

Review

Insurance–Input Bundles in Smallholder Agriculture: A Comprehensive Review of Awareness, Adoption Drivers, Satisfaction, and Productivity Outcomes

Tariro Mafirakurewa *, Nasiphi Vuzokazi Bontsa and Abbyssinia Mushunje

Department of Agricultural Economics & Extension, University of Fort Hare, Alice Campus, Alice 5700, South Africa; NBontsa@ufh.ac.za (N.V.B.); AMushunje@ufh.ac.za (A.M.)

* Correspondence: 201713660@ufh.ac.za

Abstract

Agricultural production is increasingly threatened by climate variability, limited access to quality inputs, and market shocks in developing countries. Insurance–input bundles, which integrate crop insurance with inputs like fertiliser and seed, have emerged as a promising tool for improving productivity and resilience among smallholder farmers. This study adopts a structured (systematic narrative) literature review approach, synthesising evidence from 152 studies to examine farmers’ awareness, attitudes, willingness to pay, participation, satisfaction, and productivity outcomes associated with insurance–input bundles. The findings show that awareness remains uneven and often limited by weak extension systems and low financial literacy, while farmers’ attitudes are strongly shaped by past experiences, cultural perceptions, and institutional trust. Furthermore, affordability constraints and risk misinterpretation reduce willingness to pay, whereas perceived value and institutional credibility significantly enhance demand for bundled products. Across the reviewed literature, adoption is shown to be a non-linear and interdependent process influenced by behavioural, economic, and institutional factors, where breakdowns in trust, affordability, or information can limit participation. Evidence further indicates that insurance–input bundles promote the adoption of improved inputs, increase yields, and enhance income stability, although these impacts are highly context-dependent and mediated by implementation quality, including timely payouts and effective service delivery. The review contributed to the literature by advancing a systems-based understanding of bundled insurance adoption, highlighting the central role of institutional reliability, behavioural responses, and implementation quality. Lastly, the review underscores the need for strong institutions, integrated extension systems and farmer-centred design to ensure sustainable scaling.

Keywords: agricultural productivity; crop insurance–input bundles; smallholder farmers; awareness; attitudes; willingness-to-pay perceptions; climate variability

Academic Editors: Fabian Capitanio, Lontakis Angelos, Alexandra Sintori and Tsioboukas Konstantinos

Received: 18 February 2026

Revised: 6 May 2026

Accepted: 2 June 2026

Published: 30 June 2026

Copyright: © 2026 by the authors.

Licensee MDPI, Basel, Switzerland.

This article is an open access article distributed under the terms and conditions of the [Creative Commons Attribution \(CC BY\)](https://creativecommons.org/licenses/by/4.0/) license.

1. Introduction

Agricultural production is naturally risky due to its high reliance on natural factors such as temperature, rainfall, and pests [1]. Smallholder farmers are prone to these risks because their farming practices are often rain-fed and lack sufficient financial buffers. The advent of climate change has exacerbated the incidence and severity of droughts, floods,

and pest conditions, increasing the risks for farmers [2]. In developing countries, farmers often lack adequate formal mechanisms for managing these risks, and this affects their productivity [3,4]. In most cases, smallholder farmers rely on informal mechanisms such as borrowing from relatives or selling livestock, and these mechanisms are often inadequate for managing these risks [5].

Building on these challenges, crop insurance has emerged as a crucial tool for managing agricultural risks in many parts of the world. Johnson [6] and Nshakira-Rukundo et al. [7] asserted that in sub-Saharan Africa and other developing regions, insurance markets remain underdeveloped and poorly utilised. According to Nshakira-Rukundo et al. [7], this is attributed to a lack of awareness, limited trust, and affordability constraints among farmers. In response to these constraints, various models of improving crop insurance uptake have been developed by development agencies and policymakers in different parts of the world. One of the models is the integration of crop insurance and agricultural inputs into insurance–input bundles.

Insurance–input bundles combine crop insurance and basic farm inputs such as seeds, fertilisers, and pesticides. This is premised on the idea that a farmer will receive both crop insurance and productivity-enhancing resources in one package. Nshakira-Rukundo et al. [7] and Zougmore et al. [8] asserted that this approach reduces transactional costs and increases the chances of adoption compared to pure crop insurance products. In addition, bundled insurance–input products benefit input suppliers and financial institutions by reducing default risks with credit-linked insurance provisions [9,10]. Governments and NGOs are also supporting these schemes as they align with their main goals, which include food security and agricultural resilience [11,12]. According to Nshakira-Rukundo et al. [7] and Kousky et al. [13], bundled products also address the market failure of low insurance demand by embedding insurance in input transactions.

Despite these potential benefits, empirical evidence on insurance–input bundles presents mixed outcomes. Empirical evidence shows that insurance–input bundles can improve risk management and enhance agricultural productivity outcomes [14–16]. However, adoption rates vary significantly across regions and farmer groups, reflecting differences in farmer perceptions, institutional arrangements, and programme design features [7].

This variation in results indicates that the impact of insurance–input bundles is a function of a complex interaction between behavioural, socioeconomic, and institutional variables. Several behavioural and institutional variables affecting farmers' participation in insurance–input bundles have been identified in past studies. These variables include farmers' awareness of insurance products [16–21], reliability of insurance products, cost constraints, and trust in implementing institutions [19–22]. Okpukpara et al. [23]. Alabi et al. [24] and Madaki et al. [18] added that these variables are shaped by socioeconomic variables such as farm size, education, access to extension services and gender.

This study is grounded in the Theory of Planned Behaviour (TPB) and the Technology Acceptance Model (TAM). The TPB provides a framework for understanding how farmers' attitudes, subjective norms, and perceived behavioural control influence their intentions to adopt an insurance–input bundle. While the TAM explains adoption decisions based on perceived usefulness and perceived ease of use of bundled products. Together, these models offer complementary insights into farmers' behavioural responses to insurance innovations. In addition, the study incorporated the resilience theory as a complementary lens to conceptually frame how insurance–input bundles increase farmers' capacity to absorb and adapt to agricultural production risks. The integration of these perspectives allows a detailed understanding of the behavioural drivers of adoption and their implications on farm resilience and productivity outcomes.

