments aligns with values, beliefs, and norms in this framework (Lind et al., 2015). At the same time, recent climate-change scholarship emphasizes that these value–belief pathways unfold within regionally specific risk contexts, where climate signals, governance arrangements, and production systems jointly shape how risks are interpreted and acted upon (Pedde et al., 2025). By embedding VBN theory in the everyday decision environments of Dutch arable farming, this study connects micro-level moral and cognitive mechanisms to the broader, regionally differentiated climate-risk landscapes highlighted in contemporary climate-change research.

This study addresses four linked gaps based on empirical VBN studies in agriculture (Appendix 1) and offers corresponding contributions to advancing the application of VBN theory in agricultural risk management contexts. First, prior work rarely shows *how* opportunity versus threat messages shift appraisal interacts between "business challenge" and "environmental problem," and how that interaction influences awareness of consequences and felt responsibility in professional farming (van der Linden, 2015). We explore how different framings of climate change, as opportunities or threats, interact with farmers' baseline values, beliefs, and socio-economic conditions to shape their perceptions. By examining the dual pathways of optimism (opportunity framing) and heightened risk awareness (threat framing), the research provides nuanced insights into the role of framing in sustaining climate risk perceptions (van Riper &

[1] Personal norms are synonym for moral norms and internal norms. The term personal norms will be used in this study to keep the definitions aligned with the theory in this study: VBN theory

[2] Pro-environmental behavior is defined as: actions that individuals intentionally undertake to benefit the environment or minimize negative impacts on it (Stern, 2000).

Kyle, 2014), addressing conflicting findings in the existing literature (e.g., Sorvali et al., 2022; Razzaghi et al., 2023). Second, whether personal commitment operates on its own or requires policy and financial support remains under-specified for intensive, well-capitalized agriculture (Zobeidi et al., 2022). This study examines how external support can improve perceived manageability—through financial feasibility, institutional predictability, or operational support—and thereby enable existing personal commitments to be expressed as adaptation intentions. This mechanism aligns with evidence that acceptance of ecological management policies follows the VBN pathway (Lind et al., 2015). It also accords with findings that incentives can enhance the effectiveness of existing norms in higher-income contexts (Wensing et al., 2019). Together, these results highlight the conditional mechanisms that shift climate-risk perception across contexts. Third, existing research on climate change risk perception often treats it as a fixed cognitive outcome shaped by individual values (Stern, 2000) or framing effects (Sorvali et al., 2022; Razzaghi et al., 2023). However, this perspective overlooks the dynamic nature of risk perception, which evolves over time in response to farmers' experiences, adaptation success, and broader structural conditions. We explore participants' retrospective accounts of perceived temporal dynamics, including how opportunity framing may drift into complacency and threat framing may lead to fatigue when credible routes to act are absent (Xie et al., 2019). Finally, evidence from localized, high-capacity systems is scarce; using focus groups, expert interviews, and farmer interviews across six Dutch regions, we provide context-rich insight into how framing, incentives, and personal commitment interact.

This empirical field study uses qualitative methods to explore how arable farmers' climate change risk perceptions are shaped. The empirical fieldwork includes focus groups, expert interviews, and interviews with arable farmers from six Dutch regions. The six regions provide variation in soil, market, and weather-exposure contexts, enabling an exploratory comparison of how risk priorities are described across settings. The combination of methods provides context-rich insight into different sectoral, collective, and individual perspectives; it is not intended to provide a statistically representative picture of all Dutch arable farmers.

The structure of this paper is as follows. The next section dives into Dutch agriculture to underline the specific risk context. Then, the theory of the study will be elaborated. Following that, the methodology is outlined. The subsequent sections present the study's findings, discussion and conclusions.

2. DUTCH AGRICULTURE

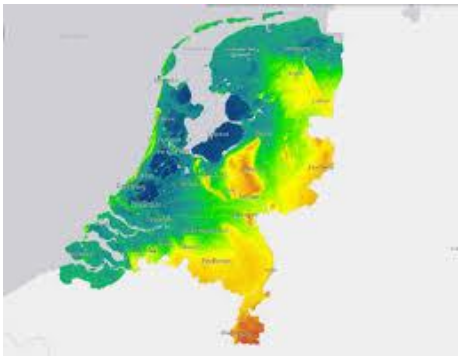
The Netherlands combines varied soils, groundwater regimes, and a low-lying coastal topography that together shape farming risk (Ministry of Economic Affairs and Climate Policy, 2021). Most arable land lies on fertile river clays, with substantial areas on sandy soils in the east and south (Esri Netherlands & Wageningen Environmental Research, 2021). Clay's low permeability raises waterlogging risk during intense rainfall, affecting planting windows and

crop choice (Pugliese et al., 2022). Sandy soils drain quickly, supporting diverse crops but increasing drought exposure and irrigation demand in dry spells (Jones et al., 2013). Groundwater dynamics and an extensive canal–dike network further condition field operations and flood protection (Ministry of Economic Affairs and Climate Policy, 2021). Elevation ranges from polders below sea level to uplands in South Limburg, producing distinct local risk profiles (Figure 1, 2).

Figure 1: The Netherlands in Europe



Figure 2: The Dutch landscape elevation range



Dutch farming is globally productive due to precision agriculture, greenhouse systems, and data-driven management (CBS, 2021). High technical efficiency enables high yields with relatively frugal resource use (Maestrini et al., 2022). Adoption, however, is constrained by market volatility and rising climate risks that complicate investment timing and payoff (Horlings & Marsden, 2014). Exposure to extremes has increased losses and operational disruption in recent years (Koop et al., 2017). Hail in 2017 and flooding in Limburg in 2021 damaged crops and infrastructure (KNMI, 2021). Consecutive dry summers since 2018 intensified salinization in coastal zones and strained freshwater supplies (Nieuwe Oogst, 2024). Salinity forces shifts toward tolerant cultivars or costly water measures, amplifying perceived risk and narrowing adaptation options (Landbouw, n.d.). Heavy rain also delays sowing and complicates cultivation on light soils, reducing flexibility for catch and dormant crops (Nieuwe Oogst, 2024a).

