

## Article

# Integrating Technology Acceptance, Sustainability Orientation, and Entrepreneurial Orientation: Evidence from Saudi Smallholder Farmers' Social Media Marketing

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## Abstract

Social media has emerged as a powerful marketing channel for smallholder farmers, re-shaping how they engage with consumers through direct online interactions and content sharing, while also facilitating the communication of sustainable agricultural practices. This study investigates social media marketing usage among smallholder farmers in Saudi Arabia and examines its impact on marketing capabilities through the Technology Acceptance Model (TAM), sustainability orientation (SO), and entrepreneurial orientation (EO). Survey data collected from 300 farmers were analyzed using partial least squares structural equation modeling (PLS-SEM). The results indicate that perceived usefulness ( $\beta = 0.195$ ,  $p < 0.001$ ) and perceived ease of use ( $\beta = 0.511$ ,  $p < 0.001$ ) significantly influence social media marketing usage, with perceived ease of use exerting the strongest influence, while perceived usefulness remains a significant enabler. Social media marketing usage also positively affects sustainability orientation ( $\beta = 0.525$ ,  $p < 0.001$ ) and enhances marketing capabilities both directly and indirectly through sustainability orientation, which acts as a significant mediator. Entrepreneurial orientation further exerts a positive influence on social media usage, marketing capabilities, and financial performance. The model explains 53.6% of the variance in social media marketing usage, 40.3% in marketing capabilities, and 73.5% in financial performance. The study extends TAM by conceptualizing sustainability orientation as a value-creation mechanism through which social media marketing use is transformed into enhanced marketing capabilities, rather than as a mere outcome of digital adoption. The findings offer practical and policy-relevant insights for strengthening digital literacy, sustainability-driven marketing strategies, and agricultural digital infrastructure.

**Keywords:** social media marketing; sustainable agriculture; technology use; smallholder farmers; entrepreneurial orientation; Saudi Arabia



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## 1. Introduction

Sustainable agriculture has become a strategic imperative globally as nations strive to balance food security with environmental stewardship [1]. Within this global shift, the Kingdom of Saudi Arabia, through its Vision 2030, has prioritized agricultural sustainability and digital transformation to reduce reliance on food imports and optimize resource management. Central to this transition is the integration of digital technologies, particularly social media, which has evolved from a simple communication tool into a robust instrument for market democratization [2,3]. By facilitating direct-to-consumer links, these platforms allow producers to bypass traditional intermediaries, thereby enhancing the economic viability of small-scale agribusinesses [4,5].

For smallholder farmers, sustainability is primarily understood in practical and economic terms: maintaining stable incomes, reducing dependence on market intermediaries, and ensuring long-term viability under resource constraints [6]. These farmer-level goals align closely with Saudi Vision 2030, which frames digital transformation as a strategic mechanism for value capture and market integration. Rather than addressing sustainability solely through large-scale initiatives, the Vision encourages small-scale producers to adopt accessible digital tools that enable them to communicate sustainability-oriented practices and engage directly with consumers [7]. Thus, digital engagement constitutes a functional pathway through which smallholders can translate sustainability efforts into economic resilience.

Despite the strong policy emphasis, smallholder farmers face persistent structural and operational challenges. Evidence from diverse contexts indicates that small-scale producers often struggle with limited digital literacy, high adoption costs, and uncertainty regarding the economic returns of technological investments [8]. Similar constraints are evident in the Saudi agricultural context, where technology adoption remains highly contingent on individual capabilities and resource endowments [9,10]. While platforms such as WhatsApp, Instagram, and X offer cost-effective avenues for engagement, their adoption remains inconsistent due to concerns related to digital skills, perceived risks, and trust in online transactions [4,11].

Technology acceptance, comprising Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), and Entrepreneurial Orientation (EO) play a critical role in shaping how farmers translate digital engagement into sustainability-oriented practices. PU and PEOU function as primary catalysts by lowering cognitive and operational barriers. When integrated with EO, including innovativeness, proactivity, and risk-taking, farmers become more likely to leverage social media as a strategic interface. This interaction is pivotal in driving sustainability orientation across the three dimensions of the Triple Bottom Line: Economically, enabling income stability through direct market access. Socially, strengthening trust-based relationships with consumers and environmentally, providing a platform to valorize eco-friendly farming practices.

Despite the growing body of research on social media in agriculture, existing studies remain fragmented and largely descriptive, with a predominant focus on adoption intentions rather than post-adoption value creation. Specifically, prior TAM-based studies rarely explain the mechanisms through which digital adoption is translated into firm-level marketing capabilities and financial performance [12].

While prior TAM-based studies in agriculture have largely followed two dominant approaches, either linking technology acceptance directly to performance outcomes or incorporating sustainability as a normative or ethical orientation, these approaches provide limited insight into how digital adoption translates into economic value for smallholder farmers. Performance-oriented TAM extensions often assume a linear relationship between adoption and outcomes, while values- or ethics-based frameworks treat sustainability as an external outcome rather than a strategic mechanism.

In contrast, this study advances TAM by conceptualizing Sustainability Orientation as a central value-creation mechanism that mediates the relationship between digital engagement and both marketing capabilities and financial performance. By doing so, the study shifts the analytical focus from adoption or values alignment to strategic utilization and value capture in smallholder agriculture.

This study addresses this gap by proposing an integrated framework grounded in the Technology Acceptance Model (TAM) that incorporates Sustainability Orientation (SO) as a mediating strategic mechanism and Entrepreneurial Orientation (EO) as a complementary strategic driver. Specifically, it advances TAM by conceptualizing sustainability orientation

not as a passive outcome but as an active strategic value-creation mechanism. In doing so, the study moves beyond a narrow focus on behavioral intentions to theorize how digital engagement is translated into performance outcomes in smallholder agriculture in emerging economies.

## 2. Literature Review

### 2.1. Social Media as a Catalyst for Agricultural Market Transformation

The digital transformation of agricultural marketing has fundamentally restructured how value is communicated and captured. By creating virtual marketplaces, social media platforms effectively mitigate traditional structural barriers, such as geographical isolation, information asymmetry, and the exploitative role of intermediaries [1,2,13]. Beyond mere transactional utility, these platforms enable farmers to engage in digital storytelling, which is particularly vital for the niche marketing of organic and sustainable produce [3]. For instance, empirical evidence suggests that when farmers provide transparent glimpses into their daily operations, it fosters a trust-based relationship with consumers, bridging the gap between production and consumption [5]. This transparency is not merely a promotional tactic but a strategic tool to enhance brand value by verifying the origin and quality of agricultural goods.

### 2.2. The Relationship Between Social Media and Sustainability Orientation

Modern agricultural discourse increasingly links digital adoption with the achievement of sustainable development goals. Research indicates that social networks, such as Facebook, serve as critical conduits for promoting agroecological practices and shifting consumer perceptions toward environmental responsibility [14]. Through the diffusion of innovations and peer-to-peer learning, social media facilitates the spread of eco-conscious methods like water preservation and soil health management [9,15]. Furthermore, this sustainability orientation serves as a significant driver of marketing performance. As urban and younger demographics, particularly Generation Z, shift their preferences toward ethically sourced and “green” products, the ability of a farm to communicate its sustainability ethos via social media becomes a core competitive advantage [11,16]. Consequently, a farmer’s sustainability orientation is no longer just an ethical choice but a financial imperative that unlocks price premiums and long-term market resilience.

### 2.3. Theoretical Foundations: The Technology Acceptance Model (TAM)

To analyze the mechanisms driving digital adoption among farmers, agricultural researchers have predominantly relied on established socio-psychological frameworks, most notably the Technology Acceptance Model (TAM). Originally developed by Davis (11) and widely applied in agricultural research, TAM posits that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are the primary determinants of technology adoption behavior [4]. In farming contexts, PU reflects the belief that digital tools enhance productivity or market performance, while PEOU captures the extent to which such tools are perceived as intuitive, accessible, and cognitively manageable [17].

Although a substantial body of empirical research confirms TAM’s robustness across diverse agricultural settings [1,18,19], this study identifies a critical theoretical limitation in how TAM has been extended within agribusiness and sustainability research. To clarify the distinctiveness of our contribution, we explicitly contrast our framework with two dominant streams of TAM-based literature.

### 2.3.1. Contrast with TAM-Performance Outcome Extensions

One prominent stream of agricultural research extends TAM by linking PU and PEOU directly to performance outcomes such as productivity gains, income growth, or market efficiency [20,21]. While this literature establishes the instrumental relevance of digital tools, it typically assumes a linear and automatic progression from adoption to performance. Our departure lies in challenging this linear assumption. In smallholder contexts characterized by resource constraints and market imperfections, technology use alone does not guarantee value realization. This study demonstrates that performance gains depend on a strategic intermediary, Sustainability Orientation (SO), which governs how digital tools are interpreted, deployed, and monetized in market interactions.

### 2.3.2. Contrast with TAM-Values and Ethics-Based Extensions

Models, typically conceptualizing them as normative orientations, contextual moderators, or ethical add-ons [22]. While these studies successfully foreground the moral and environmental dimensions of digitalization, they rarely explain how such values are operationalized into market-facing capabilities or translated into measurable economic returns. As a result, a theoretical disconnect persists between value alignment and financial performance.

To explicitly clarify how the proposed framework departs from prior TAM-based extensions in agriculture, Table 1 presents a conceptual comparison between traditional TAMs, performance-oriented extensions, values-based approaches, and the value-creation logic advanced in this study.

**Table 1.** Conceptual Comparison of TAM Extensions in Agricultural Research.

| Dimension                                  | Traditional TAM               | TAM-Performance Models                 | TAM-Values/Ethics Models                  | Proposed Model (This Study)                                        |
|--------------------------------------------|-------------------------------|----------------------------------------|-------------------------------------------|--------------------------------------------------------------------|
| <b>Core Focus</b>                          | Technology adoption intention | Adoption → performance outcomes        | Adoption → values/ethical alignment       | Adoption → strategic value creation                                |
| <b>Role of Sustainability</b>              | Not considered                | Implicit or secondary                  | Normative outcome or contextual moderator | Endogenous strategic mechanism                                     |
| <b>View of Technology Use</b>              | Behavioral outcome            | Instrumental utilization               | Moral/ethical alignment                   | Strategic utilization logic                                        |
| <b>Assumption about Value Creation</b>     | Adoption is sufficient        | Use automatically improves performance | Values coexist with adoption              | Value emerges only when digital use is sustainability-driven       |
| <b>Theoretical Logic</b>                   | Socio-psychological           | Linear, outcome-oriented               | Normative/ethics-based                    | Process-based, RBV-informed                                        |
| <b>Role of Entrepreneurial Orientation</b> | Not included                  | Rarely included                        | Not theorized                             | Complementary strategic driver                                     |
| <b>Key Limitation Addressed</b>            | Explains adoption only        | Ignores how value is realized          | Lacks an economic translation mechanism   | Explains how and why digital engagement yields economic resilience |
| <b>Nature of Contribution</b>              | Foundational                  | Incremental extension                  | Contextual enrichment                     | Transformative extension of TAM                                    |

Sources: [23–28].