Despite the growing body of literature, evidence remains fragmented and focused on isolated dimensions of adoption, behaviour, or productivity outcomes. Most research studies focus on individual aspects such as willingness to pay [25,26], awareness [9,27], and productivity impacts [28], with limited attempts to integrate these dimensions within a comprehensive analytical framework. As a result, the existing literature provides only a partial understanding of how behavioural, economic, and institutional factors interact to shape adoption decisions and farm-level outcomes in insurance–input bundle systems. In particular, the underlying mechanisms through which insurance–input bundles influence risk-management behaviour, input investment decisions, and productivity outcomes remain insufficiently theorised and empirically synthesised. This review addresses this gap by synthesising emerging literature on insurance–input bundles for smallholder farmers. Generally, the study develops an integrated framework that links farmer awareness, attitudes, willingness to pay, participation behaviour, and satisfaction with farm-level productivity and performance outcomes. This review advances the literature by (i) demonstrating how institutional reliability and behavioural constraints jointly shape adoption pathways, (ii) conceptualising adoption as a sequential yet interdependent process, and (iii) providing a systems-based perspective that connects micro-level farmer behaviour with broader programme performance and development outcomes. In addition, the study provides an overview of the key policy implications and considerations pertinent to the scaling up of insurance–input bundles. It is against this backdrop that this study seeks to (i) examine farmers’ awareness, attitudes, willingness to pay, satisfaction, and participation; (ii) evaluate evidence on the impacts of bundles on farm productivity, particularly in maize production; (iii) identify the key drivers and barriers to adoption; and (iv) highlight policy lessons and practical insights for scaling up insurance–input bundles. The literature contributes to the broader discourse on input markets, agricultural risk, and the resilience of smallholder farmers in developing economies. It further shows that there is scope for insurance–input bundles to enhance smallholder resilience. This study addresses these contributions by providing an integrated synthesis of fragmented evidence on insurance–input bundles by linking behavioural factors (such as awareness, attitudes, and willingness to pay) with farm-level outcomes, including productivity and performance. In addition, it introduces a resilience-oriented perspective to better understand how insurance–input bundles increase smallholder farmers’ capacity to adapt to shocks and manage agricultural risks. Furthermore, it offers a comprehensive assessment of the drivers and barriers to adoption across various contexts, thereby generating cross-cutting insights for policy and practice. Collectively, these contributions are crucial as they provide a detailed understanding of how insurance–input bundles function. This informs the design of more effective, scalable, and context-specific insurance interventions for improving smallholder agricultural productivity and resilience. The study is organised as follows: Section 2 presents the methodology, including the review design, search strategy, and analytical approach. Section 3 highlights the theoretical perspectives. Section 4 examines farmers’ awareness of insurance–input bundles, while Section 5 focuses on farmers’ attitudes towards insurance input bundles. Section 6 analyses determinants of farmers’ willingness to pay, and Section 7 explores farmers’ participation in insurance–input schemes. Section 8 assesses the farmers’ satisfaction with insurance–input bundles. Section 9 assesses the impact of insurance–input bundles on farm productivity and performance. and Section 10 provides a cross-cutting synthesis of key determinants, whilst section 11 highlighted the synthesis network of insurance input bundle adoption among smallholder farmers. Section 12 and 13 concludes with policy implications and directions for future research.

2. Methodology

2.1. Research Methodology

2.1.1. Review Approach

This study adopted a structured (systematic narrative) literature review approach to synthesise existing empirical and theoretical evidence on insurance–input bundles among smallholder farmers. This method combines the systematic identification and selection of relevant studies with a narrative synthesis of key themes, allowing for an in-depth analysis of behavioural, economic, and institutional determinants of adoption. The structured review design ensures analytical rigour while providing flexibility to integrate insights across diverse contexts and study designs.

2.1.2. Search Strategy

A comprehensive literature search was conducted across multiple academic databases, including Google Scholar, ScienceDirect, Scopus, and ResearchGate, to identify relevant peer-reviewed journal articles, working papers, and institutional reports. The search was guided by a combination of keywords and Boolean operators, including: “insurance–input bundles”, “agricultural insurance adoption”, “crop insurance”, “willingness to pay”, “smallholder farmers”, “risk management”, “climate resilience”, and “agricultural productivity”.

The search focused primarily on studies published between 2016 and 2025, to capture both foundational and recent developments in agricultural insurance and bundled service innovations. However, earlier studies were included where they contributed to foundational theoretical perspectives.

2.1.3. Inclusion and Exclusion Criteria

To ensure relevance and quality, studies were selected based on the following inclusion criteria:

- (i) Focus on agricultural insurance, input bundling, or related risk-management strategies;
- (ii) Empirical or theoretical contributions relevant to smallholder farming systems;
- (iii) Peer-reviewed journal articles or credible institutional publications;
- (iv) Studies addressing key themes such as awareness, attitudes, willingness to pay, participation, or farm-level outcomes.

Studies were excluded if they:

- (i) Did not relate to agricultural insurance or bundled input systems;
- (ii) Lacked sufficient methodological clarity;
- (iii) Were not accessible in full text;
- (iv) Focused on non-agricultural insurance contexts.

2.1.4. Study Selection Process

The study selection process followed a structured screening procedure. Initially, a broad pool of studies was identified through keyword searches. Titles and abstracts were then screened to assess relevance, followed by a full-text review of selected articles. A total of 187 records were identified through database searching ($n = 178$) and other sources ($n = 9$). After removing duplicates ($n = 12$), 175 records remained for title and abstract screening. During the screening stage, 12 records were excluded due to a lack of relevance to the study objectives. The full texts of 163 articles were then assessed for eligibility, and 10 of these articles were excluded for reasons including lack of focus on insurance–input bundles, absence of willingness-to-pay analysis, non-smallholder farmer contexts, and

publication outside the 2016–2025 period. After the screening and eligibility assessment, a total of 153 studies were retained for inclusion in the final review. The selection process is conceptually aligned with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework to ensure transparency and consistency in study identification and selection.

Justification for PRISMA Approach (Table 1)

Although this study adopted a structured and transparent literature review process, it does not implement a full PRISMA protocol as shown in Figure 1 below. This is because the study is designed as a systematic narrative (structured) review, which emphasises thematic synthesis and conceptual integration rather than exhaustive quantitative aggregation of studies. A PRISMA-style framework was used to guide the identification, screening, and selection of relevant literature in order to enhance transparency and replicability, as shown in Figure 1 below. However, unlike full systematic reviews and meta-analyses, this study does not impose strict exclusion thresholds at each stage, as the objective is to capture a broad and integrative understanding of behavioural, economic, and institutional factors influencing the adoption of insurance–input bundles. Therefore, the PRISMA approach was applied in a simplified and adaptive manner, consistent with best practices for structured narrative reviews, ensuring methodological rigour while maintaining analytical flexibility.