Climate shocks interact with markets to shape day-to-day risk management (Simelton et al., 2013). Potato prices recently spiked amid tight stocks and wet springs that delayed planting, underscoring income volatility (Opnieuw een Prijsstijging van Aardappelen, 2024). Farmers balance short-term survival against long-term sustainability as input costs, contract conditions, and regulatory changes shift (Patt & Schröter, 2008). Environmental pressures have triggered scrutiny of intensive systems for biodiversity loss, emissions, and soil degradation (van Grinsven et al., 2019). Sector initiatives promote nutrient stewardship, integrated pest management, and organic practices to align productivity with ecological goals (Brouwer et al., 2005). Policy reforms on nitrogen and climate have generated debate and protest, reflecting tensions between environmental targets and farm viability (Gonzalez-Martinez et al., 2021). Recent national policy shifts have heightened uncertainty and delayed investments in resilience and sustainability (Rijksoverheid, 2024). Budget cuts to nitrogen programs and the termination of a major rural

plan have created a moving regulatory baseline for farm decisions (USDA Foreign Agricultural Service, 2024). Producer organizations warn that unclear direction slows progress and complicates long-horizon adaptation planning (LTO Nederland, n.d.).

These regional differences motivated the inclusion of six study regions: Flevoland, Friesland, Betuwe, Brabant, Vechtdal, and Bollenstreek. The regional heatmaps were used to make participants' perceptions of the relative likelihood and impact of risks visible and to support an exploratory comparison of regional risk priorities. They are treated as contextual, group-level evidence rather than as statistically representative measures of regional farmer populations.

3. THEORY

Risk perception comprises multiple elements that shape how people act on specific issues (Slovic, 1987). Mapping these elements clarifies what constitutes *climate change risk perception* in agriculture. Understanding its determinants enables policymakers, researchers, and industry actors to design targeted strategies, incentives, and supports that match farmers' practical circumstances and opportunities (Leiserowitz, 2006 ; van der Linden, 2015; Xie et al., 2019).

3.1 Value–Belief–Norm theory and climate risk perception

The Value–Belief–Norm (VBN) framework links value theory, norm-activation theory, and the New Environmental Paradigm into a psychological account of pro-environmental action (Stern et al., 1999). VBN explains how values and environmental beliefs translate into behavior through the activation of personal moral norms. VBN describes a theoretical pathway in which stable values shape general beliefs about human–environment relations, which inform beliefs about consequences and personal responsibility; these beliefs may activate personal norms, which can in turn inform intention and behaviour (Stern, 2000). VBN has been widely applied to understand individual engagement[3] in pro-environmental behaviors and support for environmental movements. In this study, VBN is used to analyze how farmers' values and beliefs condition their climate-risk perceptions and, ultimately, their readiness to act.

In agriculture, VBN clarifies how farmers perceive climate risks and why they adopt or resist sustainable strategies. Values provide the base: biospheric (concern for nature), altruistic (others, future generations), and egoistic (self, income security) shape worldview and priority setting (Stern et al., 1999). Farmers with stronger biospheric values tend to see climate change as serious and feel obliged to act; egoistic values foreground immediate financial stability over distant environmental threats (Stern et al., 1999). Beliefs connect values to norms: a general ecological worldview filters risk information (Stern, 2000), and two proximal beliefs: awareness of

[3] Based on VBN theory, engagement in the environmental context encompasses active participation in decision-making, a spectrum of behavior from personal to public actions, and support for environmental movements driven by personal values and norms.

consequences (AC) and perceived responsibility (PR), bridge to personal norms (Hansla et al., 2008). AC is recognition of concrete harms (e.g., drought, soil loss, yield impacts), and may heighten concern about climate change. PR is the felt duty to address such harms(Hansla et al., 2008; Stern, 2000). Risk perception, perceived responsibility, personal norms, adaptation intention, and actual behaviour are therefore analytically distinct. A farmer may recognize serious climate consequences and feel responsible while postponing a response because land is rented, investment costs are high, or policy conditions are uncertain. In farming, strong PR may support practices such as soil and water stewardship and biodiversity protection (Rezaei-Moghaddam et al., 2020; Sargani et al., 2023).

VBN pathways are supported by latent-variable tests and behavior-change applications (van Riper & Kyle, 2014; de Groot & Thøgersen, 2021). Building on this logic, Section 3.2 examines how risk framing (opportunity vs. threat) conditions AC and PR, while Section 3.3 examines how external incentives interact with personal norms. Our scope is climate-risk perception rather than the full spectrum of farm behavior; we use VBN to articulate propositions linking values, beliefs, and perceived manageability in agricultural contexts. Here, perceived manageability refers to farmers' subjective appraisal of whether a response is feasible under the conditions they face (Xie et al., 2019). Economic efficacy refers specifically to perceived financial and market feasibility, while institutional predictability, technical and operational feasibility, tenure and investment security, and collective coordination are treated as distinct contributors to this appraisal. These conditions are understood as boundary conditions for translating personal norms into adaptation intention, rather than as direct determinants of climate-risk severity. Actual behaviour is not directly measured longitudinally in this study.

3.2 Opportunity versus risk framing

Within VBN, values form the basis for AC and PR beliefs, which activate personal norms that guide intention and behavior (Stern et al., 1999; Stern, 2000). Previous research indicates that climate-risk perception and willingness to act depend on socio-cognitive appraisals and perceived manageability (van der Linden, 2015; Xie et al., 2019). AC/PR are proximal drivers of norms (Hansla et al., 2008), and personal norms function as an internal compass for pro-environmental action (de Groot & Thøgersen, 2021). VBN pathways have been validated with latent-variable models (van Riper & Kyle, 2014). The three framing propositions are related but analytically distinct. P1 concerns how opportunity and threat framing shape climate-risk appraisal, P2 concerns the perceived persistence of risk salience, and P3 concerns the reported translation of framing into engagement and commitment.