### 2.3.3. Reconceptualizing Sustainability Orientation Within TAM

Building on the limitations of both streams, this study advances TAM by reconceptualizing Sustainability Orientation (SO) as an endogenous strategic mechanism, rather than an external outcome or a passive ethical stance. The strategic shift proposed in this research

positions SO as the value-creation logic through which digital engagement is transformed into tangible outcomes. In the proposed framework, SO emerges through repeated social media marketing use and mediates the relationship between digital engagement and both marketing capabilities and financial performance. This reconceptualization shifts TAM from a technology adoption model toward a strategic utilization and value-capture framework, explaining not only whether farmers adopt digital tools, but how they convert digital engagement into economic resilience.

In the Saudi smallholder context, technology adoption is therefore not solely a function of perceived ease of use or usefulness, but of how digital tools are strategically leveraged to communicate sustainability-oriented differentiation and build market trust. By integrating TAM's core constructs (PU and PEOU) with Sustainability Orientation and Entrepreneurial Orientation (EO), this study offers a process-based explanation of digital value creation that extends beyond prior TAM-based agribusiness research.

#### *2.4. Global Perspectives on Social Media Adoption in Agribusiness*

The empirical evidence regarding social media adoption among smallholders reveals a dichotomy between significant economic potential and persistent structural barriers. Research across diverse geographic contexts suggests that digital platforms function as more than just communication tools; they are engines for technical efficiency and market intelligence.

**Economic Impacts and Market Efficiency in South Asia,** recent evidence confirms the direct correlation between social media usage and farm profitability. For instance, in Pakistan, the use of digital platforms during the production phase has been shown to significantly increase revenue by improving technical efficiency [10]. Similarly, Indian farmers utilizing social media for marketing reported a 25% increase in revenue, driven by reduced advertising costs and enhanced consumer interaction [4]. These findings suggest that for smallholders, digital adoption is a strategic response to information hurdles, enabling them to bypass traditional intermediaries and access real-time market data [18].

**Branding, Trust, and Sustainability.** A critical dimension emerging from the literature is the use of social media for value-based marketing. Beyond transactional utility, farmers increasingly leverage platforms like Instagram and Facebook to engage in digital storytelling, chronicling their eco-friendly practices to attract health-conscious urban consumers [19,29]. This approach transforms sustainability from an abstract concept into a tangible brand attribute, allowing farmers to command price premiums. However, this transition is not universal. While 70% of direct marketers in developed economies like Germany recognize the potential of social media, actual engagement remains low (7%) due to concerns over content strategy and the time-intensive nature of digital management [5,22].

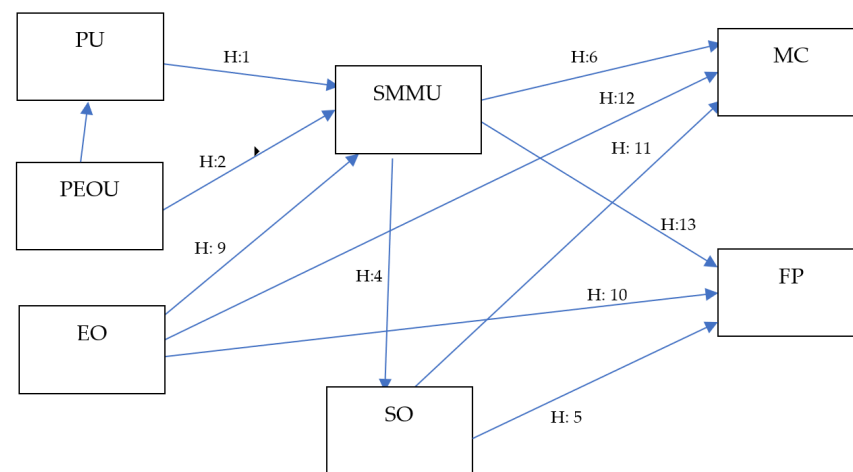
**Barriers to Adoption and the Saudi Context.** Despite the positive global trend, adoption rates are heavily moderated by socio-cultural and infrastructural factors. In African contexts, low adoption is often attributed to inconsistent electricity, high data costs, and a lack of specialized digital skills [30]. These challenges mirror earlier observations in the Saudi Arabian agricultural sector, where traditional marketing reliance and digital skepticism have historically hindered progress [31]. The persistence of these human and organizational constraints, such as perceived risk, fraud concerns, and technological anxiety, highlights the need for a model that accounts for both the perceived benefits and the farmer's internal value system, such as their sustainability orientation [32–34].

By synthesizing these global insights, it becomes evident that while the Game-Changer potential of social media is clear, its success in the Saudi context depends on a complex interplay of perceived usefulness, ease of use, and a proactive sustainability mindset. This

study aims to fill the existing empirical gap by testing these relationships within the specific socio-economic framework of Saudi Arabia.

### 3. Conceptual Framework and Hypotheses

Building on the Technology Acceptance Model (TAM), and previous research on sustainability and marketing, we present a model (Figure 1) that links farmers' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of social media to their Social Media Marketing Use (SMMU), which influences Marketing Capabilities (MC) and Financial Performance (FP). In this study, sustainability orientation refers to a farmer's level of commitment to social sustainability in their farming and marketing tactics, or how much they stress sustainable practices and principles when operating their agricultural operation [5]. Entrepreneurial Orientation refers to small farmers' willingness to experiment, take risks, and aggressively explore market possibilities to improve farm performance and sustainability [35]. We believe that their marketing efforts can influence and shape these orientations.



**Figure 1.** Conceptual framework of the study.

Figure 1 depicts a conceptual framework. Within our framework, PU and PEOU serve as external variables that represent the farmer's attitudes about social media. Farmers are more likely to adopt social media marketing (SMMU) when they believe it will improve their farm's results and find it simple or easy to use. This link is based on TAM [36]. Previous agricultural research has supported this finding [37]. We propose that increased SMMU, defined as intense or frequent use of social media for product marketing, leads to improved Marketing capabilities (MC) and Financial Performance (FP), as evidenced by outcomes such as increased sales revenue, a larger customer base, and improved marketing effectiveness [4]. Farmers are more likely to accept and use media if they believe it will help them increase sales, interact with consumers, and improve marketing effectiveness. This is an application of TAM in the agricultural marketing environment [17].

The Technology Acceptance Model (TAM) posits that Perceived Usefulness (PU), defined as the degree to which an individual believes that using a system enhances job performance, is a core determinant of technology adoption [23]. In the context of social media marketing by smallholder farmers, PU reflects beliefs that these platforms can improve marketing efficiency, expand market access, and enhance sales performance [38]. When farmers perceive social media as a valuable tool for product promotion, direct customer engagement, and improved communication, they are more likely to integrate it into their marketing activities [2,39].

Empirical evidence consistently supports this relationship in both agricultural and small-business contexts [40]. Prior studies show that farmers who perceive social media as useful for price discovery, customer interaction, and market visibility are significantly more likely to adopt and use these platforms intensively for marketing [32,41]. These findings suggest that adoption decisions among resource-constrained farmers are closely tied to expected performance and economic benefits. Accordingly, we propose:

**H1:** *Farmers' utilization of social media for marketing (SMMU) is positively influenced by the perceived usefulness (PU) of social media.*

In addition to perceived usefulness, TAM emphasizes Perceived Ease of Use (PEOU) as a key driver of technology adoption, referring to the extent to which a system is perceived as simple and effortless to use [23]. In smallholder agricultural settings, where time constraints, limited digital skills, and resource scarcity are common, ease of use plays a particularly critical role. Social media platforms that are intuitive, easy to learn, and simple to operate lower adoption barriers and encourage sustained marketing use [42].

Extensive empirical research confirms that PEOU positively influences social media marketing use, especially among non-technical users and small enterprises [2,32,39,43]. In agricultural contexts, perceived simplicity in social media platforms reduces learning costs and enables farmers to more readily integrate digital tools into routine marketing practices [44]. Based on this well-established logic, we propose:

**H2:** *The perceived simplicity of media (PEOU) positively influences its application in marketing (SMMU).*

TAM further theorizes that Perceived Ease of Use (PEOU) exerts an indirect influence on technology adoption through Perceived Usefulness (PU), as systems that are easier to use are more likely to be perceived as beneficial and performance-enhancing [23]. When farmers expend less cognitive and operational effort in managing social media platforms, they are better positioned to recognize their functional value for marketing communication, customer outreach, and sales generation [42].

This relationship has been consistently validated across digital, agricultural, and small-enterprise settings. Prior studies demonstrate that user-friendly platforms enhance perceived usefulness by reducing complexity, increasing confidence, and enabling more efficient task execution [2,15,43,44]. Accordingly, we propose:

**H3:** *Perceived Ease of Use positively influences Perceived Usefulness of social media marketing use.*

The use of Social Media Marketing (SMMU) can play a significant role in shaping and strengthening farmers' Sustainability Orientation (SO) by increasing awareness, learning, and engagement with sustainability-related practices and values. Social media platforms function not only as marketing tools but also as interactive knowledge-sharing spaces where farmers are exposed to information about environmentally friendly practices, social responsibility, and sustainable market trends [22]. Through continuous interaction with consumers, peers, and institutions on social media, farmers are increasingly encouraged to align their production and marketing strategies with sustainability expectations [45].