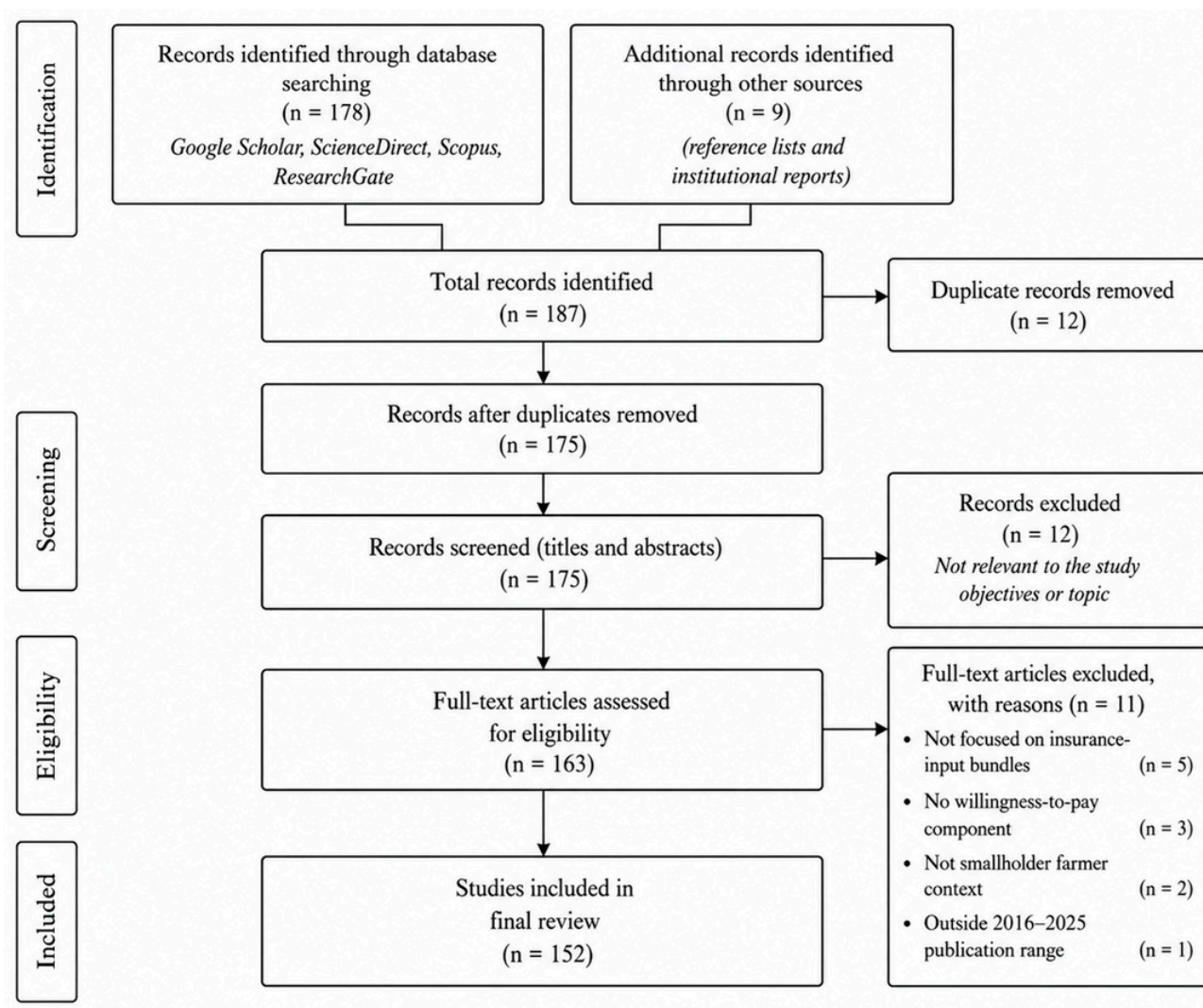


Figure 1. PRISMA flow diagram showing identification, screening, eligibility, and inclusion of studies.

2.1.5. Data Synthesis and Analytical Framework

Selected studies were analysed and synthesised using a thematic approach. The literature was organised into key thematic areas, including farmer awareness, attitudes and perceptions, willingness to pay, participation determinants, and farm-level outcomes. This thematic structure informed the development of the conceptual framework, which integrates behavioural, economic, and institutional perspectives to explain adoption pathways of insurance–input bundles.

2.1.6. Reproducibility and Transparency

To enhance reproducibility, this study provides a clear description of the search strategy, selection criteria, and analytical approach. While the review is not a full meta-analysis, the structured methodology ensures that the process can be replicated and updated in future studies.

2.1.7. Limitations and Potential Bias

This study acknowledges potential sources of bias. First, publication bias may arise from the reliance on published studies, which are more likely to report significant findings. Second, regional bias may be present, as a substantial proportion of the literature focuses on sub-Saharan Africa and parts of Asia, reflecting the geographical concentration of insurance–input bundle programmes. Despite these limitations, efforts were made to include diverse studies across regions and institutional contexts to ensure a balanced and comprehensive synthesis.

2.1.8. Definitions and Conceptual Foundations

Insurance–input bundles represent a policy and market innovation in agricultural risk management and productivity enhancement, defined as the integration of crop insurance with essential agricultural inputs such as improved seed, fertiliser, pesticides, or agricultural credit [8,17,19,25–27,29–32]. The central idea behind this arrangement is that the provision of productivity-enhancing inputs together with risk protection may address two persistent constraints in smallholder agriculture, namely, limited access to quality inputs and high exposure to climatic and production shocks. This approach is increasingly promoted across sub-Saharan Africa, Asia, and Latin America, supported by governments, donors, and private firms seeking to expand financial inclusion [33–35]

In operational terms, insurance–input bundles refer to a combined product in which crop insurance is embedded within the purchase of agricultural inputs rather than being offered as a standalone financial service. The insurance component typically protects farmers against production losses caused by drought, pests, or floods, while the input component provides essential production technologies required to improve yields. Therefore, the bundled products are expected to create complementarities between investment in agricultural productivity and risk management.

Evidence suggested that bundles of insurance and agricultural inputs (i.e., insurance–input bundles) also have potential impacts on how farmers adopt improved production methods and reduce the perceived risks associated with production [30,36,37]. However, the impact will ultimately depend on the specifics of an individual programme, institutional arrangements, and implementation effectiveness.

