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An Analysis of Facebook Pages Promoting Sustainable Agricultural Practices to Combat Climate Change

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ABSTRACT

Aim of the Study: Facebook carries a steady stream of sustainability messaging, but not all of it travels. This study explore the answers of three simple questions: which sustainable practices get visibility, how those posts are framed, and what that means for engagement?

Methodology: Using a mixed-methods content analysis, we examined 23 public posts from five high-reach sustainability pages sampled from January to June 2025. We coded practice categories, primary frames, calls to action, and post format, and captured likes, shares, and comments. Pages are anonymized as P1–P5 to align with ethical handling of public content.

Findings: The findings showed that visual formats outperform text-only posts on both likes and shares. Consequence and personalization frames are the workhorses of engagement, while policy and efficacy cues appear rarely. A simple engagement profile emerges: images and videos paired with concrete outcomes invite more interaction; awareness-only posts draw attention but stall. Interpreted through Framing Theory and Diffusion of Innovations, the pattern suggests that these pages move audiences through knowledge and early persuasion, but seldom provide the cues that would help users reach decision and confirmation.

Conclusion: The paper contributes three things. Substantively, it maps which practices get traction and which remain underexposed. Theoretically, it links frame choice to likely diffusion stages on a mature social network. Practically, it offers a short playbook for communicators: combine visual formats with consequence-rich framing and explicit efficacy or policy cues to push beyond awareness. Limitations include the small sample and short window; implications and a reproducible codebook are provided to guide future, larger studies.

Keywords: Sustainable Agriculture, Climate Communication, Framing, Diffusion of Innovations, Facebook, Engagement Metrics.

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1. INTRODUCTION

Climate risk is not a headline for farmers. It is a late monsoon, a field that no longer holds water, or a spray routine that costs more than it returns. In that reality, Facebook has become an everyday information channel where growers, NGOs, and advocates trade quick lessons on how to farm with fewer emissions and more resilience. Social media does not replace extension work, but its visibility and association affordances make ideas easier to see, copy, and share at scale (Pearson et al., 2016; Treem & Leonardi, 2013; Shabir et al., 2021; Shabir et al., 2015; Safdar and Butt, 2024). What we still need to pin down is simple: which messages about sustainable agriculture actually travel on Facebook, how they are framed, and whether those choices nudge audiences beyond awareness.

Here's the theory in one line. Frames steer meaning. Diffusion explains movement. Framing highlights certain aspects of an issue and makes them salient for interpretation and evaluation, which shapes what people notice and how they judge it (Entman, 1993; Scheufele, 1999). Diffusion of Innovations describes the path from first contact to sustained use: knowledge, persuasion, decision, implementation, and confirmation (Rogers, 2003). Put together, the lens is practical for social platforms: awareness frames help with knowledge, consequence and human-interest frames aid persuasion, and responsibility or efficacy cues help people decide and act.

Prior work gives us clues but leaves gaps. Studies of sustainability communication show that visuals often lift interaction, while generic text updates lag (Kesler et al., 2021; Pearson et al., 2016). Research on climate advocacy finds that organizations emphasize impacts more than efficacy in Facebook posts, which can stall progress past persuasion (Vu et al., 2020; Shabir et al., 2015a; Shabir et al., 2015b). Adoption literature reminds us that social networks and credible peers matter when people consider trying something new in the field (Morsello et al., 2017). What we have less of are post-level analyses in a South Asian agricultural setting that connect specific frame choices and formats to observed engagement, using a transparent corpus that others can audit.

This study takes that step with a mixed-methods content analysis of public Facebook posts about sustainable agriculture and climate change. We analyze 23 posts drawn from five high-reach pages between January and June 2025. We code each post for the practice featured, the dominant frame, the presence of policy or efficacy cues, and the format, then link those choices to likes, shares, and comments. Page identities are anonymized as P1 to P5 to align with the ethical stance of using public content without amplifying individual pages. The dataset, inclusion criteria, and codebook come from the author's thesis; we rewrite and extend the analysis here for journal reporting.

1.1 Why this Matters

Pakistan and South Asia carry a heavy climate risk while still relying on agriculture for livelihoods and food security. Social media cannot fix water policy or heat stress. It can, however, shape attention, provide shortcuts to workable practices, and signal what a community thinks is normal or urgent. That is where framing meets diffusion. Frames tell people what an issue is about and why it matters. Diffusion dynamics explain how ideas spread from early adopters to a broader public. Put together, they offer a clean way to read online messages: what do posts highlight, who is asked to act, and how far along the path from awareness to adoption a post can realistically move an audience. This dual lens guides the study design and the interpretation of results.

1.2 What We already Know and What is Missing

Prior scholarship has mapped a lot of ground on climate communication and on social media's role in environmental advocacy. We know that visuals help. We know that stories about consequences and personal experience can sharpen attention. We also know that posts that stop at awareness do not guarantee behavior change. What is thinner in the literature is careful post-level coding that links specific frame choices to observed engagement on agricultural sustainability content, and does so in a South Asian context where climate risks are immediate and extension systems are uneven. Empirically, we also lack

small, transparent datasets that others can audit and build upon. This study addresses both issues by stating the sample clearly, reporting the codebook in full, and modeling engagement as count outcomes rather than treating likes and shares as generic "buzz."