From a learning and institutional perspective, frequent use of social media facilitates access to sustainability-oriented narratives, certifications, and success stories, which can influence farmers' attitudes and strategic priorities [14]. Empirical studies indicate that engagement in social media marketing enhances farmers' sensitivity to consumer demand for sustainably produced agricultural products, thereby reinforcing their commitment to environmental and social sustainability [14]. Moreover, refs. [46,47] show that active social

media marketing use strengthens sustainability orientation by motivating farmers to adopt transparent, responsible, and value-driven marketing approaches to maintain credibility and trust in digital markets. These findings support Hypothesis H4, suggesting that greater utilization of social media marketing positively influences farmers' sustainability orientation by fostering learning, stakeholder interaction, and alignment with sustainability-driven market norms.

**H4:** *The utilization of Social Media Marketing (SMMU) positively influences the farmer's Sustainability Orientation (SO).*

Sustainability Orientation (SO) has increasingly been recognized as a strategic driver of firm-level financial performance, particularly in agrifood and resource-dependent sectors [5]. From a resource-based view, sustainability-oriented practices enable firms to develop valuable, rare, and difficult-to-imitate intangible assets such as reputation, trust, and legitimacy, which translate into superior financial outcomes [47].

In agricultural contexts, sustainability orientation enhances financial performance by improving market access, enabling price premiums, reducing input inefficiencies, and strengthening long-term relationships with environmentally and socially conscious consumers. Empirical evidence suggests that farms committed to sustainability are better positioned to signal product quality and ethical value, thereby increasing consumers' willingness to pay and stabilizing income streams [48].

Recent studies in agribusiness and small-firm settings demonstrate that sustainability-oriented strategies positively influence financial performance through cost efficiencies, risk reduction, and enhanced brand value [47–49]. access niche and premium markets, and enhance resilience against market volatility. By strengthening reputation, trust, and perceived product value, sustainability-oriented strategies allow farmers to achieve superior financial outcomes through improved price realization, market access, and income stability. Accordingly, sustainability orientation is expected to exert a direct and positive effect on financial performance.

**H5:** *Sustainability Orientation (SO) positively influences Financial Performance (FP).*

The utilization of Social Media Marketing (SMMU) has been widely recognized as a critical driver of Marketing Capabilities (MC), as it enables firms to develop skills related to market sensing, customer engagement, branding, and communication. From a resource-based and dynamic capabilities perspective, social media platforms provide interactive tools that enhance firms' ability to gather market intelligence, respond to customer needs, and co-create value [50,51]. By actively using social media, firms can strengthen their promotional effectiveness, relationship management, and market responsiveness, core dimensions of marketing capabilities.

In the context of small-scale agriculture, empirical studies suggest that social media marketing use enhances farmers' marketing capabilities by facilitating direct communication with consumers, improving product differentiation, and enabling low-cost promotional activities. Ref. [52] finds that social media engagement significantly improves small businesses' marketing competencies by fostering customer interaction and brand visibility. Ref. [53] indicates that social media use contributes to the development of digital marketing capabilities, particularly in small and resource-constrained enterprises. In agri-food settings, ref. [46] report that farmers who actively use social media for marketing exhibit stronger capabilities in branding, customer relationship management, and access to niche markets. These findings provide strong support for Hypothesis H6, indicating that the

utilization of social media marketing positively impacts marketing capabilities by enabling farmers to build more effective, responsive, and customer-oriented marketing practices.

**H6:** *The utilization of Social Media Marketing (SMMU) positively impacts Marketing Capabilities (MC).*

The relationship between Social Media Marketing Use (SMMU) and firm-level outcomes is increasingly understood as being contingent upon how digital engagement is strategically interpreted and deployed. While social media marketing enables direct market access, customer interaction, and real-time communication, its effectiveness in enhancing organizational capabilities depends on the strategic logic guiding its use [22,54,55].

In this study, Sustainability Orientation (SO) is conceptualized as a mediating mechanism rather than an antecedent, as it is theorized to emerge through active and repeated digital engagement [56]. Through social media use, farmers are exposed to consumer expectations, market feedback, and sustainability-related narratives, which collectively activate a sustainability-driven strategic orientation. Social media platforms provide a critical channel for communicating environmentally friendly production, ethical sourcing, and community engagement, thereby transforming routine marketing activities into value-based market interactions [46,51,57].

Within the agricultural context, this sustainability orientation enhances marketing capabilities by enabling differentiation, brand storytelling, and trust-building with increasingly sustainability-conscious consumers. Farmers who actively engage in social media marketing but lack a sustainability-driven strategic narrative may experience limited capability development, whereas those who embed sustainability values into their digital communications are better positioned to develop advanced marketing routines and customer relationship management practices [47,57]. Accordingly, Sustainability Orientation (SO) functions as a mediating mechanism that channels the positive impact of Social Media Marketing Use (SMMU) into enhanced Marketing Capabilities (MC) [55,58].

**H7:** *Sustainability Orientation (SO) mediates the relationship between Social Media Marketing Use (SMMU) and Marketing Capabilities (MC).*

Beyond capability development, the financial returns of social media marketing in smallholder agriculture are rarely automatic. While digital platforms can reduce transaction costs and expand market reach, their financial benefits are realized more strongly when marketing activities are aligned with sustainability values that resonate with environmentally and socially conscious consumers [22,46].

In small-scale agriculture, Sustainability Orientation plays a critical mediating role by translating digital engagement into economic value. Sustainability-oriented farmers leverage social media not only to promote products, but also to signal credibility, quality, and ethical value, which enhances consumer trust and willingness to pay premium prices [14,49,59]. Empirical evidence indicates that sustainability-oriented agri-food enterprises are better positioned to convert digital marketing engagement into increased sales, higher margins, and improved long-term financial performance.

By conceptualizing Sustainability Orientation as a mediator, this study demonstrates that the financial value of social media marketing is constructed through strategic alignment, rather than inherited through technology use alone. Social media marketing acts as the catalyst that activates sustainability-oriented strategic behavior, which in turn enables superior financial outcomes.

**H8:** *Sustainability Orientation (SO) mediates the relationship between Social Media Marketing Use (SMMU) and Financial Performance (FP).*

Entrepreneurial Orientation (EO), reflecting innovativeness, proactiveness, and risk-taking, has been widely identified as a key driver of firms' adoption and intensive use of digital technologies, including Social Media Marketing Use (SMMU) [60]. Firms and individuals with a strong entrepreneurial orientation are more inclined to experiment with new tools, proactively explore market opportunities, and embrace innovative marketing approaches to gain competitive advantages [61,62]. In small-scale agricultural contexts, entrepreneurial farmers are more willing to adopt social media marketing as a flexible and low-cost channel to reach customers, promote products, and respond to dynamic market conditions [63].

Empirical studies provide robust support for this relationship. Ref. [57] show that entrepreneurial farmers and rural entrepreneurs are more proactive in leveraging social media to build networks, access market information, and engage directly with consumers. Similarly, ref. [53] finds that EO significantly influences the extent to which small firms use social media for marketing communication, branding, and customer relationship management. In agri-food settings, ref. [64] report that farmers with higher entrepreneurial orientation demonstrate greater willingness to adopt and actively use social media marketing tools to enhance market visibility and competitiveness.

Overall, these findings support Hypothesis H9, suggesting that entrepreneurial orientation positively influences social media marketing use by fostering innovative, proactive, and opportunity-driven marketing behaviors among small-scale farmers.

**H9:** *Entrepreneurial Orientation positively influences Social Media Marketing Use.*

Entrepreneurial Orientation (EO) has been extensively linked to improved Financial Performance (FP) across firms of different sizes and sectors [35]. From a strategic management perspective, EO enables firms to identify and exploit new market opportunities, innovate products and processes, and respond proactively to competitive and environmental changes, all of which contribute to superior financial outcomes [59,65]. For small and resource-constrained enterprises, an entrepreneurial posture is particularly critical in overcoming market limitations and achieving growth.

In the context of small-scale agriculture, empirical evidence suggests that entrepreneurial farmers achieve better financial performance by adopting innovative production and marketing practices, diversifying income sources, and proactively engaging with markets. Ref. [66] demonstrate that EO has a positive and significant effect on firm-level financial performance, especially in dynamic environments. More specifically, ref. [57] find that entrepreneurial orientation enhances revenue growth and profitability among rural and agricultural entrepreneurs by facilitating opportunity recognition and strategic flexibility. Recent agri-food studies further confirm that EO positively influences farm income and financial sustainability by encouraging innovation, market responsiveness, and calculated risk-taking [46,64]. These findings provide strong support for Hypothesis H10, indicating that entrepreneurial orientation positively influences financial performance by enabling small-scale farmers to enhance competitiveness, profitability, and long-term economic viability.

**H10:** *Entrepreneurial Orientation (EO) positively influences Financial Performance (FP).*

The existing literature increasingly recognizes Sustainability Orientation (SO) as a key driver of Marketing Capabilities (MC), particularly in small firms and agricultural enterprises. According to [67], adopting environmental and social sustainability orientations encourages firms to redesign their marketing activities, including product development, customer communication, and long-term relationship building. In the agri-

cultural context, ref. [68] argue that farmers with a strong sustainability orientation are better positioned to develop value-based marketing narratives centered on environmental and social responsibility, thereby strengthening their promotional, differentiation, and market-relational capabilities.

In addition, ref. [51] emphasizes that sustainability has evolved from a purely ethical commitment into a strategic resource that enhances dynamic marketing capabilities, especially in markets where consumers are increasingly sensitive to environmental and social issues. Empirical evidence from small agricultural enterprises provided by [48] demonstrates that sustainability-oriented firms exhibit superior capabilities in market intelligence generation, customer understanding, and adaptive marketing strategies aligned with demand for sustainable products. More recently, ref. [46] found that farmers who integrate sustainability principles into their operational and marketing strategies develop stronger marketing capabilities, particularly in branding, digital marketing, and access to niche and premium markets.

**H11:** *Sustainability orientation (SO) positively influences marketing capabilities (MC).*

Recent empirical studies show that Entrepreneurial Orientation (EO) acts as a catalyst for developing superior marketing capabilities (MC) in small-scale agriculture and rural SMEs [69,70]. Entrepreneurial Orientation equips agribusiness entrepreneurs to better understand customer needs and to innovate in branding, segmentation, and distribution strategies [71,72]. Research on emerging economy firms demonstrates that EO has a positive direct impact on firms' marketing capacities, including digital marketing skills and channel management, which ultimately boosts performance [72]. In Indonesian SME contexts, EO's effect on growth was mediated by enhanced marketing capabilities, meaning entrepreneurial firms gained a competitive advantage by excelling at customer-oriented marketing practices [73]. These studies emphasize that in small agricultural enterprises, an entrepreneurial posture strengthens key marketing capabilities, enabling firms to better segment markets and build strong customer relationships, outcomes that improve rural business performance [70].