2.1.9. Implementation Challenges and Limitations

While the potential benefits of insurance–input bundles exist, there are numerous implementation difficulties related to them. In addition to this, issues such as logistical constraints related to delivering inputs, insurance services at the same time, and the long-term viability of subsidy-based programmes are also present [30]. In this arrangement, insurance coverage is embedded within the input purchase transaction rather than being sold as a separate financial product. The insurance component typically protects farmers against yield losses caused by drought, pests, or floods, while the input component provides productivity-enhancing technologies necessary for improving yields [8,23,38]. Although this integration is expected to create complementarities between risk management and agricultural investment, the magnitude of these benefits varies depending on programme design and institutional context. In most cases, farmers pay a single price for the bundle, which may be partially subsidised by governments or donors, and delivery often occurs through cooperatives, agro-dealers, or microfinance institutions [39].

3. Theoretical Perspectives

Bundling lowers transaction costs by consolidating multiple services into a single transaction and aligning insurance provision with productivity-enhancing investments. Insurance–input bundles address market failures in both insurance and input markets by mitigating the low demand for standalone insurance [7]. According to Rukundo et al. [7], Munkombwe et al. [16], and Visser et al. [35], the economic theory explains adoption of bundled products through risk aversion and transaction cost reduction. Risk-averse farmers are more likely to adopt bundled insurance than standalone insurance products. Capitanio [40] argues that agricultural risk management should not be viewed solely through the lens of insurance adoption but rather as a portfolio of complementary instruments, including insurance, credit, savings, and productivity-enhancing investments. In this context, insurance–input bundles may be viewed as a practical manifestation of a broader risk-management portfolio that simultaneously addresses production risk and input access constraints. Bundling may reduce adverse selection because input purchases can signal farmer productivity, although empirical evidence remains mixed. The second theoretical approach to the understanding of the adoption of bundles is the institutional theory. Institutional theory explains adoption through formal rules, norms, and organisational credibility [33,34,41]. Embedding insurance within existing input distribution systems may improve institutional legitimacy because farmers often interact more frequently with input suppliers than with insurance companies. Public–private partnerships and government regulation jointly enhance transparency and improve programme delivery in bundled insurance systems [42,43]. Behavioural economics is the third theoretical approach to the understanding of the response of farmers to the adoption of bundles. Behavioural economics suggests that farmers may undervalue standalone insurance due to cognitive biases such as present bias or misperceptions of risk [39,44,45]. Bundling is proposed to influence the response of farmers to insurance products by simplifying decision-making and reframing perceived value. In this case, the integration of insurance products is likely to affect the response of farmers. The loss aversion theory suggests that farmers prioritise avoiding losses over seeking gains, which increases the attractiveness of insurance-based risk protection [46]. Bundling is proposed to have an effect of reducing the complexities of decision-making. In this case, the complexities of decision-making are reduced by the evaluation of standalone insurance products and input products.

Adding to the above perspectives, this study is primarily anchored in the Theory of Planned Behaviour and the Technology Acceptance Model. The Theory of Planned Behaviour explains how farmers' attitudes, subjective norms, and perceived behavioural control shape their intentions to adopt insurance–input bundles. Similarly, the Technology Acceptance Model emphasises the role of perceived usefulness and ease of use in

influencing adoption decisions. These behavioural frameworks provide a structured basis for understanding how farmers evaluate bundled products and form participation intentions. Together with economic, institutional, and behavioural perspectives, they offer a comprehensive framework for analysing the adoption of insurance–input bundles. Institutional mistrust and limited financial literacy may still constrain adoption despite the presence of bundled incentives [31,38].

Furthermore, the resilience theory complements these perspectives by providing a framework for understanding how insurance–input bundles increase farmers' capacity to absorb, adapt to, and recover from agricultural shocks. Bundled schemes can strengthen resilience in smallholder farming systems by reducing exposure to production risks and stabilising farm income. This perspective is consistent with Capitanio [40], who argues that resilience in agriculture is strengthened through the coordinated use of multiple risk-management instruments rather than reliance on insurance alone. According to the Green Portfolio framework, resilience emerges from the interaction of insurance, financial services, productivity-enhancing technologies and supportive public institutions.

3.1. Potential Benefits of Insurance–Input Bundles

Insurance–input bundles are often promoted as mechanisms that may encourage farmers to adopt improved inputs while reducing perceived production risks [30,38,47]. Empirical evidence suggests that such programmes may contribute to increased yields, improved farm income, and reduced exposure to climatic risks. However, the magnitude of these benefits is highly context-specific and depends on programme design and implementation quality. However, it is important to note that this is highly dependent on the specific programmes. In addition to direct productivity effects, participation in bundled programmes may enhance farmers' access to complementary services such as extension support, improved creditworthiness, and market linkages [48]. These complementary benefits support the argument by Capitanio [40] that agricultural risk-management interventions are most effective when implemented as integrated packages combining risk transfer, productivity enhancement, financial services and institutional support mechanisms.

Despite their potential advantages, insurance–input bundles face several implementation challenges. Affordability remains a major constraint for resource-poor farmers, particularly where subsidies are limited [31,45]. Institutional challenges further constrain adoption. Weak governance structures may expose farmers to risks such as delayed payouts, lack of transparency, and administrative inefficiencies, which can undermine trust in insurance providers [16,18,42]. In some cases, farmers perceive bundled insurance as an additional cost rather than a risk-management tool, which discourages participation.

Gender and socioeconomic inequalities also influence participation by limiting access to financial services and agricultural support systems. Furthermore, logistical challenges associated with the simultaneous delivery of inputs and insurance services can reduce programme efficiency, particularly in remote rural areas.

Finally, concerns regarding the long-term sustainability of subsidy-supported programmes remain significant, particularly where continued public or donor support is uncertain. Thus, the effectiveness of insurance–input bundles depends on coordinated implementation, institutional capacity, and enabling socioeconomic conditions.

Overall, insurance–input bundles represent an integrated policy and market approach that attempts to simultaneously address risk management and input access constraints in smallholder agriculture. However, existing evidence points out that the performance of bundled programmes is highly dependent on the design and specific context in which they operate. It is therefore important to note that a comprehensive understanding

of both the potential benefits and limitations of bundled programmes is important in analysing participation and performance outcomes in the next sections of this study.