Framing directs how farmers construe climate risks. Opportunity framing recasts climate change as a business challenge, stimulating proactive steps when actions appear financially viable. Threat framing elevates concern (AC) and moral engagement but rarely sustains action unless feasible pathways are visible and affordable (Sorvali et al., 2022; Razzaghi et al., 2023; Hansla et

al., 2008; van der Linden, 2015). Thus, framing may influence AC/PR and the perceived persistence of personal norms, while perceived manageability conditions whether these orientations are translated into adaptation intention.

Risk perception may be dynamic: experience, adaptation outcomes, and institutional context shift what feels manageable (Xie et al., 2019). Opportunity framing can normalize risk over time ("business as usual"), while threat framing sustains attention only when credible actions remain available. A balanced mix may help prevent complacency from optimism and fatigue from threat, provided actions are implementable and policies predictable (van der Linden, 2015).

Proposition 1. *A balanced combination of opportunity and threat framing enhances farmers' climate-risk perception, supporting short-term alertness and long-term sensitivity.*
Rationale: Framing shapes construal and, via AC/PR, activates personal norms; opportunity fosters proactivity when financially viable, while threat raises concern that endures only with feasible routes (van der Linden, 2015; Hansla et al., 2008; Sorvali et al., 2022; Razzaghi et al., 2023).

Proposition 2. *A balanced integration of opportunity and threat sustains long-term risk perception by preventing complacency and mitigating emotional fatigue.*
Rationale: Enduring engagement follows perceived manageability; coupling optimism with credible actions maintains attention over time (Xie et al., 2019; de Groot & Thøgersen, 2021; van der Linden, 2015). Here, long-term persistence refers to perceived risk salience rather than observed behavioural change.

Proposition 3. *Balancing framing dynamics sustains short-term engagement through optimism and long-term commitment by maintaining risk awareness.*
Rationale: Willingness to act tracks manageability and validated VBN pathways; opportunity and threat are complementary when action remains viable (Xie et al., 2019; van Riper & Kyle, 2014; Sorvali et al., 2022; Razzaghi et al., 2023). Engagement and commitment refer to reported orientations and intentions rather than verified behaviour.

3.3 Personal norms versus external incentives

Within VBN, AC and PR beliefs activate personal norms that guide evaluation of environmental threats (Stern et al., 1999; Stern, 2000). JEP studies show that risk perception and willingness to act depend on socio-cognitive appraisal and perceived manageability (van der Linden, 2015; Xie et al., 2019). AC and PR are proximal drivers of personal norms (Hansla et al., 2008), and personal norms operate as an internal compass for pro-environmental action (de Groot & Thøgersen, 2021). Acceptance of policy instruments also aligns with VBN constructs, linking values, beliefs, and norms to support for incentives and disincentives (Lind et al., 2015).

Across contexts, the influence of norms versus incentives varies. Incentives can reinforce or crowd out salience (Price & Leviston, 2014). Intrinsic motivation conditions whether rewards

yield durable change (Bopp et al., 2019). In higher-income settings, financial incentives are often effective when paired with existing commitments (Wensing et al., 2019). In low-resource settings, strong norms can sustain risk awareness without external rewards (Zobeidi et al., 2022). PR beliefs bolster recognition of climate vulnerabilities (Sargani et al., 2023), yet economic constraints, policy instruments, and markets shape how clearly risks are perceived (Momenpour et al., 2024; Zhang et al., 2024).

External financial incentives such as subsidies, grants, and cost-sharing primarily address economic efficacy by reducing upfront costs and downside risk (Wensing et al., 2019). Supportive programmes can also improve operational feasibility through technical advice and infrastructure, while stable programmes and clear regulations improve institutional predictability (Rezaei-Moghaddam et al., 2020). Tenure security and collective arrangements affect investment horizons and coordination, respectively, and should therefore be treated as distinct conditions rather than as forms of economic efficacy. Together, these conditions may make responses feasible enough for personal norms to be translated into adaptation intention; they do not necessarily determine perceived climate severity directly.Proposition 4. *In resource-rich settings, external incentives strengthen the influence of personal norms by reinforcing farmers' climate-risk perceptions and the salience of long-term concerns.*
Rationale: Incentives act as efficacy enablers that stabilize norm→intention pathways when infrastructure and finance are predictable (Lind et al., 2015; Wensing et al., 2019; Sorvali et al., 2022).

Market volatility, rising inputs, and thin margins can shift attention towards short-term survival and may diminish the salience of long-term climate risks (Badsar et al., 2023; Scottish Government, 2011). Under financial stress, acting on personal norms may become less feasible; external incentives may help maintain awareness and engagement when they restore a credible and affordable route to action (Zhang et al., 2024). Where upfront costs and returns are uncertain, subsidies and cost-sharing can reduce perceived risk and keep sustainable options viable (Wensing et al., 2019). Incentives may also stabilize framing under pressure by reducing the risk of disengagement (Sorvali et al., 2022; Zhang et al., 2021).

Proposition 5. *Economic pressures diminish the salience of climate-risk perception, increasing reliance on external incentives to sustain awareness and cognitive engagement with environmental threats.*
Rationale: Willingness to act tracks perceived manageability; when economic efficacy falls, risk salience may decline and adaptation intention may be deferred unless external incentives restore feasibility (Xie et al., 2019; van der Linden, 2015; Wensing et al., 2019).