These findings support Hypothesis H12, suggesting that Entrepreneurial Orientation (EO) has a strong influence on small farmers' marketing capabilities. has a strong influence on small farmers' marketing capabilities.

**H12:** *Entrepreneurial Orientation (EO) has a positive influence on marketing capabilities (MC).*

In the agri-food and smallholder farming context, empirical studies indicate that active use of social media marketing improves farmers' financial outcomes by facilitating direct-to-consumer sales, strengthening customer relationships, shortening supply chains, and enhancing customers' trust. Ref. [22] state that social media adoption by farmers enhances price realization and farm income through improved market transparency and consumer trust. Moreover, ref. [14] find that social media marketing use significantly increases sales growth and profitability among small agri-businesses by enabling targeted promotions and real-time interaction with customers. Recent evidence by [46] further confirms that social media-enabled marketing capabilities positively influence financial performance by supporting product differentiation and access to premium and niche markets. These findings support Hypothesis H13, suggesting that greater use of social media marketing positively influences financial performance by enhancing market efficiency, customer value creation, and revenue generation in small-scale agricultural enterprises.

**H13:** *Social media marketing use (SMMU) positively influences financial performance (FP).*

Based on the foregoing theoretical arguments and empirical evidence, a set of hypotheses was developed to examine the relationships among the study variables. The proposed hypotheses, together with the key supporting theoretical and empirical studies, are systematically summarized in Table 2, which provides a structured overview of the theoretical foundations underpinning the research model and clarifies the hypothesized linkages among its constructs.

**Table 2.** Research Hypotheses and Theoretical Support.

| Hypothesis | Statement                                                                                                                                       | Supporting Studies |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| H1         | Farmers' utilization of media, for marketing (SMMU), is positively influenced by the Perceived Usefulness (PU) of social media.                 | [2,17,23,43]       |
| H2         | The perceived ease of use (PEOU) positively influences its application in marketing (SMMU).                                                     | [23,32,40,41]      |
| H3         | Perceived Ease of Use positively influences Perceived Usefulness of social media marketing use.                                                 | [23,40,74]         |
| H4         | The utilization of Social Media Marketing (SMMU) positively influences the farmer's Sustainability Orientation (SO).                            | [14,22,46]         |
| H5         | Sustainability Orientation (SO) positively influences Financial Performance (FP).                                                               | [49,75]            |
| H6         | The utilization of Social Media Marketing (SMMU) positively impacts Marketing Capabilities (MC).                                                | [4,76,77]          |
| H7         | Sustainability Orientation (SO) acts as a mediator in the connection between Social Media Marketing Use (SMMU) and Marketing Capabilities (MC). | [22,75]            |
| H8         | Sustainability orientation (SO) mediates the relationship between social media marketing use (SMMU) and financial performance (FP).             | [49,75]            |
| H9         | Entrepreneurial Orientation positively influences Social Media Marketing Use.                                                                   | [78,79]            |
| H10        | Entrepreneurial Orientation (EO) positively influences Financial Performance (FP).                                                              | [49,80,81]         |
| H11        | Sustainability orientation (SO) positively influences marketing capabilities (MC).                                                              | [46,49]            |
| H12        | Entrepreneurial Orientation (EO) has a positive influence on marketing capabilities (MC).                                                       | [78,79]            |
| H13        | Social media marketing use (SMMU) positively influences financial performance (FP).                                                             | [4,10,30]          |

## 4. Materials and Methods

### 4.1. Data Collection Procedure

Data were collected between August and November 2025 using a structured online questionnaire developed specifically for this study and administered via Google Forms. The survey link was disseminated through WhatsApp groups comprising small-scale farmers and individuals involved in agricultural activities, as these groups constitute a widely used and effective communication channel within the farming community. The link was accompanied by a brief explanatory message outlining the objectives and significance of the study. The use of Google Forms ensured ease of access for respondents, enhanced data accuracy, and facilitated efficient data collection and management within the designated time period.

To reach individual participants, the researchers employed a multi-stage recruitment mechanism. First, access was obtained through administrators of agriculture-focused WhatsApp groups that serve as active communication hubs for Saudi smallholder farmers. Following administrative approval, an invitation containing the survey link was shared within these groups using a voluntary response approach. To ensure sample relevance, screening questions were included at the beginning of the survey to confirm that respondents met the definition of a smallholder farmer and were actively engaged in digital marketing. Subsequently, participants were encouraged to share the survey link within their professional networks, generating a snowball sampling effect that leveraged the high connectivity of these digital communities. This strategy was adopted as the most effective means of identifying a specialized and hard-to-reach population in the absence of a comprehensive national database of digitally active smallholder farmers.

The study was conducted in accordance with established ethical research standards and guidelines for research involving human participants. Participation was entirely voluntary. At the beginning of the questionnaire, respondents were presented with an informed consent statement clearly describing the purpose of the study, the voluntary nature of participation, and assurances regarding the confidentiality and anonymity of their responses. Only participants who provided explicit consent were allowed to proceed with the survey, while those who declined were automatically exited.

To ensure the relevance of the collected data and minimize unnecessary respondent burden, a screening question was included to verify whether participants used social media to market their agricultural products. Only respondents who confirmed the use of social media for marketing purposes were eligible to complete the full questionnaire, whereas those who did not were automatically screened out. Participants were informed of their right to withdraw from the study at any stage without any consequences (Table 3).

**Table 3.** Demographic Profile of the Study Sample (N = 300).

| Variable                   | Category                    | Frequency (n) | Percentage (%) |
|----------------------------|-----------------------------|---------------|----------------|
| <b>Age (years)</b>         | 18–24                       | 62            | 20.7           |
|                            | 25–34                       | 63            | 21.0           |
|                            | 35–44                       | 57            | 19.0           |
|                            | 45–54                       | 57            | 19.0           |
|                            | 55 and above                | 61            | 20.3           |
| <b>Gender</b>              | Male                        | 271           | 90.3           |
|                            | Female                      | 29            | 9.7            |
| <b>Education Level</b>     | Secondary education or less | 121           | 40.3           |
|                            | Post-secondary diploma      | 98            | 32.7           |
|                            | Bachelor’s degree           | 49            | 16.3           |
|                            | Master’s degree             | 24            | 8.0            |
|                            | Doctoral degree             | 8             | 2.7            |
| <b>Geographical Region</b> | Central Region              | 62            | 20.7           |
|                            | Western Region              | 67            | 22.3           |
|                            | Eastern Region              | 46            | 15.3           |
|                            | Northern Region             | 70            | 23.3           |
|                            | Southern Region             | 55            | 18.3           |
| <b>Farm Size</b>           | Less than 0.5 hectare       | 30            | 10.0           |
|                            | 0.5 to <1 hectare           | 46            | 15.3           |
|                            | 1 to <1.5 hectares          | 70            | 23.3           |
|                            | 1.5 to <2 hectares          | 91            | 30.3           |
|                            | More than 2 hectares        | 63            | 21.0           |

No personally identifiable information was collected, and all responses were anonymized and used exclusively for academic research purposes. The data were securely collected and stored through Google Forms, ensuring the protection of participant privacy and the confidentiality of the information throughout the research process.

#### *4.2. Research Design and Sample*

This study adopted a quantitative survey research design to examine social media marketing use and its implications for sustainability orientation, marketing capabilities, and financial performance among smallholder farmers in Saudi Arabia. The target population comprised small-scale farmers engaged in crop production and livestock farming. In the Saudi context, smallholders are typically characterized by farm sizes of less than 10 hectares and a strong reliance on local or regional markets.

Importantly, this study specifically targets digitally engaged smallholder farmers. Accordingly, the sampling frame was intentionally restricted to farmers who actively utilize social media platforms for marketing purposes. This purposive sampling approach was adopted not to represent the entire agricultural population, but to investigate the internal strategic mechanisms that emerge once the digital adoption barrier has been crossed. By focusing on active users, the study is able to examine how social media engagement is strategically converted into sustainability orientation, marketing capabilities, and financial performance, which aligns with the study's post-adoption and value-realization objectives.

Data collection was conducted across five key regions of the Kingdom of Saudi Arabia: the central, western, eastern, northern, and southern regions. A total of 300 valid responses were obtained. This sample size meets recommended thresholds for partial least squares structural equation modeling (PLS-SEM) and provides sufficient statistical power to detect moderate effect sizes at a significance level of  $\alpha = 0.05$ .

Prior to model estimation, the suitability of the data for factor analysis was assessed. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy yielded a value of 0.903, indicating excellent sampling adequacy. In addition, Bartlett's Test of Sphericity was statistically significant ( $\chi^2 = 5127.353$ ,  $df = 528$ ,  $p < 0.001$ ), confirming the presence of adequate correlations among the study variables. Together, these diagnostics demonstrate that the correlation matrix was appropriate for factor extraction, supporting the use of exploratory and confirmatory factor analyses in subsequent stages of the analysis.

The demographic profile of the respondents indicates a well-balanced and diverse sample of small-scale farmers, strengthening the robustness of the empirical analysis within the defined study scope. The age distribution is relatively even across groups, ensuring representation of both younger and older farmers, an important consideration given potential generational differences in digital technology usage. The predominance of male respondents reflects the current structure of farm ownership in Saudi Arabia, while the presence of female farmers, although limited, indicates emerging participation.

In terms of education, most respondents possess secondary education or post-secondary diplomas, suggesting a moderate level of formal education among digitally active smallholders. This further underscores the relevance of perceived ease of use as a key determinant of effective social media engagement. Geographical representation across all major regions of the Kingdom enhances the contextual relevance of the findings by capturing regional heterogeneity in infrastructure and market access.

Finally, the distribution of farm sizes confirms that the sample primarily consists of genuine small-scale operations. The concentration of farms between 1 and 2 hectares indicates that the findings are particularly applicable to farms that depend heavily on efficient, low-cost marketing channels. Overall, the sampling design and respondent characteristics are well aligned with the study's objective of examining how digitally engaged smallholder

farmers convert social media marketing use into sustainability-oriented value creation and performance outcomes.