3.2. Conceptual Framework

The conceptual framework (Figure 2) illustrates the behavioural, economic, and institutional mechanisms that influence subsequent farm-level outcomes. The conceptual framework presents a sequential pathway from awareness to attitudes, willingness to pay, participation, and farm-level outcomes, with economic, institutional, and social factors influencing each stage of the adoption process while also incorporating feedback mechanisms that capture the iterative nature of adoption behaviour. The framework is organised along a sequential decision-making pathway: Awareness → Attitudes → Willingness to Pay → Participation → Farm-level Outcomes. The conceptual framework is primarily grounded in the Theory of Planned Behaviour (TPB), which provides the main behavioural foundation for explaining farmer decision-making. In addition, the framework draws on complementary insights from Technology Adoption Theory, Expected Utility Theory, the Technology Acceptance Model (TAM), and institutional theory to explain how behavioural intentions are shaped by perceptions, economic incentives, and institutional conditions.

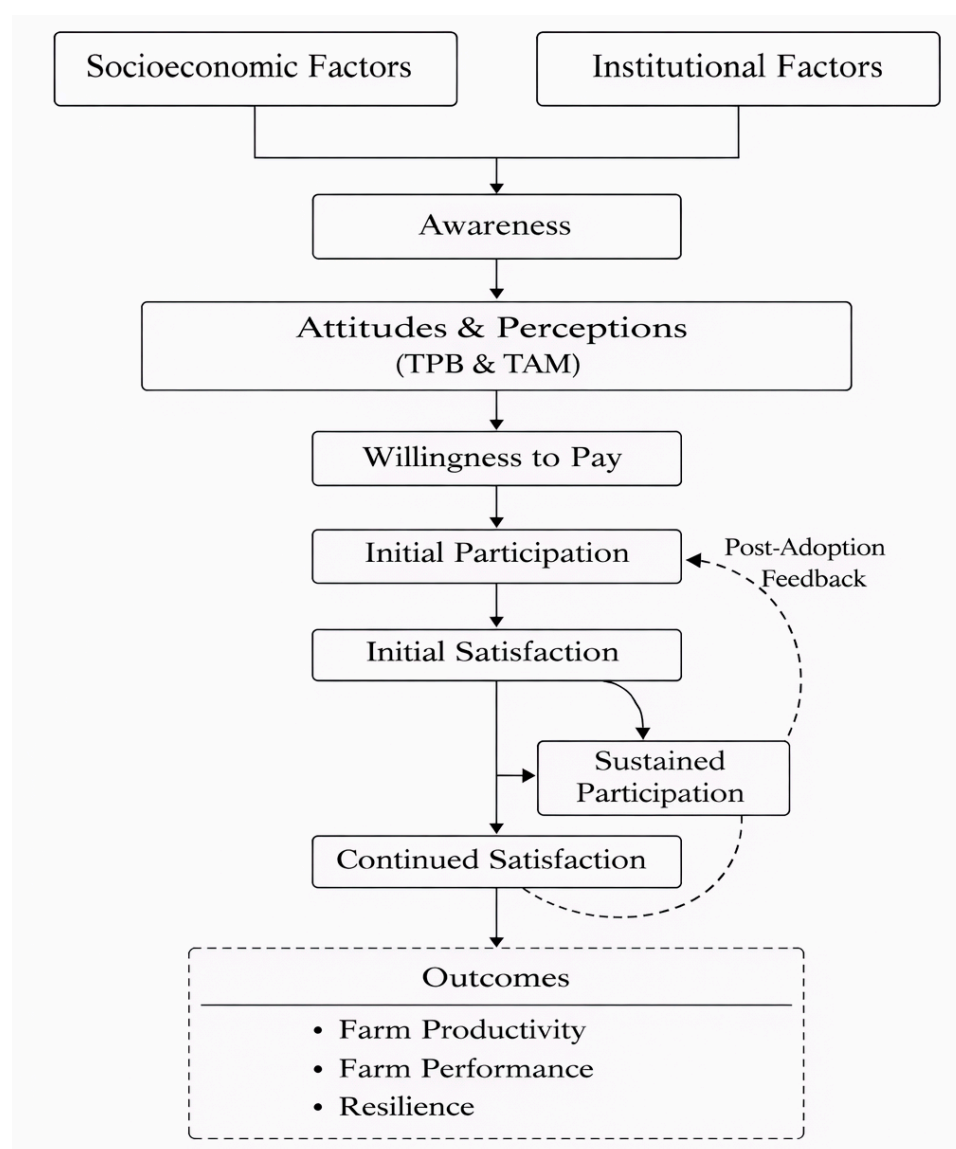


Figure 2. Conceptual framework illustrating both initial and sustained participation dynamics. Post-adoption feedback loops capture how farmers' experiences (satisfaction) influence continued participation decisions over time.

At the initial stage, smallholder farmers' awareness is the fundamental prerequisite for adoption, as it reflects farmers' exposure to information about the structure, benefits, and operational mechanisms of insurance–input bundles [49]. According to Technology Adoption Theory [50], knowledge and information dissemination are critical in shaping individuals' adoption decisions for new technologies and innovations. In various smallholder farming systems, information asymmetries, limited financial literacy, and limited extension service access constrain farmers' understanding of agricultural insurance products [7]. Therefore, awareness forms the foundation upon which attitudes toward insurance–input bundles are formed. This entails that awareness is essential for enabling farmers to evaluate the benefits of bundled insurance products.

In addition, the adoption framework shows how satisfied farmers with the implementation of the programme are an essential intermediate outcome. Satisfaction represents farmers' assessment of how well the programme has been delivered to them (e.g., timely payouts, timely input supply, good communication between the programme and the farmers). High satisfaction levels reinforce trust in insurance providers and increase the likelihood of continued participation. The framework shows a distinction between initial satisfaction, which reflects early post-adoption experiences, and continued satisfaction, which reflects long-term evaluation of the programme over repeated participation cycles.

In the end, effective programme implementation and successful adoption contribute to improvements in farm productivity, overall farm performance and smallholder farmers' resilience. Insurance–input bundles can stimulate greater adoption of improved agricultural technologies, stabilise farm income, and strengthen farmers' capacity to cope with climatic shocks through the reduction in risk exposure and encouragement in the investment in productivity-enhancing inputs. However, these outcomes are conditional on programme implementation quality and institutional effectiveness. Over time, these outcomes contribute to broader development objectives which include improved smallholder resilience, improved food security, and more sustainable agricultural production systems.

Awareness plays an instrumental role in shaping perceptions and farmers' attitudes, which are subjective judgments of the usefulness, dependability, and credibility of insurance–input bundles. These attitudes are shaped by trust in insurance providers, prior experience with agricultural programmes, and social learning. According to the Technology Adoption Theory, the adoption of agricultural technologies among farmers is based on several factors such as perceived ease or difficulty, relative benefits, and compatibility of new technology. Therefore, awareness alone does not directly lead to adoption, but operates through attitudes that determine farmers' willingness to engage with bundled products. Farmers also consider factors such as their perception of the quality of inputs being delivered, reliability in payouts and whether the cooperation among programme participants is transparent before they adopt any new agricultural technologies. Perceptions are instrumental in shaping farmers' willingness to pay (WTP) for insurance–input bundles.