4. METHODS

4.1 Research design and data collection

To investigate how arable farmers construct their perceptions of climate change risks, the study follows an exploratory qualitative design. Qualitative inquiry excels at exposing the interplay of personal beliefs, farm-level realities and macro-level pressures because it captures participants' own vocabularies and lets unanticipated themes emerge (Marshall & Rossman 2016; Tracy 2024). The three data sources served complementary analytical functions. Expert interviews provided sectoral context and helped identify salient risk domains; focus groups used heatmaps to elicit group-level assessments of the relative likelihood and impact of these risks; and farmer interviews captured individual experiences, interpretations, and decision conditions. For each proposition, the available material from each source was reviewed separately, and supporting, contrasting, or contextual evidence was selected where relevant. In the present analysis, the sources are therefore treated as complementary rather than as a single integrated dataset (Creswell & Poth 2018; Patton 2015). This study therefore investigates how different framings (opportunities versus risks) interact with farmers' baseline values, beliefs, and socio-economic conditions to shape their perceptions, the interplay between personal norms and external incentives, and cross-regional comparative evaluation of how cultural and social differences shape the pathways outlined in VBN. Table 1 summarizes where and when empirical material was gathered, and what the main purpose was.

The interviews and focus groups were explicitly designed to explore the five propositions developed in the theoretical framework, focusing on: a combination of opportunity and threat framing (P1, 2, 3), and personal norms versus external incentives (P4, 5).

Table 1: Empirical material

Method	Participant	Profile	Timing & venue	Format	Key purpose / outputs
Expert interviews	9 interviews	Researchers; knowledge-transfer specialists (Delphy); agricultural accountants (Flynth); Greenport D&B	Online, May–Jun 2023	Semi-structured; 8 Dutch, 1 English	Reconstruct sector evolution; identify 30 salient risks across finance, climate, environment, entrepreneurship (Appendix 3)
Focus groups	16 groups (11 face-to-face, 5 online) × 2–5 participants	Farmers; researchers; Ministry of LNV[4], Staatsbosbeheer[5]; crop-protection specialists	Flevoland Bloeit event (Jun 2023); online sessions (Jan–Mar 2024)	Heat-map exercise with 30 risk cards; Dutch	Make participants' relative assessments of risk likelihood and impact visible; support discussion of group-level and regional risk priorities (Appendix 4)
Farmer interviews	59 interviews conducted by the project team[6].	Arable entrepreneurs[7] diverse in age, farm size, tenancy status, succession prospects	Across six regions, May 2023–Mar 2024	Semi-structured; Dutch	Weather-shock experiences, climate attitudes, resources and trade-offs driving adaptation decisions

To contextualize the qualitative analysis, the study sample comprised farmer-owners and farm workers from six Dutch regions, varying in farm scale, production focus, age, and experience. This heterogeneity captures both established practices and newer climate-risk-management strategies; most farms were family-owned. In the Netherlands, SME status is based on economic size, expressed in Standard Output (SO), rather than a fixed hectare threshold. Thus, farms averaging 64 hectares (range: 2–280 ha) may still qualify as SMEs. Turnover, profit, and detailed financial data were not collected to safeguard openness during interviews, as these may reveal personal income. Most farms employed one to three permanent workers, supplemented by contractors or seasonal labour during peak periods. Soil types and crop portfolios varied across farms and regions. These characteristics are reported solely to contextualize the qualitative analysis and do not constitute analytical variables or imply statistical representativeness.

4.2 Data coding and analysis

The expert interviews were transcribed and coded in MAXQDA using the following categories: general questions for interviewees, introduction, perceived risks and opportunities, managing

[4] *The Ministry of Agriculture, Nature and Food Quality works on sustainable food, valuable nature and a vital countryside*. Ministerie van Landbouw, Natuur en Voedselkwaliteit | Rijksoverheid.nl
[5] Staatsbosbeheer manages the green heritage Startpagina Staatsbosbeheer. Het zit in onze natuur
[6] Interviewers work together in the project "Van crisismanagement naar Risicomanagement". They are researchers from Inholland UAS, Van Hall Larenstein, Aeres UAS and HAS Green Academy.
[7] From six Dutch arable regions that differ in soil type, market orientation and exposure to extreme weather: Flevoland, Oost-Friesland/Terschelling, Betuwe, Zuidoost Brabant, Vechtdal, Duin- en Bollenstreek

risks/opportunities, network, governance, and future perspective on development of climate change. For these transcripts, the researchers designed a data structure with first-order constructs, high-order constructs and aggregated issues. The researcher discussed the data structure with two secondary researchers in a Devil's Advocate meeting[8]. A second, more focused round of analysis was conducted to deepen understanding of their climate risk perception and competing priorities. Analytical categories were aligned with the five theoretical propositions. To explore the balance of opportunity and threat framing and personal norms versus external incentives, the researchers systematically identified supporting material across the empirical sources. Drawing on the approach of Gioia et al. (2013), a structured coding framework was developed. This method emphasized iterative comparison and interpretation, with a strong emphasis on traceability, thematic alignment, and analytical flexibility to refine emerging insights. While the broader logic of case-informed theory building follows Eisenhardt (1989), the data structuring and coding process aligns more directly with Gioia's methodology for inductive concept development. The five propositions guided the organisation of the analysis but did not determine all categories in advance. We also retained recurring patterns and themes that emerged from the empirical material.

The heatmap exercise provided a visual representation of how participants perceived the relative likelihood and impact of the identified risks. This made differences in perceived risk priorities immediately visible, including to participants without a statistical background. The heatmaps were used descriptively to identify group-level and regional patterns and to support discussion; they were not treated as statistically representative measures or quantitative estimates of risk prevalence. For the live focus groups, heatmaps created by participants were photographed and compared to identify common patterns and divergences in risk prioritization across groups. By reviewing these images with the risk-identification data, the researcher identified patterns of consensus and divergence. Notes from the discussions were used to contextualize these patterns. In the online focus groups, a similar approach was applied in real-time. For each case area, participants contributed to a heatmap during the session, allowing the group to visually assess and discuss risk prioritization and perception directly. This approach enabled immediate feedback and discussion, as participants could explain their reasoning, clarify uncertainties, and reach a consensus on risk prioritization.

Data from the semi-structured interviews with agricultural entrepreneurs were recorded in the master file containing the questions from Appendix 2. The interviews were conducted on site by a fixed project team of researchers[9] involved in the same project. They were not audio-recorded or transcribed; interviewers documented participants' answers as fully as possible in the master file.