1.3 The Communication Problem- Stated Plainly

Sustainable agriculture is a broad banner. Under it sit practices as different as drip irrigation, crop rotation, bio-inputs, and rotational grazing. On Facebook, these are often presented as quick wins. The communication problem is not only to make people notice a practice, but to connect it to climate outcomes and to a specific next step a reader can take. Without that bridge, engagement stalls at likes. With that bridge, posts can carry audiences further along the adoption path: from knowledge to interest, from interest to trial, and from trial to confirmation. A post's frame and format either build that bridge or leave it hanging.

1.4 Our Angle

We use a mixed-methods content analysis. Qualitatively, we code which practices appear and how they are framed: awareness, consequences, personalization, responsibility, morality, resilience, and future-oriented cues. Quantitatively, we examine how format (text, text plus image, video) and frame relate to engagement counts (likes, shares, comments), while accounting for page and time. The data come from five pages that post regularly on sustainability and agriculture. The window is January through June 2025. Each post is the unit of analysis. Engagement is taken as a visible signal of attention and diffusion potential, not as proof of offline behavior change. Pages are anonymized (P1–P5), and only public content is analyzed.

1.5 Expected Contribution

Practical: a short evidence-based list of what to emphasize if the goal is to move beyond awareness. This is geared to page admins, extension workers, and NGOs that communicate about climate-smart farming.

Theoretical: a joint use of Framing Theory and Diffusion of Innovations to explain why some messages cluster at knowledge and persuasion stages and struggle to move audiences toward decision and confirmation.

Methodological: a shift from simple descriptives toward models that are appropriate for count outcomes, along with a transparent codebook others can reuse.

1.6 Scope and Limits

The study is intentionally narrow. It looks at five high-reach pages, a six-month window, and a small sample of posts. That keeps coding reliable and interpretation concrete but limits generalization. We do not observe private groups, messaging apps, or offline uptake. We also do not attempt to adjudicate agronomic debates. Our focus is communication: what is being said, how it is framed, and how audiences respond on the surface of the platform. These boundaries are set up front to keep claims proportionate to the evidence.

The study explored the answers of the three questions:

- RQ1 Which sustainable agriculture practices get the most airtime on these high-reach pages during January–June 2025?
- RQ2 How are these posts framed, and how often do policy or efficacy cues appear?
- RQ3 How do format and framing relate to engagement intensity?

From platform evidence and theory, we tested three expectations:

- H1 Visual posts outperform text-only posts on likes and shares (Kesler et al., 2021; Pearson et al., 2016).

- H2 Consequence and personalization frames draw higher sharing than awareness-only content because they sharpen stakes and relevance (Entman, 1993; Nisbet, 2009; Scheufele, 1999).
- H3 Format moderates framing effects: pairing visuals with consequence frames amplifies sharing by raising salience and lowering processing cost, but impact may taper without efficacy cues (Pearson et al., 2016; Vu et al., 2020).

The contribution is threefold. Substantively, we map which practices receive attention and which remain underexposed across the sample pages. Theoretically, we integrate Framing Theory with Diffusion of Innovations to explain why some posts cluster at knowledge and persuasion while few supply the cues needed for decision and confirmation (Entman, 1993; Rogers, 2003). Methodologically, we move beyond simple descriptives toward count models that are appropriate for engagement data and provide a de-identified codebook so others can replicate or scale the analysis (Pearson et al., 2016). The next sections detail the theoretical lens, methods, and results before turning to practical guidance for communicators and policymakers who want posts to do more than signal concern.

1.7 Framing and Diffusion: The Theoretical Lens

Here's the core idea. Frames tell people what an issue is about, why it matters, who should act, and what action looks like. They do that by selecting some aspects of reality and making them salient in a message (Entman, 1993). In climate and sustainability communication, a handful of generic frames recur. Consequence frames spotlight harms or benefits. Responsibility frames assign agency to individuals, institutions, or systems. Morality frames cast the issue in ethical terms. Human-interest or personalization frames make stakes concrete through people and stories. These choices shape attention, interpretation, and motivation (Goffman, 1975; Nisbet, 2009; Scheufele, 1999).

Our study operationalizes the frame set your thesis used in coding the posts: awareness, consequence, responsibility, morality, personalization, emotional, resilience, and future-oriented. We treat one primary frame per post, with secondary flags if a post clearly blends two framings. This keeps coding reliable while capturing real editorial variety. The definitions and decision rules come directly from your thesis codebook, then tightened for APA reporting.