Considering the Expected Utility Theory, every farmer is under uncertainty as a rational decision maker. They evaluate the benefits and risks of the decisions they make [51]. Therefore, insurance–input bundles are instrumental in providing risk protection against climate-related risks while providing farmers access to quality inputs. Therefore, farmers' willingness to pay for insurance–input bundles is an indication of the risks they are willing to take up, the expected utility from the insurance payout, and the expected productivity gains from the quality inputs. WTP therefore reflects farmers' valuation of both risk

reduction and productivity gains associated with bundled products. However, farmers are often confronted by liquidity constraints when trying to pay for insurance–input bundles.

Participation is influenced by economic, social, and institutional factors. Economic factors include farm size, income, access to credit, and exposure to risk. The framework further distinguishes between initial participation, representing first-time adoption decisions, and sustained participation, which reflects farmers' continued participation over time. Social factors include cooperative membership, peer influence, and market participation. Institutional factors include extension services, regulatory frameworks, and trust in insurance providers (institutional theory). Thus, participation reflects the interaction between behavioural intentions (WTP) and enabling institutional conditions. The economic factors include farm size, household income, access to credit, and exposure to climatic risk. Institutional factors encompass the effectiveness of extension services, the credibility of insurance providers, regulatory frameworks, and government support programmes, which are the fundamental principles of the institutional theory. The theory argues that the economy is embedded within institutions. Therefore, the behaviour of farmers is often embedded within the institutional environment [50]. Thus, participation represents the behavioural outcome of both willingness to pay and enabling conditions within the institutional environment. The interaction between behavioural drivers and institutional conditions ultimately influences the adoption of bundled insurance schemes. Such bundled approaches aim to address multiple constraints simultaneously by improving access to quality inputs while mitigating production risks associated with climatic variability and market uncertainty. This integrated perspective is consistent with the Green Portfolio framework proposed by Capitanio [40], which emphasises that effective agricultural risk management requires the combination of insurance, financial services, productivity-enhancing technologies and institutional support mechanisms operating within a coordinated system.

Satisfaction is an intermediate outcome that reflects farmers' evaluation of programme implementation, including timely payouts, input delivery, and communication quality. When farmers get quick insurance payouts, reliable inputs, and clear communication from the people running the programme, they feel good about it. Most importantly, satisfaction feeds back into participation by reinforcing trust and influencing continued adoption, creating a dynamic feedback loop in the framework (Figure 1). Farmers' trust is easily eroded due to complicated claim processes, delays in payments, or bad service, and farmers start losing trust.

In conclusion, the conceptual framework indicated that there is an interaction between the efficiency of insurance–input bundles and the behavioural, economic, and institutional environments while explicitly accounting for feedback effects that influence repeated participation decisions over time. Accordingly, it is important to understand how these interdependent pathways work together when working with policy design and programme design to create compelling and sustainable changes in the agricultural productivity of all smallholder farmers through bundled insurance.

4. Farmers' Awareness of Insurance–Input Bundles

4.1. Thematic Synthesis of Awareness

Awareness is a prerequisite for the adoption of insurance–input bundles, referring to farmers' exposure to and understanding of the existence, structure, and functioning of bundled products [52,53]. Empirical evidence shows that awareness levels of insurance–input bundles vary across regions and farming systems due to differences in institutional capacity, extension outreach, and financial literacy. Limited awareness remains a major barrier to participation, particularly in contexts where agricultural insurance markets are

still developing [54]. The relationship between awareness and willingness to participate appears particularly relevant for insurance-based products, where improved understanding of insurance mechanisms can increase farmers' willingness to participate in risk-management schemes [55,56]. However, this relationship is mediated by institutional and contextual factors, meaning that awareness translates into participation only where supporting systems (such as extension services and credible insurance providers) are functional. More specifically, in the case of insurance–input bundles, farmers' awareness must extend beyond general knowledge of insurance products to include an understanding of how the insurance component is operationally linked with agricultural inputs within a single package. This difference is significant because bundled input schemes combine a number of services, and farmers evaluate both the input values and the protection components before deciding to participate. Therefore, awareness of insurance–input bundles is more than knowing about the existence of such products. Across studies, awareness is therefore better understood as a cognitive and interpretive process which should be conceptualised as a multi-dimensional construct that includes exposure to information, comprehension of bundled design, and the ability to interpret risk-transfer mechanisms rather than a passive receipt of information.

While awareness is necessary, it is not sufficient to guarantee participation, as adoption decisions are also influenced by institutional trust, financial constraints, and understanding of insurance mechanisms [7,57].

4.2. Key Determinants Shaping Awareness

Across studies, three major channels shape farmer awareness of insurance–input bundles:

4.2.1. Institutional Channels

A range of institutional actors contribute to raising awareness of insurance–input bundles. Government extension systems traditionally serve as key channels through which farmers learn about new agricultural programmes and innovations [57–62]. Through activities such as training sessions, demonstration plots, and farmer field days, extension agents can explain how bundled products operate and how insurance protection is linked to the purchase of inputs. Evidence from several studies suggests that farmers who regularly interact with extension agents tend to exhibit higher levels of awareness of agricultural insurance and related innovations [57,59,63]. However, the effectiveness of extension systems in raising awareness varies across contexts, as many countries face constraints related to limited funding, insufficient staffing, and inadequate training on specialised financial products such as agricultural insurance [62,64]. This variation in extension capacity partly explains why awareness levels of insurance–input bundles remain uneven across regions, particularly in areas where farmers have limited exposure to financial or insurance-based agricultural services.

In response to these limitations, non-governmental organisations (NGOs) and development agencies increasingly participate in awareness creation for agricultural insurance and bundled products. These organisations often operate at the community level and may employ participatory approaches, such as farmer group meetings, local demonstrations, and training sessions conducted in local languages [57,60,61,63,65]. Compared to formal extension systems, NGO-led interventions tend to be more flexible and locally adapted, but their sustainability is often limited by short-term funding cycles. Research has shown that initiatives implemented by NGOs can reach some groups that have been excluded from economic and social well-being, such as women's groups and farmers with limited financial resources, particularly when NGO providers combine their outreach efforts with financial education and awareness campaigns. Nevertheless, NGO programmes often

have project-based designs that weaken continuity and long-term consolidation of awareness among farmers once external funding ends [66–68]. These limitations indicate the need for coordinated institutional approaches that integrate community-based awareness efforts with public extension systems. This is justified by the fact that the effectiveness of NGO-led awareness programmes highly depends on the coordination between local institutions and public extension services, which indicates the importance of promoting insurance–input bundles through integrated information systems.