[8] In the Devils' Advocate meeting, the researcher explained to two secondary researchers Nikki Numan and Jesper Beverdam how the data structure was built and how the aggregated issues were compiled. The secondary researchers asked critical questions about the process, reasoning and substantive conclusions.
[9] Researchers Jolien Lelivelt, Thijs Frenken and Ilse Ubels

The full interview protocol was used in four regions[10], whereas interviews in two regions[11] focused on organisational and personal-level questions. This variation reflects the flexible nature of semi-structured interviewing, in which the order and depth of questions can be adapted to the interviewee's background, responses, and available time, while the relevant core topics remain comparable (Creswell & Poth 2018; Patton 2015). One researcher[12] reviewed the complete set of recorded notes and identified material relevant to each proposition. Cross-regional comparisons were made only for topics covered in all six regional interview sets; topics not collected in the two partial-protocol regions were treated as unavailable rather than as evidence of absence and were not used for six-region comparisons. The coding unit was the answer or note segment recorded for an interview question. To support consistency, the analysis used the common protocol, the fixed interviewer team, centralised review, and comparison of recurring, contrasting, and boundary cases; no formal inter-coder reliability statistic was calculated for the farmer notes.

Quotations from expert interviews are based on the interview transcripts, whereas quotations attributed to farmer interviews reproduce the wording recorded in the interviewer's notes rather than transcript excerpts.

Table 2 provides an illustrative coding trace from empirical material to first-order codes, higher-order themes, and propositions; extended excerpts and supporting citations are provided in Appendix 5.

Table 2. Illustrative coding trace from empirical material to propositions

Data source	Illustrative empirical material	First-order code	Higher-order theme	Proposition(s)
Expert interview transcript	"Measures happen when conditions demand it"	Adaptation is conditional on context	Opportunity framing and feasibility-dependent engagement	P1, P3
Farmer interview notes	"We'll act if it pays off; every investment hits income"	Profitability as an action threshold	Economic efficacy and perceived manageability	P4, P5
Focus-group heatmap and discussion material	Relative placement of risk cards by likelihood and impact	Relative risk prioritisation	Group-level risk salience and regional nuance	P1, P2

[10] Bollenstreek, Betuwe, Oost-Flevoland and Vechtstreek.
[11] Zuidoost Friesland and Brabant
[12] The first author of this paper

5. FINDINGS

We interpret the results through a theoretical bridge linking the VBN pathway (values → beliefs: AC/PR → personal norms → intention) to perceived manageability/economic efficacy as a boundary condition for norm enactment. This bridge guides how we read framing effects and the role of incentives in shaping climate-risk perception[13].

To keep the main text lean, all literature citations that inform interpretation are provided in Appendix 5, together with extended quotes and robustness checks. The Findings below draw on three complementary sources: farmer interviews, expert interviews, and focus groups in Dutch arable farming. For each proposition, the available material from each source was reviewed separately, and supporting, contrasting, or contextual evidence was selected where relevant. We use brief, anonymized source tags after excerpts *(farmer interview)*, *(expert interview)*, *(focus group).* Expert excerpts are based on interview transcripts, whereas farmer excerpts reproduce wording recorded in interviewer notes and are not transcript excerpts.

Analytically, we report patterned themes identified in the available material for each proposition, compare evidence across sources where relevant, and note negative cases/boundary conditions. We indicate when evidence converged or diverged across farmer interviews, expert interviews and focus groups. The excerpts are illustrative rather than exhaustive; fuller passages and additional examples appear in Appendix 5. Because the data are qualitative and cross-sectional, references to persistence, change of influence concern participants retrospective accounts amd analytically inferred patterns rather than observed longitudinal or causal effects. The focus is interpretive: the Findings describe how participants related risk, responsibility, norms, intention, and feasibility, not independently measured behaviour.

5.1 Opportunity versus risk framing

Proposition 1: Participants described opportunity and threat framing as shaping climate-risk appraisal in different ways; in their accounts, combining the two was associated with alertness and engagement when feasible routes to action were visible. Opportunity framing tended to recast climate change as a business challenge rather than an existential environmental problem (AC acknowledged; PR latent). Farmers described evaluating options through profitability and operational feasibility: *"we'll act if it pays off; every investment hits income"* (farmer interview; AC present, PR not activated without manageability), and reported pragmatic adjustments (earlier or later sowing, shorter-cycle cultivars, crop switching) as routine risk management rather than *"climate action."* Experts echoed this entrepreneurial construal: *"measures happen*

[13] Climate-risk perception refers to participants' appraisal of the severity and relevance of climate-related risks. Risk salience refers to the prominence and persistence of these risks in participants' accounts; personal norms refer to a felt obligation to respond; and adaptation intention refers to reported willingness or commitment to act. Actual behaviour was not independently or longitudinally measured.

when conditions demand it" (expert interview; norms instrumental, gated by feasibility). In contrast, threat framing heightened perceived severity and urgency where harms felt irreversible or place-bound (soil loss, salinity, water scarcity): *"erosion cuts yields for years; fixing it costs and doesn't earn"* (expert interview; AC↑). Yet raised concern did not consistently translate into reported adaptation intentionunless viable, affordable pathways were visible (PR → personal norms only when manageability is credible). Action thresholds were repeatedly located in downside financial risk *"weather hits the wallet—then we move"* (farmer interview; AC↑, PR contingent on feasibility). When markets offset losses, participants did not necessarily report an intention to make pro-social choices (*"you sell to the highest bidder,"* farmer interview; egoistic values dominate; PR not engaged).

Two boundary patterns tempered these effects. First, once workable routines existed, opportunity framing sometimes normalized risk as *"business as usual,"* dampening urgency even as adjustments continued: *"it's always been variable; we're more adaptive now"* (farmer interview, AC narrow; PR low). Second, when hazards felt uncontrollable or prohibitively costly (e.g., prolonged drought, high irrigation costs), threat framing slid into resignation: *"some plots we just abandon; you can't recoup that system"* (farmer interview; AC high, manageability↓ → PR/norms stall). Policy instability amplified both tendencies; unclear rules and shifting programs encouraged deferral: *"we need clarity to decide"* (farmer interview; institutional efficacy gates PR → norms), whereas credible options (infrastructure, technical support, predictable finance) helped maintain attention without fatigue and made opportunity frames easier to translate into reported intention (manageability↑ → PR/norms engage).