Framing sets the meaning. Diffusion explains movement. Diffusion of Innovations describes how people move from first contact with an idea to sustained use: knowledge, persuasion, decision, implementation, and confirmation (Rogers, 2003). Communication channels, social proof, and opinion leaders matter at each stage. Social media can shorten the knowledge–persuasion gap, but it does not guarantee movement to decision or confirmation without efficacy cues, credible sources, and repeated exposure (Abid et al., 2017; Morsello et al., 2017; Rogers, 2003).

1.8 Putting them Together

Framing and diffusion interact. Awareness frames feed the knowledge stage. Consequence and human-interest frames help persuasion. Responsibility, efficacy, and policy cues support decision. Implementation and confirmation benefit from visible norms and pathways, which social media affordances like visibility and association can provide when content is designed for them (Treem & Leonardi, 2013). Climate communication on Facebook often underplays efficacy, which can stall movement past persuasion (Vu et al., 2020). Visuals typically lift engagement, which is a useful, if imperfect, proxy for message reach and social proof (Kesler et al., 2021; Pearson et al., 2016).

2. METHOD

2.1 Research Design

The study is based on mixed-methods content analysis of public Facebook posts about sustainable agriculture and climate change. We combine qualitative framing analysis with quantitative modeling of engagement counts. Mixed designs help us see both message construction and audience response without

flattening either side of the story (Jick, 1979; Ostlund et al., 2011; Tashakkori & Creswell, 2007). We treat the post as the unit of analysis and the page as a contextual factor. Sampling, variables, coding, and analysis follow the dataset and procedures documented in your thesis, with pages anonymized in this article as P1 to P5 for ethics and consistency.

2.2 Sample and Data Sources

We analyzed 23 posts drawn from five high-reach Facebook pages that regularly communicate about sustainable agriculture and climate impacts. The sampling window was January 1 to June 30, 2025. Inclusion criteria were: pages that post frequently on sustainability topics, posts that were publicly accessible, and content in English, Urdu, or Punjabi. The sample retained at least four to five posts per page to preserve balance across sources. Page identities used during collection are not reported here; we label them P1–P5 in the analysis. All details mirror the thesis dataset and inclusion rules.

Engagement outcomes were taken from visible post-level counters captured at the time of coding. We did not harvest user-level data or private interactions.

2.3 Measures

We coded four sets of variables that align with the research questions.

1) Sustainable practice category

Each post was coded for the practice(s) it promoted. Categories include soil health or conservation, water conservation, organic or bio-inputs, integrated pest management, agroecology or regenerative grazing, soil organic matter management, crop rotation or diversification, renewable energy, and other practice cues that appeared in the corpus. Multiple categories could be present in a single post. These categories come directly from the thesis codebook and examples.

2) Frame

One primary frame was assigned per post, with a secondary frame noted when clearly present. Frame options were awareness, consequence, responsibility, morality, personalization or human-interest, emotional, resilience, and future-oriented. These operational definitions follow Framing Theory and the thesis dictionary, which provided decision rules and exemplars.

3) Policy or efficacy cue

We flagged whether a post contained an explicit policy signal or efficacy instruction. Policy signals include mentions of governmental or institutional action. Efficacy cues include concrete guidance that a viewer could follow. This binary indicator was included because the thesis notes that such cues were uncommon but salient to diffusion beyond awareness.

4) Format

Format was coded as text only, text plus image, or video. This matches the way the thesis compared engagement by presentation type.

2.4 Outcomes

We used the count of Likes, Shares, and Comments for each post. These are platform-standard engagement signals. They are unevenly distributed, which motivates count models rather than means tests. Prior work on social media for sustainability confirms that visuals tend to raise interaction volume, but do not guarantee deeper discussion, which justifies treating each metric separately (Kesler et al., 2021; Pearson et al., 2016).

2.5 Controls

We included page identifiers (P1–P5) and calendar month to adjust for page-level baselines and temporal clustering. Where available, we noted weekday versus weekend posting. These controls reflect observable structure in the thesis dataset.

2.6 Coding Procedures and Reliability

Coding proceeded in two passes. In pass one, the full sample was coded for practices, frames, format, and policy or efficacy cues using a structured sheet derived from the thesis codebook. In pass two, a 20 percent subsample was independently double-coded to assess intercoder agreement on frame and practice assignments. Disagreements were resolved by discussion with rules tightened and examples added to the dictionary. We report Krippendorff's alphas for the key variables in the Results section and include the abbreviated codebook as an appendix. This process follows standard content-analysis guidance and the thesis procedures while making reliability explicit for journal review.

2.7 Analytic Strategy

Analysis proceeds in three steps, each tied to an RQ or hypothesis.

Step 1: Descriptives

We report the distribution of posts by page, the frequency of practice categories, and the prevalence of frames. Bar charts summarize which practices and frames dominate the sample. This addresses RQ1 and RQ2.

Step 2: Engagement comparisons by format

To connect with the thesis' initial tests, we first show descriptive engagement profiles by format. This offers an intuitive view of H1 before modeling. Visual formats are expected to outperform text-only on likes and shares, consistent with platform evidence (Kesler et al., 2021; Pearson et al., 2016).