#### 4.3. Survey Instrument and Measures

Data were collected using a structured questionnaire administered in Arabic, the native language of the respondents. The instrument was initially developed in English based on established and validated measurement scales, and subsequently translated into Arabic following a rigorous translation and back-translation procedure conducted by a professional translator to ensure semantic equivalence and content accuracy. Before the main survey, the questionnaire was pilot-tested with ten small-scale farmers and two agricultural extension officers to refine item wording, improve clarity, and ensure logical flow.

The questionnaire consisted of four main sections. The first section provided an introduction to the study and obtained informed consent, clearly stating the research objectives and assuring respondents of anonymity and confidentiality. Participation was entirely voluntary, and consent was implied upon continuation with the survey. The second section captured demographic and farm-related information, including age, gender, education level, farm size (in hectares), and geographical location.

The third section focused on respondents' social media usage behavior. Farmers were asked whether they currently use social media for marketing their agricultural products. The fourth section measured the latent constructs included in the research model using multi-item scales assessed on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Table A1 in Appendix A. presents an overview of the constructs, representative items, and source references. Perceived Usefulness (PU) was measured using three items adapted from [43] (Cronbach's  $\alpha = 0.808$ ). Perceived Ease of Use (PEOU) was measured with three items, also adapted from Venkatesh et al. (2003) [43], capturing the perceived effort associated with using social media platforms (Cronbach's  $\alpha = 0.901$ ). Social Media Marketing Use (SMMU) was assessed using two items derived from prior research on social media usage intensity [82] (Cronbach's  $\alpha = 0.859$ ).

Sustainability Orientation (SO) was measured using three items adapted from [49], reflecting the extent to which farmers integrate sustainability considerations into their marketing and operational decisions (Cronbach's  $\alpha = 0.744$ ). Marketing Capabilities (MC) were measured using four items based on [49], capturing abilities related to customer engagement, promotion, and market responsiveness (Cronbach's  $\alpha = 0.771$ ). Financial Performance (FP) was measured using four perceptual items adapted from the same source, reflecting changes in sales, revenue, and overall financial outcomes (Cronbach's  $\alpha = 0.823$ ). Entrepreneurial Orientation (EO) was assessed using five items adapted from [49], capturing innovativeness, proactiveness, and risk-taking tendencies (Cronbach's  $\alpha = 0.861$ ).

To reduce response patterns and common method biases, all scale items were presented as statements and randomized within their respective sections. As the study was designed to include only farmers who actively use social media for marketing purposes, all Social Media Marketing Use (SMMU) items were formulated to capture actual usage behavior rather than usage intentions. This approach ensured conceptual clarity and consistency in measurement across respondents and strengthened the internal validity of the study.

It should be noted that the sampling strategy intentionally focused on farmers who already use social media for marketing purposes. While this approach ensured that respondents had direct experience with social media marketing, it also implies that the sample does not represent non-adopters or digitally excluded farmers. Consequently, the findings primarily reflect the perceptions and behaviors of digitally engaged smallholders, which should be considered when interpreting and generalizing the results.

#### 4.4. Data Analysis Methods

The collected data were coded and analyzed using a combination of SPSS 28 and SmartPLS v.4.1.1.6. First, we performed basic descriptive analysis in SPSS v.22: frequencies for categorical data, and means and standard deviations for scale items and key variables.

For the core analysis, we used partial least squares structural equation modeling. Smart-PLS was chosen due to the exploratory nature of incorporating a new construct (sustainability orientation) and the mix of measurement scales; it is also robust to slightly non-normal data and suitable for our sample size ( $N = 300$  is adequate for the complexity of our model [83]). We followed a two-step approach: first, assessment of the measurement model, and second, assessment of the structural model.

##### 4.4.1. Measurement Model Assessment

We assessed the measurement model by examining indicator loadings, internal consistency reliability (Cronbach's  $\alpha$  and Composite Reliability), convergent validity (Average Variance Extracted; AVE), and discriminant validity. Following established PLS-SEM guidelines, indicators with standardized loadings below 0.70 were initially flagged for further evaluation; however, indicator retention decisions were not based on loading values alone.

Consistent with the recommendations of [83], an iterative deletion-and-impact assessment was conducted. Indicators were removed only when their exclusion resulted in clear improvements in construct-level psychometric quality, particularly the Average Variance Extracted (AVE) and Composite Reliability (CR), or when their retention contributed to conceptual overlap among theoretically distinct constructs.

Specifically, PU4 (0.679) and PEOU5 (0.528) were removed due to insufficient indicator reliability, as their retention suppressed construct-level explanatory power. Similarly, SMMU3 (0.610), FP2 (0.484), EO1 (0.585), and EO9 (0.615) were identified as weak indicators whose inclusion contributed to elevated cross-construct correlations during preliminary discriminant validity assessments. Retaining these indicators increased conceptual overlap, as evidenced by elevated HTMT values, despite acceptable AVE levels.

Accordingly, these indicators were removed to reduce cross-construct contamination and to ensure that all constructs satisfied the recommended thresholds of  $AVE \geq 0.50$  and  $CR \geq 0.70$ , confirming adequate convergent validity and internal consistency. Importantly, no indicator was deleted solely based on its loading magnitude; all deletion decisions were contingent upon demonstrable improvements in construct-level validity metrics.

Prior to removal, all indicators were reviewed to ensure that their exclusion did not compromise the content validity or theoretical coverage of the constructs. The retained indicators adequately represent the conceptual domain of each latent variable while providing a more parsimonious and psychometrically robust measurement model.

Table 4 presents the retained indicator loadings, Cronbach's  $\alpha$ , composite reliability, and AVE values for each construct, all of which meet or exceed the recommended thresholds. Table 5 reports the cross-loadings and the HTMT ratio, with all HTMT values falling below the conservative threshold of 0.85. Discriminant validity was further confirmed using the Fornell–Larcker criterion (Table 6).

Given the self-reported, single-survey research design, potential common method bias was also assessed. Harman's single-factor test indicated that no single factor accounted for the majority of the variance (38.13%), and the marker variable technique further suggested that common method variance is unlikely to significantly affect the results [84].

**Table 4.** Construct reliability and validity.

| Construct                         | Items                           | Loading                                   | Cronbach's $\alpha$ | Composite Reliability | R-Square $R^2$ | Average Variance Extracted (AVE) |
|-----------------------------------|---------------------------------|-------------------------------------------|---------------------|-----------------------|----------------|----------------------------------|
| Social Media Marketing Use (SMMU) | SMMU1<br>SMMU2                  | 0.935<br>0.937                            | 0.859               | 0.859                 | 0.530          | 0.876                            |
| Perceived Ease of Use (PEOU)      | PEOU1<br>PEOU2<br>PEOU3         | 0.903<br>0.935<br>0.902                   | 0.901               | 0.902                 |                | 0.834                            |
| Perceived Usefulness (PU)         | PU1<br>PU2<br>PU3               | 0.868<br>0.791<br>0.871                   | 0.808               | 0.868                 | 0.195          | 0.713                            |
| Marketing capabilities (MC)       | MC1<br>MC2<br>MC3<br>MC4        | 0.749<br>0.786<br>0.776<br>0.747          | 0.771               | 0.786                 | 0.398          | 0.585                            |
| Sustainability orientation (SO)   | SO1<br>SO2<br>SO3               | 0.818<br>0.790<br>0.831                   | 0.744               | 0.744                 | 0.273          | 0.662                            |
| Entrepreneurial Orientation (EO)  | EO2<br>EO3<br>EO4<br>EO5<br>EO8 | 0.836<br>0.835<br>0.878<br>0.753<br>0.705 | 0.861               | 0.869                 |                | 0.646                            |
| Financial Performance (FP)        | FP1<br>FP3<br>FP4<br>FP5        | 0.704<br>0.842<br>0.848<br>0.834          | 0.823               | 0.833                 | 0.731          | 0.655                            |

**Table 5.** Heterotrait–monotrait ratio (HTMT)—Matrix.

|                                   | Entrepreneurial Orientation (EO) | Financial Performance (FP) | Marketing Capabilities (MC) | Perceived Ease of Use (PEOU) | Perceived Usefulness (PU) | Social Media Marketing Use (SMMU) | Sustainability Orientation (SO) |
|-----------------------------------|----------------------------------|----------------------------|-----------------------------|------------------------------|---------------------------|-----------------------------------|---------------------------------|
| Entrepreneurial Orientation (EO)  |                                  |                            |                             |                              |                           |                                   |                                 |
| Financial Performance (FP)        | 0.826                            |                            |                             |                              |                           |                                   |                                 |
| Marketing Capabilities (MC)       | 0.647                            | 0.842                      |                             |                              |                           |                                   |                                 |
| Perceived Ease of Use (PEOU)      | 0.512                            | 0.655                      | 0.751                       |                              |                           |                                   |                                 |
| Perceived Usefulness (PU)         | 0.593                            | 0.577                      | 0.520                       | 0.712                        |                           |                                   |                                 |
| Social Media Marketing Use (SMMU) | 0.533                            | 0.401                      | 0.558                       | 0.487                        | 0.878                     |                                   |                                 |
| Sustainability Orientation (SO)   | 0.657                            | 0.590                      | 0.661                       | 0.631                        | 0.682                     | 0.557                             |                                 |

#### 4.4.2. Structural Model Assessment

After validating the measurement model, we estimated path coefficients for the hypothesized relationships using PLS, with 5000 bootstrap resamples to assess significance. Figure 2 guided this analysis, with paths corresponding to H1–H13.

We evaluated model fit using the explained variance  $R^2$  for the endogenous constructs and the predictive relevance Stone-Geisser  $Q^2$ , employing blindfolding, where  $Q^2 > 0$

indicates predictive power. Additionally, although PLS-SEM lacks a definitive global fit index like covariance-based SEM, we report the Standardized Root Mean Square Residual (SRMR) as a goodness-of-fit measure. Our model's SRMR was 0.071, below the 0.08 threshold, suggesting a good approximate fit.