In simple terms, how farmers *see* climate risk depends on both the message and what feels doable. In the VBN view, people move from values to beliefs—awareness of consequences (AC) and personal responsibility (PR)—which then activate personal norms and, where feasible, adaptation intention. Opportunity framing shifts the lens from "environmental crisis" to "business challenge," helping farmers translate climate signals into concrete, profitable steps; threat framing keeps the issue serious, but only leads to action when clear, affordable routes exist. Across our data, threat framing was associated with greater emphasis on consequences in the accounts, yet PR and personal norms translated into intention only when farmers perceived real manageability (financial and institutional support). Without stable rules and visible means, threat bred fatigue and opportunity slid into complacency. The takeaway: pair opportunity (what to do, at what cost) with calibrated threat (why it matters, over what horizon) and back it with predictable support (cost-sharing, technical guidance, clear timelines). That combination sustains short-term alertness and long-term sensitivity to climate risks.

Proposition 2: Participants' accounts suggested that combining opportunity and threat framing could help sustain perceived risk salience by limiting complacency and fatigue.. Opportunity framing initially produced optimism and control (manageability↑ → AC scope narrow; PR low). Farmers anchored risk in the here-and-now: *"we'll handle it when it comes"* (focus group; reactive AC), and pointed to buffers (earlier sowing, shorter-cycle cultivars, hail nets) as proof of

manageability, postponing consideration of slower, systemic risks. Threat framing broadened horizons: soil degradation, salinity, and water scarcity felt cumulative and irreversible: *"erosion cuts yields for years"* (expert interview; AC↑), and sharpened trade-offs between immediate returns and long-term soil and water health: *"a good harvest now may compact the soil for later"* (farmer interview; PR considered but contingent on feasible alternatives).

Over time, each frame showed limits. Opportunity could normalize climate variability as routine, dampening urgency once routines existed: *"we're more adaptive now"* (farmer interview; AC narrow; PR low; complacency risk). Threat could overextend concern into strain where solutions seemed unaffordable or ineffective, like *"some plots we just abandon"* (farmer interview; AC high, manageability↓ → PR/norms fatigue). Economic position steered trajectories: business-oriented farmers treated volatility as a bet: *"you can earn multiples if supply shifts"* (focus group; egoistic values; PR not engaged), while financially constrained farmers worried more yet deferred action: *"I can't afford two bad years"* (farmer interview; AC↑, PR blocked by low manageability).

Context moderated both complacency and fatigue. Clear, stable policies and accessible programs kept threat salient without burnout and made opportunity actionable: *"we need clarity to decide"* (farmer interview; institutional efficacy↑ → PR/norms engage). Confusing or shifting rules encouraged deferral: *"schemes contradict each other"* (farmer interview; institutional efficacy↓ → PR stalls). Collective arrangements (e.g., joint water retention) translated concern into feasible steps (expert interview; manageability↑). The heatmaps also indicated regional differences in perceived risk priorities rather than a single common ranking. Drought was especially salient in Friesland and Brabant, while water-quality, salinity, and water-related risks were more prominent in Flevoland. Temperature change, disease and pests, and waterlogging also received attention across the regions, with their relative emphasis varying between areas. In Betuwe, temperature increase was additionally associated with a perceived revenue benefit, illustrating that the same climate-related change could be construed as both risk and opportunity. These patterns are descriptive group-level findings from the focus groups, not statistically comparable or representative regional estimates.

In plain terms: keeping farmers alert to climate risks isn't about more scary messages or more upbeat stories. It's about pairing the message with credible ways to act. In VBN language, threat framing raises awareness of consequences (AC), but this only turns into personal responsibility (PR) and personal norms when the options are clear, affordable, and supported. Opportunity framing helps by translating climate signals into concrete, profitable steps, while threat framing keeps the issue serious. Without feasible routes, opportunity drifts into complacency and threat into fatigue. The sweet spot is a balanced mix: optimism linked to specific actions and timelines, seriousness tied to feasible routes and support. That combination sustains long-term sensitivity to climate risks in everyday farm decisions.

Proposition 3: Participants' accounts linked balanced framing to reported short-term engagement and longer-term commitment when credible and feasible routes to action were available. In the near term, participants described opportunity framing as increasing perceived control and kept attention on workable, profitable steps (manageability↑ → AC narrow; PR low). Farmers described treating variability as a business problem: *"we'll handle it when it comes"* (focus group), and pointed to buffers such as sowing shifts, shorter-cycle cultivars, and protective measures as evidence that risks were manageable (farmer interviews). This kept engagement practical but reactive, with responsibility for broader climate harms rarely foregrounded (PR not activated).

Threat framing widened horizons: soil degradation, salinity, and water scarcity were construed as cumulative and partly irreversible: *"erosion cuts yields for years"* (expert interview; AC↑). Where credible options existed, threat also legitimated responsibility-taking: *"a good harvest now may compact the soil for later"* (farmer interview; PR considered when alternatives are feasible). Absent feasible routes, however, sustained exposure to threat slid toward strain and disengagement, *"some plots we just abandon; you can't recoup that system"* (farmer interview; AC high, manageability↓ → norms stall).

Participants' retrospective accounts described different longer-term tendencies for each frame. Opportunity sometimes normalized risk as *"business as usual,"* especially after repeated successful workarounds: *"we're more adaptive now"* (farmer interview; complacency risk). Threat sometimes produced fatigue when costs were high or policies unstable: *"schemes contradict each other… I'm holding off investing"* (farmer interview; institutional efficacy↓ → PR stalls). Economic position shaped these trajectories: market-oriented farmers emphasized upside volatility: *"you can earn multiples if supply shifts"* (focus group; egoistic values; PR low), whereas financially constrained farmers reported heightened worry but postponed action without support: *"I can't afford two bad years"* (farmer interview; AC↑, PR blocked by feasibility).