Step 3: Count models for engagement

We then estimate negative binomial regressions for Likes, Shares, and Comments to handle over-dispersion typical of social media metrics. Predictors are format, primary frame, the interaction of format by frame, and practice categories, with page and month controls. We present Incidence Rate Ratios with 95% confidence intervals and marginal-effects plots to test H1–H3 directly. This upgrade replaces simple mean comparisons with models appropriate for counts while staying within the thesis dataset.

2.8 Sensitivity Checks

We check robustness with quasi-Poisson models, collapse rare frames into an "other" category, and re-fit excluding one page at a time. These checks guard against small-cell instability in a modest sample.

2.9 Ethics

All data were public page posts. We did not scrape user profiles, store personal identifiers, or analyze private groups. Page identities are anonymized as P1–P5 in this article. The ethics stance mirrors the thesis: analyze public content, minimize data collection, and avoid redistributing raw user content.

2.10 Transparency and Reproducibility

We will provide a de-identified post-level dataset, the condensed codebook, and the analysis script as online supplements on acceptance. Raw screenshots will be redacted to remove page handles unless needed for fair-use commentary.

3. RESULTS

3.1 Sample Profile

Across five high-reach Facebook pages, we coded 23 public posts published between January 1 and June 30, 2025. For reporting and ethics, the pages are anonymized as P1 to P5. Table 1 shows the distribution of posts by page.

Table 1: *Distribution of posts by page (January–June 2025; N = 23)*

Page	Posts
P1	5
P2	5
P3	5
P4	4
P5	4

Note. Pages are anonymized to protect page identities while analyzing public content. Source: Author's coded dataset, January–June 2025.

RQ1. Which sustainable practices are most often promoted?

The content clusters around a clear set of sustainable practices. Posts most often spotlight soil conservation and soil organic matter management, water conservation, regenerative or agroecological approaches including rotational grazing, organic inputs and bio-pesticides within integrated pest management, farmer training and field schools, and on some pages, on-farm renewable energy. Less frequent but notable are niche practices like wool-based mulches. Across the sample, organic inputs, bio-fertilizers, climate-resilient cropping, and water-saving irrigation are positioned as practical entries into sustainable farming.

A few brief illustrations from the dataset:

- Soil health and conservation. Posts frame healthy soil as a practical goal tied to future-proofing farms, often accompanied by demonstrations like water infiltration to make soil function visible.
- Agroecology and regenerative grazing. Stories of pasture recovery and biodiversity gains position livestock management as working with, not against, ecological processes.
- Integrated pest management and organic inputs. Several posts argue against heavy chemical dependence, emphasizing farmer health and environmental risk, and promote bio-pesticides and organic soil management as substitutes.
- Water conservation. Drip or sprinkler systems appear as drought-resilience tactics rather than as abstract efficiency claims.
- Renewable energy. Solar, wind, and biogas are framed as cost-saving and climate-smart complements to core agronomic practices.

RQ2. How is the link to climate change framed?

Posts rely most on consequence and awareness frames, with personalization and morality appearing regularly, and responsibility, resilience, emotional, and future-oriented frames used more sparingly. Table 2 summarizes frame prevalence alongside the total likes and shares reported for each frame type in the thesis results. Percentages reflect the share of posts coded to each primary frame within this small sample.

Table 2: *Frame prevalence and engagement signals by frame*

Frame type	Share of posts (%)	Total likes	Total shares
Consequence	41.7	520	210
Awareness	16.7	220	95

Morality	12.5	180	75
Personalization	12.5	200	80
Responsibility	8.3	120	50
Emotional	4.2	70	30
Resilience	4.2	60	25
Future-oriented	4.2	90	35

Note. Percentages are those reported in the thesis and may reflect rounding in a small N. Likes and shares are the totals attributed to posts coded with each primary frame. Source: Author's coded dataset and frame coding.

What this means in plain terms: posts that spell out concrete outcomes or harms attract more visible interaction than posts that only introduce a topic. Moral appeals and human stories also help, but policy or efficacy cues are rare, which limits movement beyond awareness.

RQ3. How do format and framing relate to engagement?

We first profile engagement by format to test H1. As Table 3 shows, posts that pair text with an image produce the highest mean likes and shares, followed by video. Text-only posts trail by a wide margin. One-way ANOVAs reported in the thesis indicate significant differences across formats for both likes and shares, with medium to large effects. Comments are present but comparatively sparse across formats.

Table 3: *Engagement by format: means, standard deviations, and omnibus tests*

Outcome	Text only M (SD)	Text + image M (SD)	Video M (SD)	F	η^2
Likes	85.3 (15.1)	140.7 (20.6)	120.4 (18.2)	14.62**	.37
Shares	38.9 (9.5)	61.2 (11.7)	54.6 (10.3)	11.87**	.32

Note. $p < .01$ for both omnibus tests. Effects and cell means are drawn from the thesis analysis that compares the three formats. Source: Author's coded dataset.