Private sector actors, including insurers, seed companies, and agro dealers, also play an important role in communicating information about bundled products. When insurance is embedded in the purchase of agricultural inputs, farmers may first encounter the concept during input transactions at agro-dealer shops or through marketing campaigns linked to seed or fertiliser distribution programmes [7,31,69]. As a result, awareness generated through private channels may be strong in terms of product exposure but weak in terms of conceptual understanding. However, commercial marketing sometimes prioritises the promotion of products and may not emphasise the detailed explanations of the insurance mechanisms. As a result, farmers may receive inadequate information about the insurance claims procedures or coverage conditions. This indicates that institutional channels differ not only in reach but also in the depth of understanding they generate, where extension systems facilitate structured learning, NGOs enhance accessibility, and private actors primarily generate initial exposure rather than full comprehension.

4.2.2. Informal and Social Learning Channels

Informal communication networks also shape awareness of insurance–input bundles. Peer-to-peer interactions among farmers frequently influence the spread of information, as experiences shared within farmer groups or local communities can shape perceptions of both risks and benefits [70,71]. While these social learning processes can certainly help disseminate new programmes, they can also facilitate the dissemination of inaccurate information or inflated expectations about insurance payout amounts [71,72]. This dual role suggests that informal networks act not only as channels of information diffusion but also as potential sources of distortion in farmers’ understanding of insurance products. Consequently, informal learning processes tend to complement rather than replace formal awareness channels such as extension services or structured training programmes. Farmers’ ability to understand technical terminology and interpret insurance contracts is often limited by low literacy levels, which increase farmers’ reliance on verbal explanations from extension agents or input suppliers [7,18,51]. Such challenges mainly stem from linguistic diversity, gender inequalities, and limited financial literacy, which affect access to information among smallholder farmers [7,73,74]. This indicates that social learning strengthens information diffusion but cannot substitute for structured technical comprehension of insurance mechanisms.

4.2.3. Structural and Individual Constraints

Despite multiple awareness channels, several structural barriers continue to limit effective understanding of insurance–input bundles. Firstly, farmers must have knowledge of how the bundled arrangement functions, including the integration of inputs with insurance coverage, eligibility conditions, and potential benefits in reducing production risk [75]. However, insurance products are often difficult for farmers to interpret due to their intangible and probabilistic nature. In many contexts, farmers may confuse insurance with government relief programmes or struggle to understand payout conditions and contract terms [53,76]. These challenges are more pronounced in settings with low financial literacy and limited exposure to formal insurance markets. Such limited understanding reduces confidence in bundled products and may discourage participation, particularly where

uncertainty exists around payout conditions and contract terms. Access to reliable and understandable information, therefore, plays an important role in shaping farmers' perceptions and willingness to engage with insurance–input bundles [15]. The literature, therefore, suggests that awareness should not be interpreted solely as exposure to information, but also as a process through which farmers gradually develop a practical understanding of how bundled products function and how they relate to farm risk-management strategies.

In addition to the above, institutional weaknesses such as limited coordination among programme implementers, weak regulatory oversight, and inconsistent communication strategies can reduce the effectiveness of awareness campaigns [33,77]. These institutional limitations further reinforce information gaps, particularly in regions where extension systems and regulatory oversight are weak. Cultural perceptions and trust in institutions further influence awareness and interpretation of insurance products. In some contexts, scepticism toward formal financial institutions or beliefs that crop losses are unavoidable acts of fate may reduce farmers' interest in learning about insurance programmes [7,19,78]. Collectively, these constraints indicate that awareness outcomes are shaped not only by information availability but also by institutional credibility and farmers' interpretation of agricultural risk. Altogether, these constraints reinforce persistent information asymmetries that limit the translation of awareness into meaningful understanding. Generally, this shows that awareness is not only a function of information availability but also of how farmers interpret risk and institutional credibility. Furthermore, these factors indicate that awareness strategies need to extend beyond information dissemination to include trust-building measures and context-specific communication approaches. This highlights the importance of trust-building communication strategies, including simplified messaging, local languages, visual tools, and community-based engagement to increase understanding of insurance–input bundles.

4.3. Regional Patterns and Comparative Insights

Regional evidence shows clear differences in awareness levels and determinants. In Asia, awareness tends to be relatively high due to strong government-led agricultural insurance programmes and structured farmer education systems. Nevertheless, despite relatively high exposure levels, conceptual understanding of insurance mechanisms remains uneven, particularly for index-based insurance products, where complexity limits full comprehension of risk-transfer principles. In Africa, awareness is generally lower and more uneven, reflecting weaker extension systems and limited penetration of agricultural insurance markets. Farmers are often familiar with input packages but not with the embedded insurance components. This indicates that exposure to agricultural inputs does not automatically translate into awareness of embedded risk-management mechanisms, particularly where insurance markets are still emerging. While awareness among farmers in Latin America is closely linked to participation in cooperatives, contract farming systems, and credit-linked agricultural programmes, institutional arrangements actively structure information flow and enhance farmers' exposure to integrated financial and input services.

A consistent pattern emerges in which awareness is strongly mediated by institutional architecture rather than farmer interest alone across regions. Countries with structured public programmes and coordinated extension systems tend to achieve higher levels of awareness, while those with weaker institutional linkages exhibit fragmented and uneven understanding of insurance–input bundles. It is important to note that exposure alone does not guarantee comprehension, as farmers may be aware of bundled products without fully understanding their insurance component. This suggests that differences in awareness outcomes are driven less by information availability and more by the

effectiveness of institutional systems in translating exposure into a meaningful understanding. These regional differences reinforce the argument that awareness is not a uniform phenomenon, but a context-dependent outcome shaped by institutional strength, programme design, and the extent of farmer participation in agricultural insurance systems.

4.4. Key Synthesis Patterns

Across all regions, three consistent patterns emerged, namely: (i) Awareness alone does not translate into adoption unless it is reinforced by institutional trust, comprehension of insurance mechanisms, and effective support systems that enable farmers to interpret and act on information. (ii) Institutional channels, particularly extension systems, remain the primary drivers of awareness formation, although NGOs and private sector actors increasingly contribute through complementary but functionally different information pathways. (iii) Awareness is most effective when it evolves from simple exposure to repeated interaction and practical demonstration, which enables deeper comprehension of bundled insurance mechanisms rather than superficial recognition of products. Across the reviewed literature, a consistent pattern is that awareness functions as an entry condition in the adoption pathway, but its effectiveness is mediated by institutional credibility, cognitive understanding, and the quality of communication channels. This implies that differences in awareness outcomes across regions are not simply a reflection of information availability, but of how effectively institutional systems transform exposure into meaningful understanding.