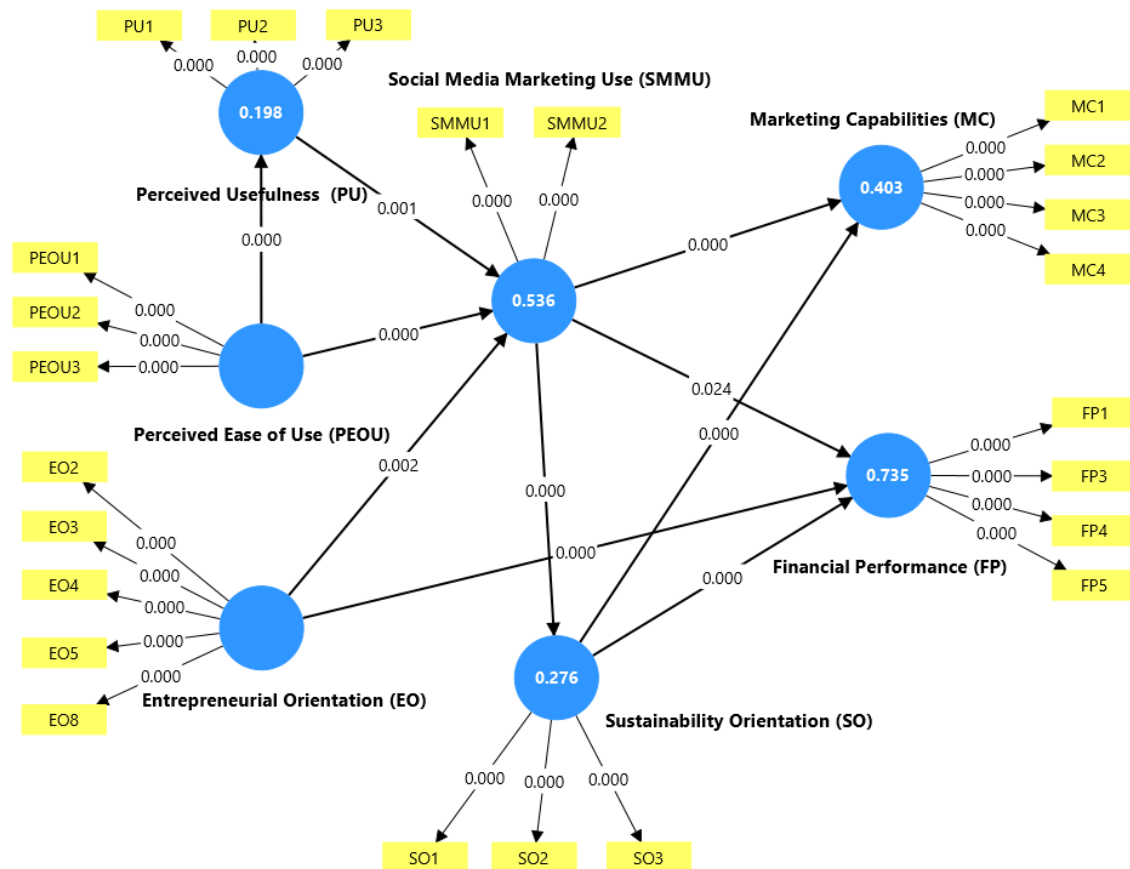


Figure 2. Depicts the structural model results with standardized path coefficients.

Table 6. Fornell–Larcker criterion.

|                                   | Entrepreneurial Orientation (EO) | Financial Performance (FP) | Marketing Capabilities (MC) | Perceived Ease of Use (PEOU) | Perceived Usefulness (PU) | Social Media Marketing Use (SMMU) | Sustainability Orientation (SO) |
|-----------------------------------|----------------------------------|----------------------------|-----------------------------|------------------------------|---------------------------|-----------------------------------|---------------------------------|
| Entrepreneurial Orientation (EO)  | 0.804                            |                            |                             |                              |                           |                                   |                                 |
| Financial Performance (FP)        | 0.704                            | 0.809                      |                             |                              |                           |                                   |                                 |
| Marketing Capabilities (MC)       | 0.562                            | 0.554                      | 0.765                       |                              |                           |                                   |                                 |
| Perceived Ease of Use (PEOU)      | 0.509                            | 0.534                      | 0.614                       | 0.913                        |                           |                                   |                                 |
| Perceived Usefulness (PU)         | 0.353                            | 0.461                      | 0.416                       | 0.445                        | 0.844                     |                                   |                                 |
| Social Media Marketing Use (SMMU) | 0.506                            | 0.554                      | 0.538                       | 0.688                        | 0.485                     | 0.736                             |                                 |
| Sustainability Orientation (SO)   | 0.657                            | 0.742                      | 0.569                       | 0.485                        | 0.419                     | 0.525                             | 0.813                           |

Table 7, presents the path coefficients (standardized betas), t-values, and significance levels for each hypothesis, as well as  $R^2$  for each dependent construct. We also describe the mediation test for H6 and H7: this was performed by examining the indirect effect of

SMMU on FP via SO (product of SMMU  $\rightarrow$  SO and SO  $\rightarrow$  FP coefficients) and checking its significance with bootstrapping. Full or partial mediation was determined by whether the direct effect (SMMU  $\rightarrow$  FP) remained significant when SO was included.

**Table 7.** Structural Model Path Coefficients and Hypothesis Testing.

| Hypothesis | Path                                   | $\beta$ | t-Value | p-Value | Supported |
|------------|----------------------------------------|---------|---------|---------|-----------|
| H1         | PU $\rightarrow$ SMMU                  | 0.195   | 3.298   | <0.001  | Supported |
| H2         | PEOU $\rightarrow$ SMMU                | 0.511   | 8.742   | <0.001  | Supported |
| H3         | PEOU $\rightarrow$ PU                  | 0.445   | 6.968   | <0.001  | Supported |
| H4         | SMMU $\rightarrow$ SO                  | 0.525   | 8.869   | <0.001  | Supported |
| H5         | SO $\rightarrow$ FP                    | 0.338   | 5.737   | <0.001  | Supported |
| H6         | SMMU $\rightarrow$ MC                  | 0.330   | 4.931   | <0.001  | Supported |
| H7         | SMMU $\rightarrow$ SO $\rightarrow$ MC | 0.208   | 5.235   | <0.001  | Supported |
| H8         | SMMU $\rightarrow$ SO $\rightarrow$ FP | 0.178   | 4.446   | <0.001  | Supported |
| H9         | EO $\rightarrow$ SMMU                  | 0.178   | 3.030   | <0.002  | Supported |
| H10        | EO $\rightarrow$ FP                    | 0.526   | 7.429   | <0.001  | Supported |
| H11        | SO $\rightarrow$ MC                    | 0.396   | 6.997   | <0.001  | Supported |
| H12        | EO $\rightarrow$ MC                    | 0.178   | 3.030   | <0.002  | Supported |
| H13        | SMMU $\rightarrow$ FP                  | 0.110   | 2.257   | <0.024  | Supported |

Note:  $p < 0.05$ ,  $p < 0.01$ ,  $p < 0.001$  (two-tailed tests).

All analyses were conducted at a 95% confidence level. The results are detailed in the next section, followed by interpretation and discussion. And the indirect effect of SMMU on MC via SO (product of SMMU  $\rightarrow$  SO and SO  $\rightarrow$  MC coefficients) and checking its significance with bootstrapping. Full or partial mediation was determined by whether the direct effect (SMMU  $\rightarrow$  MC) remained significant when SO was included. All analyses were conducted at a 95% confidence level. The results are detailed in the next section, followed by interpretation and discussion.

## 5. Integrated Results and Discussion

The structural model indicates that value creation in smallholder agribusiness is not an automatic outcome of technology adoption, but a contingent process shaped by usability, strategic orientation, and entrepreneurial agency. Although all 13 hypotheses were supported, substantive interpretation is based on path magnitudes and effect-size considerations rather than statistical significance alone [83,85].

A clear hierarchy of influence emerges. PEOU  $\rightarrow$  SMMU represents the strongest relationship ( $\beta = 0.511$ ), underscoring usability as the primary gateway to sustained digital engagement among smallholders. More importantly, the findings clarify the transformation mechanism through which digital activity becomes economically meaningful: Sustainability Orientation (SO) provides the strategic logic that converts social media engagement into Marketing Capabilities (MC) by shaping value framing, differentiation, and market communication routines. In this sense, SO does not merely accompany digital engagement; it operationally channels it into capability development and, through this route, contributes to improved performance outcomes.

By contrast, the direct link between SMMU and Financial Performance is statistically significant but substantively modest ( $\beta = 0.110$ ), indicating that digital presence alone yields only incremental financial gains. Similarly, PU  $\rightarrow$  SMMU is weaker than the usability pathway ( $\beta = 0.195$ ), implying that manageability concerns currently outweigh performance expectations in shaping engagement behavior.

From an RBV perspective, capabilities emerge from the interaction of technological enactment (SMMU), strategic orientation (SO), and entrepreneurial agency (EO), justifying the inclusion of their direct paths as complementary mechanisms rather than redundant

effects [83]. While this structure may raise parsimony concerns, it is theoretically intentional to reflect the multidimensional nature of capability formation in smallholder agribusiness contexts [38,86,87].

### 5.1. Technology Acceptance: The Primacy of Usability (H1, H2, H3)

The SEM results show that the TAM-based relationships are supported (Table 7), confirming that both Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) positively influence Social Media Marketing Use (SMMU) among Saudi smallholder farmers. However, the effects are not equally strong: PEOU  $\rightarrow$  SMMU is the dominant pathway ( $\beta = 0.511$ ), while PU  $\rightarrow$  SMMU is comparatively modest ( $\beta = 0.195$ ). In addition, PEOU significantly strengthens PU ( $\beta = 0.445$ ), reinforcing the role of usability perceptions in shaping beliefs about usefulness.

Taken together, these findings validate the core logic of TAM [40], while revealing a context-specific nuance: in smallholder and rural settings, usability functions as a critical psychological gatekeeper to digital engagement [13,38,50]. This pattern contrasts with capital-intensive agribusiness contexts where adoption is more strongly driven by expected economic utility. Importantly, usability constraints are not confined to emerging economies; evidence from highly developed agricultural systems similarly highlights learning costs and technological unfamiliarity as persistent barriers among small-scale farmers [87].

Within the Saudi context, characterized by heterogeneous digital literacy and limited institutionalized support for farm-level digitalization [8], ease of use likely reduces not only technical effort but also the cognitive burden and perceived risk associated with shifting toward direct digital market participation [2]. From an institutional perspective, the strong effect of usability aligns with Saudi Vision 2030's emphasis on digital transformation and entrepreneurship [88]. The findings suggest that the remaining adoption challenge for many smallholders lies less in access and more in functional usability and applied competence [89]. Accordingly, Vision 2030 aligned initiatives should prioritize user-centered design, intuitive mobile interfaces, and targeted digital literacy programs to ensure that social media tools function as bridges, rather than barriers, to market access, participation, and value creation.