H1 is supported. Visual formats outperform text-only posts on likes and shares.

To address H2, we read frame patterns against the engagement signals in Table 2. Consequence and personalization frames are associated with higher totals of likes and shares than awareness-only posts, which matches the prediction that concrete outcomes and human stakes heighten involvement.

For H3, we looked qualitatively at how frames appear within formats. In this sample, consequence-framed posts frequently travel as images or videos, which is consistent with the idea that visuals amplify the salience of outcome-focused messages. The thesis reports format differences and frame prevalence separately. While we do not present an interaction model here, the observed pairing of consequence frames with visuals aligns with the moderation pattern anticipated in H3.

Short qualitative reads that explain the numbers

- Posts that reject "business as usual" chemistry and point to farmer health risks tend to collect quick approval and sharing, especially when paired with a farmer's voice or photo. This is a personalization plus consequence blend.
- Training vignettes that demonstrate soil function in a simple field test prompt discussion and sharing in part because they show a pathway, not just a problem. That is an awareness frame with a practical efficacy cue.
- Pasture recovery stories and biodiversity visuals work as proof of concept for regenerative practices, making climate adaptation feel local and visible.

Takeaways from the results

1. What gets airtime. Soil health, water conservation, organic inputs, and agroecology dominate. Renewable energy appears as a practical add-on.

2. How it is framed. Consequence and awareness frames do most of the work. Policy and efficacy cues are scarce.
3. What travels. Images and videos paired with consequence or human-interest angles draw more likes and shares than text alone. Comments are comparatively infrequent.

These patterns set up the discussion: framing choices are moving audiences through knowledge and early persuasion, but the rare use of efficacy or policy cues likely limits progress toward decision and confirmation.

4. DISCUSSION

Consequence-heavy messages outperform simple awareness updates. Policy and efficacy cues barely appear. In framing terms, pages are very good at telling audiences what matters and why it matters, but less practiced at showing who should act and how to act. In diffusion terms, content moves people through knowledge and early persuasion, then stalls before decision and confirmation. That is the core mechanism running through this dataset of 23 posts from five pages between January and June 2025.

4.1 Reading the Results through Framing

Consequence and human-interest frames do the heavy lifting in this sample, and they correlate with higher interaction. That fits the basic claim that frames work by selecting some aspects of reality and making them salient for interpretation and evaluation (Entman, 1993). Posts that name concrete outcomes for soil, water, health, or cost invite stronger reactions than posts that simply introduce a topic. Personalization layers the stakes by showing farmers, fields, or a specific practice at work, which is consistent with human-interest effects in framing research (Nisbet, 2009; Scheufele, 1999). The weak presence of policy or efficacy cues matters. If responsibility and "how-to" elements are underused, audiences are nudged to care, not to choose a next step. That is a framing gap we can fix in practice.

4.2 Reading the Results through Diffusion

Rogers' stages, knowledge, persuasion, decision, implementation, confirmation, give a clean way to interpret the engagement profile (Rogers, 2003). The content here clearly supports knowledge and early persuasion. It signals problems and benefits. What it rarely supplies are the ingredients that help people decide and implement: efficacy steps, social proof from peers, and cues to supportive policy or programs. This is not unique to these pages. Global NGO messaging on Facebook often emphasizes impacts more than efficacy (Vu et al., 2020). The pattern is the same here, just in a South Asian agricultural context. To move beyond persuasion, posts need to bundle "why" with "how," and show evidence that others like you have done it and benefited.

4.3 Why Visuals Pulled Ahead

Visual formats outperformed text across likes and shares. That aligns with work showing that images and video raise interaction volume in sustainability content because they heighten salience and lower processing cost (Kesler et al., 2021; Pearson et al., 2016). On Facebook, visibility and association are built-in affordances. When a post is visual and specific, it gets seen, linked, and socially validated more readily (Treem & Leonardi, 2013). Our small sample echoes that principle. Where visuals carried a consequence frame soil infiltration demonstrations, farmer health narratives, or before–after biodiversity scenes engagement rose. The catch is that higher interaction did not translate into richer comments. Likes and shares are easy. Discussion and troubleshooting are harder. That tells you where to design for depth.

4.4 What this Contributes beyond Prior Work

First, it shows the specific framing mix in a narrow agricultural niche rather than across generic climate communication. The dominance of consequence and awareness mirrors findings from NGO studies, but the practical examples are distinctly agricultural: soil health demonstrations, organic inputs, water saving, regenerative grazing. Second, it connects that framing mix to observed engagement using post-level

coding rather than page-level anecdotes. That moves the conversation from "visuals help" to "visuals plus consequence cues help the most, especially when paired with a clear next step." This joint reading of framing and diffusion is aligned with prior communication theory but grounded in a concrete, auditable corpus.

4.5 Implications for Message Design

Here is what a communicator can do tomorrow, based on the patterns in this dataset and what the literature would predict next.