In everyday terms: messages appear more likely to influence adaptation intentionwhen people see a clear way to act. In the VBN model, awareness of consequences (AC) must be followed by a felt sense of responsibility (PR) and a personal "should" to act (personal norms). We found that optimistic, opportunity messages help when they spell out *what* to do and *what it will cost*, while serious, threat messages help when they explain *why it matters* and *over what time frame*. Crucially, both need predictable support: simple rules, stable policies, and affordable options. Put together, this balance keeps farmers engaged in the short term and committed over the long term.

5.2 Personal norms versus external incentives

Proposition 4: In the resource-rich setting examined, participants described external incentives as enabling the translation of personal norms into adaptation intention when financial and institutional conditions made action feasible and worthwhile. Incentives reduced downside risk, supplied know-how, and validated farmers' sense that addressing climate risks is the "right"

thing to do: turning awareness into responsibility and intention when finance and infrastructure were predictable (manageability↑ → PR → personal norms).

Across interviews, farmers acknowledged mounting hazards: *"the weather is becoming both wetter and drier… damage is increasing*" (farmer interview), but emphasized feasibility constraints. Capital lock-in and tight credit blunted follow-through: "*previous investments aren't depreciated… banks won't lend; you're stuck in a framework*" (expert interview). Where incentives lowered costs or de-risked adoption, participants described norm-related commitments translating into intended or reported concrete steps: "*subsidies allowed us to invest in a tire-pressure exchanger*" (farmer interview). Farmers also wanted incentives tied to place-based planning: "*subsidies should facilitate long-term regional plans*" (farmer interview).

Incentives worked best alongside collaborative capacity. Multi-stakeholder arrangements helped convert concern into coordinated action: "*collaboration between farmers, water boards, and nature organizations is key… long-term leases make soil investments worthwhile*" (farmer interview). Technical and institutional support clarified goals and mechanisms: "*bundling fertile lands and managing the water system can really make a difference*" (farmer interview), and reinforced the idea that risks are shared and manageable.

Boundary conditions were clear. System transitions were perceived as disruptive: "*transitions don't happen gradually… it places a heavy burden on the entrepreneur*" (expert interview), and could create cognitive overload if incentives were not stable and simple. Policy volatility eroded trust and engagement: "*rules are too strict and constantly changing… unreliable*" (farmer interview); "*schemes contradict each other*" (farmer interview). By contrast, credible regional governance sustained cooperation: "*the province looks for opportunities within national policies*" (farmer interview).

Put simply, incentives work when they make action feel doable. In VBN terms, they keep awareness of consequences high and turn personal responsibility into something people can realistically take on. So personal norms ("I should act") become actual intentions. That happens when costs are shared, steps are clear, and there's coordination across partners. Without predictable, trusted support, even strong convictions stall and concern fades. The practical recipe is stable, collaborative, place-based programs that lower hassle and risk. So that moral commitment can turn into concrete, sustained action.

Proposition 5: Participants' accounts linked economic pressure to narrower climate-risk salience and greater reliance on external incentives to maintain engagement with environmental concerns. When prices fluctuated and input costs rose, farmers described prioritizing short-term survival over long-term sustainability (manageability↓ → PR/personal norms stall). Decisions were framed as business calculations: "*Potato farmers with large storage capacities hold their stock until they can sell at a good price*" (expert interview); "*Harvesting slightly earlier can yield a much better price*" (farmer interview). Supply-chain concentration further constrained autonomy: "*thousands of farmers depend on a handful of purchasing organizations… this narrowing makes*

it complicated" (expert interview), and shifted attention to market risk rather than environmental risk: "*You can't influence the weather, so the focus quickly shifts to the market*" (farmer interview).

Under financial stress, AC (awareness of consequences) remained present. Farmers recognized worsening extremes, but PR (responsibility) became contingent on feasibility and cash flow: "*If the land isn't yours, you won't invest in improving it…*" (farmer interview). Capital lock-in and credit barriers blunted follow-through: "*Previous investments aren't depreciated… banks won't lend; you're stuck in a framework*" (expert interview). In this context, incentives acted as anchors that kept climate risks cognitively prioritized and made intended responses more feasible: "*Subsidies should be used to facilitate long-term regional plans*" (farmer interview); "*Subsidies can support a long-term vision for a region and the supply chain… you can't expect every farmer to map this out alone*" (farmer interviews).

Even so, some farmers reported using low-cost adaptations: "*I planted a windbreak… use wind nets and support mesh*" (farmer interview), but many postponed larger, systemic investments without predictable support: "*We need measures that actually work… a clear goal to aim for*" (farmer interview). Policy uncertainty amplified the dampening effect of economic pressure: "*rules are changing… unreliable*" (farmer interview), pushing decisions toward deferral despite concern about the future of the sector: "*Right now, it's hard to say what will happen… should we reduce or not?*" (farmer interview).

When money is tight, people focus on keeping the lights on. Farmers still see the climate risks, but unless there's a clear and affordable way forward, responsibility and "I should act" don't turn into action. (In VBN terms: AC remains high, but low perceived manageability prevents PR → personal norms → intention.) Incentives help by lowering costs, spelling out steps, and coordinating partners, so awareness becomes responsibility and intention. Without predictable support, even motivated farmers defer decisions. The practical recipe is steady finance, simple rules, and regional collaboration that make the sustainable choice the workable choice.