### 5.2. Digital Engagement as a Strategic Driver (H4, H5, H6, H7, H8, H11, H13)

Beyond adoption, the results indicate that Social Media Marketing Use (SMMU) acts as a strategic driver that shapes orientations, capabilities, and performance. SMMU strongly strengthens Sustainability Orientation (SO) ( $\beta = 0.525$ ) and also contributes directly to Marketing Capabilities (MC) ( $\beta = 0.330$ ), suggesting that sustained digital engagement is associated with both stronger marketing proficiency and a more sustainability-oriented strategic mindset among Saudi smallholder farmers.

However, the financial value of digital engagement is not realized primarily through direct use. Although SMMU retains a statistically significant direct effect on Financial Performance (FP), its magnitude is modest ( $\beta = 0.110$ ), indicating that social media presence alone yields only incremental financial gains. In contrast, both SO  $\rightarrow$  FP ( $\beta = 0.338$ ) and SO  $\rightarrow$  MC ( $\beta = 0.396$ ) are substantial, reinforcing the interpretation that sustainability operates as a strategic mechanism through which digital engagement is converted into market-facing capabilities and, ultimately, stronger performance outcomes.

This mechanism is further supported by the mediation results. The indirect effects of SMMU  $\rightarrow$  SO  $\rightarrow$  MC ( $\beta = 0.208$ ) and SMMU  $\rightarrow$  SO  $\rightarrow$  FP ( $\beta = 0.178$ ) confirm that social media engagement generates meaningful economic returns primarily when it activates a sustainability-oriented logic that shapes how farmers frame value, communicate credibility, and leverage digital interactions strategically. In this sense, technology serves

as enabling infrastructure, whereas SO functions as the transformation mechanism that channels engagement into capability development and performance improvement.

Within the Saudi smallholder context, the mobile phone can be viewed as a portable marketing department, enabling real-time coordination of pricing, customer communication, and product differentiation [90]. Social media also provides an integrative space where smallholders can operationalize the triple bottom line by strengthening direct sales, building trust-based consumer relationships, and communicating environmental stewardship through visible farming practices [39,91]. These dynamics are particularly relevant given broader evidence that small-scale farmers, across both emerging and developed economies, face persistent challenges related to market access, scale disadvantages, and the commercialization of innovation [92].

A distinctive contribution of this study is showing that Sustainability Orientation emerges endogenously through repeated digital interaction, rather than being imposed externally. From an RBV perspective, SO functions as an intangible strategic asset that amplifies the returns to digital investment by enabling more durable differentiation and market positioning [38,93]. In the Saudi agri-food market, characterized by high information asymmetry [94,95], credible sustainability signaling can support premium pricing, customer loyalty, and financial resilience. Accordingly, sustainability orientation should be understood not as a cost burden, but as a value-creation mechanism that transforms social media engagement into superior financial outcomes.

### 5.3. Entrepreneurial Orientation: The Engine of Success (H9, H10, H12)

Entrepreneurial Orientation (EO) emerges as a central behavioral driver shaping both digital engagement and performance outcomes among Saudi smallholder farmers. EO shows the strongest direct effect on Financial Performance (FP) ( $\beta = 0.526$ ), underscoring that strategic posture and entrepreneurial agency are critical determinants of success in small-scale agribusiness.

Beyond performance outcomes, EO also supports proactive digital engagement and capability development. EO positively influences SMMU ( $\beta = 0.178$ ), suggesting that more innovative and proactive farmers are more willing to experiment with social media as a strategic tool rather than treating it as a peripheral communication channel. EO also contributes directly to Marketing Capabilities (MC) ( $\beta = 0.178$ ), indicating that entrepreneurial behavior fosters market-sensing routines, adaptive marketing practices, and learning-by-doing in digital environments. These results align with entrepreneurship theory emphasizing innovativeness, proactiveness, and risk-taking as key drivers of performance under uncertainty [59,65].

Importantly, the results suggest that EO strengthens farmers' ability to translate both digital engagement and sustainability-oriented practices into tangible economic gains. In the Saudi context, entrepreneurial farmers are more likely to leverage social media for active market sensing, experimenting with sustainability-oriented narratives, and responding adaptively to consumer feedback behaviors that help navigate evolving triple bottom line expectations in modern agrifood markets [2]. Accordingly, EO functions as the behavioral engine that enables smallholders to convert digital tools from mere channels of communication into instruments of strategic value creation.

From a policy perspective, accelerating digital transformation under Saudi Vision 2030 requires more than technical access or hardware provision. Complementary support that fosters entrepreneurial mindsets, through incubation programs, mentorship, and risk-sharing mechanisms, can enhance farmers' capacity to leverage digital engagement for sustainable value creation and long-term financial resilience.

Table 7 summarizes the structural path coefficients and hypothesis testing results discussed above.

#### 5.4. *The Dark Side of Digital Engagement: Beyond Positive Outcomes:*

While the findings demonstrate the positive role of Social Media Marketing Use (SMMU) in shaping sustainability orientation, marketing capabilities, and financial performance [15,96], it is equally important to acknowledge potential unintended consequences associated with sustained digital engagement among smallholder farmers. Recognizing these dark side dynamics does not undermine the proposed model; rather, it provides a more realistic and balanced understanding of digital marketing as a double-edged tool [97,98].

First, the strong association between SMMU and Sustainability Orientation (SO) suggests the possibility that sustainability-related signaling could, in some cases, outpace substantive sustainability practices, reflecting a potential decoupling between digital representation and on-farm implementation. Social media platforms prioritize visibility, visual narratives, and symbolic communication, which may incentivize farmers to emphasize environmentally friendly messaging even when operational changes are partial or incremental [14,99,100]. Such a decoupling between sustainability signaling and substantive practice could expose farmers to reputational risks and erode consumer trust over time, particularly as sustainability awareness among Saudi consumers continues to increase in line with Vision 2030 initiatives [101–103].

Second, social media marketing may impose a non-trivial digital labor burden on smallholder farmers. Unlike larger agribusinesses with specialized marketing staff, smallholders often manage production, logistics, and customer engagement simultaneously [32,38,49]. The need for continuous content creation, responsiveness, and platform monitoring may contribute to time pressure and digital fatigue, potentially diverting attention away from core farming activities. In this sense, digital engagement may introduce new forms of work intensification rather than unambiguous efficiency gains.

Third, social media environments expose farmers to high volumes of information, advice, and emerging trends related to sustainability and marketing [104–107]. While access to information can be beneficial, it may also lead to information overload or the diffusion of unverified practices. In the absence of strong institutional filtering mechanisms, smallholders may adopt practices based on popularity rather than agronomic or economic evidence, which could negatively affect productivity or financial stability [108–112].

Taken together, these potential dark sides underscore the importance of complementary institutional support, capacity-building initiatives, and guidance mechanisms. Social media marketing should therefore be understood not as a universally beneficial solution, but as a strategic tool whose outcomes depend on how it is governed, integrated, and supported within smallholder farming systems.

#### 5.5. *Implications*

Building on the integrated results and discussion presented above, this subsection outlines the study's theoretical contributions, practical and policy implications.

##### 5.5.1. Theoretical Contributions

This study advances the Technology Acceptance Model (TAM) beyond a merely incremental extension by challenging its traditionally linear logic that links technology acceptance directly to performance outcomes. Whereas conventional TAM applications in agricultural research often conceptualize adoption as the primary or final endpoint [28], this study reconceptualizes Sustainability Orientation (SO) as an endogenous strategic value-creation mechanism that determines how digital engagement is translated into concrete

marketing capabilities and financial performance. To clarify this theoretical advancement, Table 7 presents a conceptual comparison positioning the proposed framework relative to prior TAM-based extensions. The theoretical contribution unfolds along three interrelated dimensions.

**From Adoption Intention to Value-Capture Logic.** Most TAM-based studies in agriculture focus on explaining the determinants of technology adoption or usage intensity. This study shifts the analytical focus from adoption incidence to value realization. By positioning sustainability orientation as a mediating mechanism, the findings demonstrate that perceived usefulness does not automatically translate into superior financial performance. Instead, economic value is realized only when digital tools are strategically employed to communicate sustainability-based differentiation. In this sense, SO operates as the strategic logic through which social media engagement enables trust building, product differentiation, and market positioning, thereby converting digital interaction into economic returns.

**Reframing TAM as a strategic utilization framework.** This perspective reframes TAM from a predominantly behavioral adoption model into a strategic utilization and value-capture framework. Such a shift is particularly relevant in resource-constrained smallholder contexts, where the pathway from usability to profitability is neither automatic nor technologically determined. Rather, value realization is contingent upon how farmers strategically align digital engagement with sustainability-oriented market narratives. This interpretation aligns with the Resource-Based View (RBV) [87], which conceptualizes strategically deployed digital engagement as a firm-specific intangible capability capable of generating sustained competitive advantage.

**Integrating Entrepreneurial Drive.** By incorporating entrepreneurial orientation (EO) as a foundational driver, the proposed model further extends TAM beyond its traditional socio-psychological boundaries. EO captures the proactive, innovative, and risk-taking behaviors that activate the value-creation process. This integration addresses a key limitation of traditional TAMs, which often overlook the strategic posture of the technology user. The empirical results confirm that EO functions as the engine driving not only the adoption of social media marketing tools but also the effective translation of digital engagement into enhanced marketing capabilities and superior financial outcomes.

### 5.5.2. Practical and Policy Implications

The findings offer a clear and actionable roadmap for advancing the agricultural objectives of Saudi Vision 2030. Digital transformation initiatives should move beyond merely expanding access to digital platforms and instead prioritize user-centered capacity building. Training programs should be designed to reduce cognitive load and emphasize intuitive mobile workflows, such as digital storytelling, customer messaging, and direct market interaction. Such an approach can facilitate farmers' transition from intermediary-dependent selling to direct digital market participation while strengthening trust and transparency.