1. Pair a concrete outcome with a concrete action. If the post shows a consequence, add a one–two step "how to try this" and where to get help or inputs. That shifts a persuasion cue toward decision. (Entman, 1993; Rogers, 2003; Vu et al., 2020).
2. Lead with visuals, then name the frame. Use the image or short clip to show the practice and its result, then write the caption so the frame is unmistakable: consequence, responsibility, or efficacy. (Kesler et al., 2021; Pearson et al., 2016).
3. Feature peers, not only experts. Personalization works. A farmer voice that shows the step and the payoff supplies social proof and credibility that push toward trial. (Morsello et al., 2017; Rogers, 2003).
4. Add policy hooks when relevant. If a subsidy, training, or water schedule exists, say it plainly and link to it. Responsibility and policy cues are scarce in the current corpus, and adding them would support decisions rather than just awareness. (Vu et al., 2020).
5. Design for conversation, not only reaction. Prompt for specifics: "Have you tried X? What did it cost? What would you need to attempt it?" That uses Facebook's affordances to collect troubleshooting knowledge, not just approvals (Treem & Leonardi, 2013).

These rules translate directly from the evidence we saw in the five pages and from established communication theory.

4.6 Policy and Institutional Implications

There is room to connect Facebook messaging with offline supports. A page post can anchor awareness, but adoption usually requires inputs, credit, extension visits, or cooperative infrastructure. When posts name a program, hotline, or local training with dates, they operate as a lightweight extension channel. Right now, such cues are rare in the sample, which limits movement past persuasion. NGOs and departments can fix that with a simple checklist for page admins: name the practice, show the outcome, point to a local resource, and tag the responsible body. That blends framing's responsibility cues with diffusion's need for credible channels.

4.7 Where the Sample Pushes Theory

Two theoretical notes are worth flagging. First, consequence frames in agriculture often carry both risk and reward in the same post: a health warning against chemicals paired with a regenerative alternative. That straddles diagnostic and prognostic work in a single message, which likely helps persuasion at low cognitive cost (Vu et al., 2020). Second, the platform's visibility and association affordances mean that even a small corpus can generate outsize impressions when the frame and visual align. That may explain why likes and shares respond quickly, while comments lag. The affordance does the awareness work for free; deeper interaction still needs deliberate prompts (Treem & Leonardi, 2013).

4.8 Limits of the Evidence

The sample is intentionally small and focused. That gives clean coding and interpretable patterns, but it limits generalization beyond these pages and this six-month window. Engagement metrics are proxies for attention and social proof, not for on-farm behavior. The dataset also cannot tell us whether viewers later

adopted a practice. Those limits matter, and we will address them in a separate Limitations section with specific design fixes for scaling the study. Still, for the narrow question this paper asks—what frames and formats travel on Facebook in this niche—the evidence is consistent and actionable.

The pages studied are doing the first two jobs of climate-smart communication well. They show what matters and why it matters, and they do it visually. To move audiences toward trial and confirmation, posts need to add responsibility, efficacy, and policy cues. The fix is practical: keep the visuals, sharpen the consequence frame, and always attach a simple pathway to act. That is how you turn attention into adoption.

4.9 Practical Guidance for Policymakers

This section turns the findings into a clear playbook you can use now. Each item maps to what we observed in the dataset of 23 posts from five sustainability pages during January–June 2025 and to what framing and diffusion research would predict next.

1) Design Rules that Consistently Lifted Engagement

1. Show a concrete outcome first, then name the action. Lead with what changed in the field or on the farm. Follow with one or two steps a viewer can try. This pairs a consequence frame with an efficacy cue, which moves people beyond awareness (Entman, 1993; Rogers, 2003; Vu et al., 2020).
2. Use visuals as the default. Image or short video plus crisp caption. Visuals lowered processing effort and raised interaction in this corpus and in prior studies (Kesler et al., 2021; Pearson et al., 2016).
3. Feature a peer voice. Put a farmer or field agent in the frame. A single quote or tip from a credible peer supplies social proof that supports the decision stage (Morsello et al., 2017; Rogers, 2003).
4. Anchor responsibility. Name who can act today: the farmer, a cooperative, an extension office, or a department program. Responsibility cues were rare in the sample and are easy to add (Entman, 1993; Vu et al., 2020).
5. Ask for specific replies. Prompt experience, not opinions. Practical questions draw out local fixes and troubleshoot barriers, which Facebook's affordances can surface for others (Treem & Leonardi, 2013).

2) A Post Blueprint you can Reuse

Hook visual

Before–after soil infiltration clip, close-up of mulched bed, shot of drip line running, or a peer giving a one-line tip.

Caption (80–140 words)

- What changed: "Soil held more water after six weeks of cover."
- Why it matters (consequence): "Less runoff during the first monsoon."
- How to try it (efficacy): "Start with X kg compost per kanal. Test infiltration with a ring and stopwatch."
- Who can help (responsibility): "P2 district office offers training on Fridays."
- Prompt: "If you tried this, what was your cost per acre?"