6. CONCLUSIONS

These findings suggest, in participants' accounts, that arable farmers' climate-risk perceptions were shaped less by message frequency than by how risks were construed and whether responses appeared manageable. Opportunity framing recasts climate change as a business risk, helping farmers translate signals into concrete, profitable steps. Threat framing raises seriousness, but it rarely sustains engagement without visible, affordable pathways. Across cases, incentives and governance structures were described as enabling conditions: predictable finance and rules supported the translation of personal commitment ("I should act") into reported intention ("I will act"), whereas tight margins and policy uncertaintycoincided with narrower risk salience and deferred decisions. Participants' retrospective accounts linked changes in risk salience to experience, adaptation outcomes, markets, and institutions. Here, complacency and fatigue are

analytical interpretations of reduced salience or engagement, not observed within-person changes.

The contribution to environmental psychology is to specify perceived manageability as a boundary condition on the translation of personal norms into reported adaptation intention within VBN. Personal norms may remain present when responses are constrained; actual behaviour was not independently or longitudinally measured. We also clarify framing pathways, opportunity was associated with business-oriented appraisal, whereas threat was associated with greater attention to consequences. A balanced combination was described as supporting alertness and engagement when feasible routes remained available.

7. DISCUSSION

In participants' accounts, farmers' climate-risk perceptions hinged less on message volume than on how risks were construed and whether a response appeared manageable. Opportunity framing was described as recasting climate change as a business challenge, whereas threat framing was described as heightening attention to consequences but not consistently accompanying reported engagement or adaptation intention when credible pathways were unavailable. Within VBN, personal norms may remain present while reported intention is deferred; perceived manageability therefore functions as a boundary condition shaped by financial and market feasibility, institutional predictability, and related implementation conditions (Stern, 2000; Stern et al., 2000; Xie et al., 2019). Echoing recent Climatic Change evidence that framing effects in agriculture are conditional on institutional and economic feasibility rather than message content alone (Byfuglien et al., 2025) .

Work often posits that opportunity fosters optimism/proactivity and threat activates norms/longer-term engagement (Sorvali et al., 2022; Razzaghi et al., 2023; Zhang et al., 2021). Our evidence qualifies this: farmers engage when actions are economically viable and institutionally supported. Opportunity does not erase risk; it reframes it as an operational challenge. Threat framing was associated with greater attention to consequences but was not necessarily accompanied by reported personal responsibility or adaptation intention when feasible routes were absent (Stern, 2000; Razzaghi et al., 2023). Participants' retrospective accounts suggested that opportunity could normalize risk and threat could be accompanied by fatigue under low manageability; these are inferred patterns rather than observed within-person temporal changes.A "balanced" mix was described as more workable under stable policy and finance (Zhang et al., 2024; Pedde et al., 2025). Here, complacency and fatigue are analytical descriptions of reduced salience or engagement, not judgements about farmers' motives.

VBN highlights AC/PR-based personal norms; policy supports and subsidies may create conditions for norm and enactment (Price & Leviston, 2014; Bopp et al., 2019). Consistent with Wensing et al. (2019) and Sorvali et al. (2022), participants described incentives as reducing perceived downside risk and supporting feasible responses under pressure (Zobeidi et al., 2022;

Badsar et al., 2023). Participants described subsidies primarily as business tools rather than norm validators; intrinsic motivation did not necessarily strengthen (Momenpour et al., 2024). Financial incentives, technical support, predictable regulation, tenure security, and collective arrangements address different constraints and are not interchangeable. Collaborative governance and technical support enabled longer-term, integrated strategies (Rezaei-Moghaddam et al., 2020). Market volatility and supply-chain power bounded what felt manageable, showing that incentives alone are insufficient without broader market/policy reforms, a pattern consistent with empirical studies documenting how farmers' risk perceptions and adaptive responses are embedded in local institutional and market constraints (Serrao et al., 2025; Amosah et al., 2026).

Theoretically, the findings position perceived manageability as a boundary condition for translating personal norms into adaptation intention within VBN. It includes distinct financial and market, institutional, technical and operational, tenure and investment, and collective conditions. Low adaptation intention should not automatically be interpreted as weak norms, and actual behaviour was not independently measured. Framing pathways are also distinct: opportunity was associated with business-oriented appraisal, while threat was associated with greater attention to consequences and risk salience. A balanced combination was described as supporting alertness and engagement when feasible routes remained available.

Practical implications for agriculture, policymakers, and researchers include pair framing with predictable support: accessible finance (cost-sharing, low-friction credit), stable regulation (clear timelines, simple compliance), and place-based collaboration (coordinated water–soil programs). Advisory messages should answer two questions up front: *what exactly should I do, and at what cost?* and *why does it matter, over what horizon?* Such measures may make sustainable choices more workable and help maintain attention to climate risk, but they do not guarantee behaviour. These implications address feasibility constraints; they do not imply that farmers' pragmatic choices are irrational or morally deficient.

Findings derive from qualitative interviews and focus groups within one national sector, which constrains transferability. The purposive sample and descriptive heatmaps cannot establish statistical representativeness or directly comparable regional estimates. The cross-sectional design supports retrospective and interpretive inferences rather than longitudinal causal claims, and actual behaviour was not independently measured. Because two regions used a partial interview protocol, cross-regional comparisons are limited to topics covered in all six regional interview sets. The shared project context and common fieldwork approach support procedural consistency, but the present interpretation is limited to the empirical material analysed here rather than the wider project evidence.Future research should (i) test the proposed economic-efficacy moderation of norm→intention pathways, (ii) examine temporal dynamics of framing (normalization vs. sustained engagement), (iii) compare regions with distinct cultures, climates, and governance, and (iv) assess how policy clarity, regulatory consistency, and institutional trust shape risk salience and adaptation intention (Zobeidi et al., 2022), including comparative work across high-capacity and resource-constrained farming systems as suggested by recent Climatic

Change and related environmental research (Serrao et al., 2025; Amosah et al., 2026). Mixed-methods designs and larger samples can strengthen generalizability while preserving the mechanistic focus developed here.

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Linda Snippe: conceptualization, methodology, software, investigation, resources, data curation, writing - original draft, writing - editing, project administration, funding acquisition.

Pieter Jansen: conceptualization, methodology, writing – review.

Nazim Hussain: writing – review.

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