Taken together, the results indicate that the mobile phone functions as a portable marketing department for smallholder farmers, enabling promotion, customer engagement, branding, and market signaling, rather than serving merely as a basic communication device. To enhance financial performance, farmers are encouraged to intentionally integrate sustainability narratives, such as organic production practices, water conservation, or local sourcing, into their social media content. Importantly, this is not a compliance-driven activity, but a proven mechanism for value capture, brand differentiation, and customer loyalty.

Public support programs should foster an entrepreneurial mindset alongside technical digital skills. Encouraging innovativeness, proactiveness, and calculated risk-

taking through agricultural incubators, mentorship schemes, and targeted financial incentives can accelerate the shift toward high-value, sustainability-driven agribusiness models. Integrating digital competencies with sustainability and entrepreneurship training is likely to yield more durable improvements in farm performance than isolated capability-building initiatives.

## 6. Conclusions, Limitations, and Future Research

### 6.1. Conclusions

This study examined how social media marketing use (SMMU) influences sustainability orientation (SO), marketing capabilities (MC), and financial performance (FP) among digitally engaged smallholder farmers in Saudi Arabia. By integrating the Technology Acceptance Model (TAM) with sustainability and entrepreneurial perspectives. Drawing on survey data from 300 active social media users and employing PLS-SEM, the findings provide robust empirical evidence that digital engagement is not merely an outcome of technology adoption, but rather a strategic mechanism that shapes both organizational orientation and performance in small-scale agriculture.

The results confirm that perceived ease of use (PEOU) and perceived usefulness (PU) remain central drivers of social media marketing use, with ease of use emerging as the more dominant factor in this context. This finding shows that for smallholder farmers operating under heterogeneous levels of digital literacy and limited institutional support, usability functions as a critical gateway to effective digital market participation. Beyond adoption, social media marketing use was shown to strengthen sustainability orientation and marketing capabilities, which subsequently translated into improved financial performance. Importantly, sustainability orientation emerged as a key mediating mechanism, demonstrating that digital engagement generates meaningful economic returns primarily when embedded within a sustainability-driven strategic logic.

The study further highlights the pivotal role of entrepreneurial orientation (EO) as a foundational driver of both digital engagement and financial success. Entrepreneurially oriented farmers were better positioned to strategically leverage social media platforms, experiment with sustainability-oriented practices, and respond proactively to market signals. Collectively, these findings advance understanding of how technology acceptance, sustainability orientation, and entrepreneurial behavior interact to drive value creation in digitally active smallholder agriculture.

From a theoretical perspective, this research extends TAM beyond its traditional focus on adoption intentions by emphasizing strategic utilization and performance outcomes. It demonstrates that sustainability orientation should not be viewed as a compliance burden or a peripheral outcome, but rather as a value-creation mechanism through which digital tools are transformed into more durable competitive advantages. From a practical and policy standpoint, the findings suggest that initiatives aligned with Saudi Vision 2030 should move beyond expanding digital access alone and instead integrate digital skills development with sustainability awareness and entrepreneurial capacity building. In terms of scope, the findings should be interpreted as representative of digitally engaged smallholder farmers in Saudi Arabia and may not directly generalize to non-adopters or digitally marginalized farmers without further comparative research.

While the full support of the hypothesized relationships strengthens internal model consistency, it also emphasizes the importance of cautious interpretation. The results reflect a close alignment between theory and data within a specific institutional and cultural setting, rather than deterministic or universally applicable effects. Accordingly, the study's contribution lies not in hypothesis confirmation alone, but in elucidating how technology acceptance, sustainability orientation, and entrepreneurial orientation jointly shape market-

ing capabilities and performance outcomes. Future research should examine alternative model configurations, potential moderating variables, and different agricultural contexts to further validate the robustness and generalizability of these relationships.

## 6.2. Limitations and Future Research

Despite its contributions, this study is subject to several limitations that should be acknowledged. First, the sample was intentionally restricted to smallholder farmers who were already using social media for marketing purposes. While this focus was theoretically necessary to examine post-adoption mechanisms, specifically how digital engagement is transformed into sustainability orientation, marketing capabilities, and financial performance. It introduces a degree of self-selection bias. Accordingly, the findings should be interpreted within the boundary of digitally engaged smallholder farmers and may not be directly generalizable to non-adopters or late adopters of digital tools.

At the same time, this purposive sampling strategy enabled a more focused and internally valid examination of strategic behavior following adoption. By concentrating on active users, the study avoids the conceptual and empirical noise associated with non-users who lack meaningful digital engagement. Thereby allowing clearer identification of the mechanisms through which social media marketing contributes to sustainability-oriented value creation and financial resilience.

It is also important to acknowledge the potential inflation of effect sizes resulting from the research sampling approach. By focusing exclusively on actual users of social media marketing, the study examines a relatively homogeneous group characterized by higher levels of technological readiness and potentially stronger baseline entrepreneurial orientation. In a more heterogeneous sample that includes non-users, the variance in social media marketing use would likely be greater, which could attenuate the observed relationships between SMMU, MC, and FP.

This suggests that the transformative effects of sustainability and entrepreneurial orientations identified in this study reflect the potential value realization among digitally ready farmers, rather than universal effect sizes applicable across the entire agricultural sector. For farmers facing substantial initial barriers to digital entry, these benefits may emerge more gradually or be less pronounced. Consequently, the reported path coefficients should be interpreted as representing the strategic impact of digital engagement within an advanced or digitally prepared segment of smallholder agriculture.

Beyond selection bias, several additional contextual limitations warrant consideration. First, the findings are situated within a broader digital divide in the agricultural sector. While the results demonstrate the benefits of social media marketing for digitally connected smallholders, they do not fully capture the structural, infrastructural, and digital literacy barriers that prevent other farmers from accessing or effectively using digital platforms. As a result, the value-realization pathways identified in this study may remain inaccessible to smallholders operating on the disadvantaged side of the digital divide.

Second, the sample exhibits a pronounced gender imbalance, with approximately 90% of respondents being male. Although this distribution reflects the prevailing structure of farm ownership and digital market participation in the studied context [113,114], it limits the generalizability of the findings to female-led agribusinesses. Gender-specific differences may exist in how sustainability orientation is formed, how trust is cultivated through social media, or how digital tools are leveraged for market engagement—dynamics that this study was not designed to capture.

Third, the study does not differentiate between platform-specific effects. In practice, smallholder farmers often employ a portfolio of social media platforms, combining private messaging applications (e.g., WhatsApp) for transactional coordination with visual or

public platforms (e.g., Instagram or TikTok) for branding and storytelling. These platforms offer distinct affordances that may shape marketing capabilities and performance outcomes in different ways [115]. Future research should therefore adopt a platform-sensitive perspective to examine how specific social media functionalities, such as the relational intimacy of messaging apps versus the visual reach of content-driven platforms, moderate the relationship between digital engagement, sustainability orientation, and firm performance.

Looking ahead, several avenues for future research emerge. Longitudinal studies could examine how the relationships between social media marketing use, sustainability orientation, and financial performance evolve as farmers accumulate greater digital experience. Future research could also integrate consumer-side data to assess how sustainability signaling influences trust, perceived quality, and willingness to pay in agri-food markets. Additionally, exploring the interaction between social media marketing and emerging technologies, such as blockchain-based traceability, IoT applications, or AI-driven market sensing, could yield deeper insights into advanced digital strategies for smallholder competitiveness.

Finally, comparative research designs that include both adopters and non-adopters, as well as late adopters at different stages of technological readiness, would help clarify how digital value-creation mechanisms vary across adoption stages and contextual conditions. Examining moderating factors such as age, education, farm size, and access to extension services would further enhance understanding of heterogeneous digital transformation pathways in smallholder agriculture.

Overall, while bounded by these limitations, the study provides robust insights into how social media marketing use, when strategically aligned with sustainability and entrepreneurial orientations, can function as a powerful enabler of value creation and financial resilience in emerging agricultural economies.

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## Abbreviations

The following abbreviations are used in this manuscript:

|      |                             |
|------|-----------------------------|
| SMMU | Social media marketing use  |
| PEOU | Perceived Ease of Use       |
| PU   | Perceived Usefulness        |
| SO   | Sustainability Orientation  |
| EO   | Entrepreneurial Orientation |
| FP   | Financial Performance       |
| MC   | Marketing Capabilities      |

## Appendix A

**Table A1.** Measurement Items and Sources.

| Construct                         | Items                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Reference |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Perceived Ease of Use (PEOU)      | PEOU1. It is easy to learn to use social media for marketing.<br>PEOU2. Posting and managing content on social media is easy for me.<br>PEOU3. Interacting with customers via social media is straightforward.                                                                                                                                                                                                                                                                                                       | [23]      |
| Perceived Usefulness (PU)         | PU1. Social media use improves my farm's marketing performance.<br>PU2. Social media helps me reach more customers efficiently.<br>PU3. Using social media increases my sales and profits.                                                                                                                                                                                                                                                                                                                           | [23]      |
| Social Media Marketing Use (SMMU) | SMMU1. I frequently use social media to market my products.<br>SMMU2. I share photos or videos of my farm products on social media.                                                                                                                                                                                                                                                                                                                                                                                  | [82]      |
| Sustainability Orientation (SO)   | SO1. I prioritize eco-friendly farming practices.<br>SO2. I highlight my farm's sustainable practices in marketing.<br>SO3. I am committed to sustainable agriculture, even if costs are higher.                                                                                                                                                                                                                                                                                                                     | [49]      |
| Marketing Capabilities—MC         | MC1. I have a strong knowledge of my target market.<br>MC2. I have effective control over and access to key market channels.<br>MC3. I have privileged and strong relationships with my clients.<br>MC4. I have a stable and fixed base of regular clients.                                                                                                                                                                                                                                                          | [49]      |
| Entrepreneurial Orientation—EO    | EO2. My farm has implemented several new product lines in the last five years.<br>EO3. My farm has implemented important shifts in product lines in the last five years.<br>EO4. My farm is generally the first to begin actions that the competitors follow.<br>EO5. My farm is very often the first to implement new products, new technologies, new production methods, etc.<br>EO8. Attending to the type of environment, audacious acts accomplish the farm's purposes, and not minimum tactical modifications. | [49]      |
| Financial Performance—FP          | FP1. On average, my farm has increased its sales in the last five years.<br>FP3. The product portfolio of my farm has improved in the past five years.<br>FP4. New product markets were reached by my farm in the past five years.<br>FP5. New geographical markets were reached by my farm in the past five years.                                                                                                                                                                                                  | [49]      |

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