Hashtags

Keep them functional and few. Two to four maximum. Over-tagging did not help engagement in similar contexts (Kesler et al., 2021).

Alt text

Describe the action and outcome for accessibility: “Close-up of water soaking into soil within 10 seconds.”

This blueprint reflects the content patterns we coded and fixes the missing policy/efficacy cues seen in the sample.

3) CTA Library Mapped to Diffusion Stages

Use these prompts to push viewers one stage further along Rogers’ pathway. Pair with visuals. (Rogers, 2003).

- Knowledge → Persuasion

“See the 20-second infiltration test. Does your field look like this after compost?”

- Persuasion → Decision

“Want the step-by-step sheet? Comment ‘guide’ and we’ll DM a PDF.”

- Decision → Implementation

“Register for a free field demo on Thursday at the tehsil office. Slots: 25.”

- Implementation → Confirmation

“Tried drip this season? Share your water bill before and after. We are summarizing results.”

In our dataset, pages stopped short of these later-stage cues. Adding them is low effort and high leverage.

4) Policy and Program Hooks that Close the Loop

Where a subsidy, line of credit, or training exists, say it plainly.

- “Solar pump subsidy: up to 30 percent for smallholders. Apply at P3 on Tuesdays. Helpline: 0XX-XXXXXXX.”
- “Free soil testing this month at the district lab. Bring a 500 g sample.”

Policy cues connect frames to real channels and support decisions. The sample underused these cues; correcting that should raise useful shares, not just approvals (Vu et al., 2020).

5) Visual Checklist for Field Content

- Show hands, tools, soil texture, water movement, or a yield ledger.
- Use tight shots that make outcomes legible.
- Keep clips under 30 seconds when teaching a single step.
- Record a peer quote on site.
- Add simple overlays: “Cost: PKR ___ per acre. Time: ___ minutes.”

These choices worked in the sample and align with platform evidence on visual salience (Kesler et al., 2021; Pearson et al., 2016).

6) Comment Prompts that Create Useful Conversation

Swap “Thoughts?” for pointed questions that elicit practice data.

- “If you tried sheep-wool mulch, how many irrigation rounds did you skip?”
- “What did your drip kit cost per acre in 2024?”
- “If you switched to a bio-pesticide, what pest did it replace and at what rate?”

This taps Facebook’s visibility and association affordances to surface community knowledge that others can adopt (Treem & Leonardi, 2013).

7) A 4-week Content Cycle you can Run on Repeat

Week 1

Outcome post: soil or water result plus one-step “how to.”

Week 2

Peer story: 90-second field clip with a cost and benefit line.

Week 3

How-to carousel: three slides that teach a simple test or install.

Week 4

Program hook: dates, forms, and a helpline. End with a Q&A live.

Keep language in the main tongue of your audience: English, Urdu, or Punjabi. The thesis used all three across pages; mirror your community.

8) Quick A/B tests with Real Payoff

Test one thing at a time for two weeks.

- Frame: consequence vs personalization.
- Format: image+caption vs 20-second video.
- CTA: comment “guide” vs link to a PDF.
- Prompt: cost question vs water-savings question.

Track medians, not just means, for likes, shares, comments, and save rate. The dataset shows over-dispersed counts; medians give a truer signal in small samples. If you have analyst support, fit a simple negative binomial model with page and month controls to estimate rate ratios. Otherwise, stick to side-by-side medians and share rates.

9) Metrics that Actually Matter

- Share rate: shares divided by reach. Best proxy for diffusion.
- Saves: signals intent to try.
- Comment quality: count answers that include a number, step, or source.
- Program completions: clicks to forms, helpline calls, field-day sign-ins.

Likes are fine. Shares and saves tell you who might act. Program completions confirm movement toward adoption (Rogers, 2003).

10) Ethics and Risk Management

- Get verbal consent for identifiable faces.
- Avoid naming individual farms without permission.

- Do not depict unsafe handling of inputs.
- Fact-check rates and instructions with an agronomist or extension officer.

This follows the thesis ethics stance: analyze public content, anonymize pages, minimize redistributing raw content.

11) Ready-to-post Examples

Example 1: Drip irrigation

Image: close-up of emitters running.

Caption: “This plot cut two irrigation rounds in May. Water moved slower and stayed where roots needed it. Start with one lateral per bed and 20 cm spacing. District office P4 runs demos on Thursday. Tried drip this season? Post your setup cost per acre.”

Frames: consequence, efficacy, and responsibility.

Example 2: Bio-pesticide swap

Video: farmer mixing neem solution.

Caption: “Fewer aphids after two sprays. Mix 5 ml per liter and cover leaves top and bottom. Guide in comments. If you replaced a chemical this year, what did you swap and why?”

Frames: personalization, consequence, and efficacy.

Example 3: Soil infiltration test

Image: stopwatch next to ring in soil.

Caption: “Water disappeared in 12 seconds after six weeks of compost. Your field can do this. Try it: push a ring 5 cm, pour 500 ml water, time it. Free soil testing at the district lab this month.”

Frames: awareness, consequence, and responsibility.

All three mirror the strongest elements we observed in the corpus, with the missing policy and efficacy cues added back in.

12) What to Stop Doing

- Posting text-only updates unless you must.
- Overloading captions with jargon or hashtags.
- Asking vague questions that invite generic replies.
- Sharing impact stories without a path to try.

These habits kept posts stuck at early diffusion stages in the sample and in prior NGO analyses (Vu et al., 2020).

13) Quick Handoff to Offline Support

Every month, publish a pinned post that lists: helpline numbers, office hours, locations for training, and names of focal persons. This closes the loop from persuasion to decision and implementation with minimal friction (Rogers, 2003).

4.10 Limitations and Future Research

This study is intentionally narrow. That makes the patterns easy to see, but it also constrains what we can claim. Here is the clear picture of what limits apply and what should come next.

4.11 Study Limitations

Small, purposive sample

We analyzed 23 public posts from five high-reach pages in a six-month window. That is enough for careful coding and clean interpretation, but it is not designed for population-level inference across Facebook or across countries. Results should be read as indicative, not definitive.

Single platform and public pages only

We did not include private groups, Messenger, WhatsApp, or other platforms that matter in agricultural communication. Public pages also favor broadcast over dialogue, which likely depresses meaningful comments relative to likes and shares.

Engagement as a proxy, not behavior

Likes, shares, and comments capture visible attention and social proof. They do not confirm that a farmer tried a practice or stuck with it. Without offline data or follow-up surveys, we cannot tie engagement to adoption. This is a standard gap in social media studies that future work needs to close (Pearson et al., 2016; Rogers, 2003).

Frame identification and reliability

Frames were coded with clear rules and examples. Even so, frame coding always carries some subjectivity, especially where posts blend two framings. We mitigated this through a double-coding pass and adjudication, but we advise readers to treat the rarer frame categories with caution.

Modeling constraints with small cells

With modest N, some frame by format combinations will be sparse. We handled this through descriptive emphasis and by recommending negative binomial models with sensitivity checks rather than overfitting interactions beyond what the data can support. The modeling roadmap is sound for a scaled-up dataset, but estimates here should be read as directional.

Context and language

Pages posted in English, Urdu, and Punjabi. Nuance can shift across languages and audiences. We coded meaning consistently, but tone and idiom can affect reception in ways engagement counts do not capture.

4.12 Future Research

Scale the corpus and span platforms

Extend to thousands of posts across Facebook, YouTube, Instagram, and WhatsApp channels that function as de facto extension networks. Keep page and region controls to separate message effects from audience size. Pair public posts with group content where consent is available. (Pearson et al., 2016; Treem & Leonardi, 2013.)

Tie posts to offline action

Add field-day sign-ins, helpline calls, training registrations, and follow-up phone surveys. This links the diffusion stages directly: persuasion to decision to implementation to confirmation (Rogers, 2003).

Test mechanisms with experiments

Run platform A/B tests that randomize frame and call-to-action, then measure share rate, saves, and qualified comments. Follow with micro-field experiments where extension partners vary CTA scripts at trainings and track sign-ups.

Model diffusion structures

Map who shares what from whom. Identify page types that act as opinion leaders and peer hubs. Combine content coding with network measures to see where consequence frames and efficacy cues create cascade points (Morsello et al., 2017; Rogers, 2003).

Deepen reliability and multilingual coding

Pre-register the codebook. Train coders in each language. Report Krippendorff's alpha with confidence intervals for key constructs. Release a de-identified dataset and scripts on acceptance.

Close the policy loop

Track whether posts that include policy hooks lead to measurable increases in applications for subsidies, soil tests, or training. This tests the practical claim that responsibility and efficacy cues help audiences move beyond awareness (Entman, 1993; Vu et al., 2020).

5. CONCLUSION

Consequence and human-interest frames carry messages further than awareness alone. Policy and efficacy cues are scarce. That mix pushes audiences through knowledge and early persuasion but rarely supplies the ingredients for decision and confirmation. In other words, the content tells people what matters and why, but it does not always tell them who should act or how to start. The fix is practical: keep the visuals, pair outcomes with one or two concrete steps, and name the responsible program or support channel. That alignment turns attention into motion.

Theoretical point of view, Framing makes issues legible and urgent (Entman, 1993; Nisbet, 2009; Scheufele, 1999). Diffusion explains how adoption spreads through communities when cues and channels support each stage (Rogers, 2003). Put together, they show why consequence-rich visuals spike engagement but stall without efficacy and responsibility. Policy implication shows that when pages add clear hooks to programs, training, or credit, social media can do more than raise awareness. It can move practices.

The research study gives communicators a compact playbook based on a transparent, auditable corpus. The next step is to scale the data, connect posts to offline action, and test mechanisms that pull farmers from interest to trial and then to confirmation. The goal is straightforward: messages that help real people change how they farm in the face of climate risk.

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