4.5. Link to Research Objectives

This synthesis directly informs the study objective on farmers' awareness of insurance–input bundles by establishing that awareness is a multi-dimensional construct shaped by institutional arrangements, information delivery systems, and socioeconomic conditions influencing how farmers interpret bundled insurance products. Furthermore, it highlighted that the variation in awareness across regions is largely driven by variations in institutional capacity and communication strategies, rather than differences in farmer interest alone, but is instead primarily driven by variations in institutional capacity, communication effectiveness, and the depth of exposure to insurance-related information. The reviewed literature therefore provides a conceptual foundation for examining awareness not as a binary condition of being informed or uninformed, but as a graduated process influenced by exposure, comprehension, and institutional mediation. This framing supports the study's empirical focus on unpacking how awareness is constructed and translated into potential adoption behaviour among smallholder farmers. Taken together, the literature review establishes awareness as the entry point in the adoption pathway of insurance–input bundles, while also demonstrating that its effectiveness depends on institutional functionality and the quality of information systems that shape farmer understanding.

5. Farmer's Attitudes Towards Insurance Input Bundles

5.1. Thematic Synthesis of Attitudes and Perceptions

Farmers' attitudes toward insurance–input bundles are shaped by a combination of economic, behavioural, institutional, and socio-cultural factors [7,79]. While economic incentives influence adoption decisions, farmers' attitudes are primarily shaped by perceived usefulness, risk protection value, and institutional credibility of bundled insurance products. Understanding these attitudes is critical because participation depends not only on economic incentives but also on trust in institutions and perceived effectiveness of

bundled risk-management mechanisms. These factors influence how farmers interpret agricultural risk and evaluate formal insurance mechanisms. Empirical studies suggest that favourable perceptions of bundles are more likely to emerge when the inputs included in the package are of high quality, delivered on time, and accompanied by clear explanations of insurance coverage [31,80,81]. Although attitudes toward agricultural insurance schemes are shaped by trust in insurers, past compensation experiences, and affordability considerations, perceptions of insurance–input bundles are more strongly influenced by how farmers evaluate the integrated performance of both inputs and insurance components. In bundled input arrangements, farmers also assess the credibility of the insurance component as well as the value of the inputs provided [7,82–84]. Financial incentives such as subsidised premiums may increase initial uptake; however, sustained acceptance depends on continued confidence in programme credibility and claim reliability.

5.2. Socio-Cultural and Behavioural Influences

In many rural contexts, prevailing cultural beliefs and social norms shape how farmers interpret risk and evaluate formal insurance products. For instance, reliance on informal risk-sharing mechanisms or beliefs that agricultural losses are determined by fate may reduce the perceived necessity of insurance-based protection [7,70,84]. These variations indicate that attitudes toward insurance–input bundles are socially embedded and shaped by collective norms, rather than being purely individual economic decisions. Generational and social differences may also influence perceptions, as younger farmers sometimes view insurance as a modern risk-management tool, while others may regard it with scepticism or perceive it as externally imposed [70,85]. These variations indicate that attitudes toward insurance–input bundles are embedded within broader social and cultural contexts, rather than being purely individual economic decisions. These differences highlight that social structures and generational dynamics shape how new risk-management tools are interpreted and adopted.

5.3. Behavioural and Risk Preference Factors

Risk preferences and behavioural factors further shape farmers' attitudes toward insurance–input bundles. More risk-averse farmers often place greater value on insurance protection as a mechanism for reducing production uncertainty [45,86]. However, behavioural biases such as overconfidence, present bias, and loss aversion may lead farmers to underestimate benefits or perceive premiums as unnecessary costs [87,88]. Cognitive biases such as overconfidence, present bias, and loss aversion may lead farmers to underestimate benefits or perceive insurance premiums as unnecessary expenditures. These behavioural factors underscore the importance of communication strategies which address both psychological and economic dimensions of decision-making. This indicates the need for communication strategies that address both behavioural biases and economic constraints in shaping farmers' acceptance of bundled insurance products.

5.4. Institutional Credibility and Regional Evidence

Across regions, programme credibility and institutional performance consistently emerge as key determinants of farmer perceptions. Positive perceptions are reported where transparent claim settlements and reliable service delivery exist, particularly in Kenya's index-based insurance programmes [30,38,79]. This contrast highlights that programme credibility is a central driver of farmer attitudes, where consistent performance strengthens trust while service failures rapidly erode confidence. In contrast, negative perceptions arise where compensation processes are delayed, unclear, or inconsistent [18,31]. Institutional context also shapes perceptions, as farmers report more favourable attitudes where insurance is supported by credible organisations such as NGOs, cooperatives, and

farmer associations [55,89]. On the other hand, weaker perceptions are observed in contexts with heavy reliance on disaster relief systems and limited exposure to formal insurance markets.

5.5. Synthesis Statement

Across the reviewed literature, farmers' attitudes toward insurance–input bundles emerge from the interaction of economic incentives, behavioural biases, institutional credibility, and socio-cultural norms (Table 2). While financial incentives may facilitate initial uptake, sustained positive perceptions depend on trust in programme implementation, clarity of communication, and consistent service delivery. This indicates that attitudes are not static preferences, but dynamic evaluations shaped by both past experiences and institutional performance.

6. Determinants of Farmers Willingness to Pay for Insurance Input Bundles

6.1. Thematic Synthesis of Willingness to Pay

Willingness to pay (WTP) is widely used to assess farmers' valuation of agricultural insurance products and their potential demand for risk-management instruments. In the context of insurance–input bundles, willingness to pay reflects both farmers' financial capacity to afford the product and their perceived value of integrating insurance with agricultural inputs. Policymakers and insurers often use WTP estimates to guide premium pricing, subsidy levels, and programme design. However, stated willingness in surveys may differ from actual purchasing behaviour, particularly where insurance markets are new or poorly understood. This discrepancy highlights the role of liquidity constraints, behavioural biases, and institutional trust in shaping the gap between stated willingness and actual adoption behaviour. This distinction is critical because stated willingness in surveys often overestimates actual adoption, which is constrained by real financial capacity and trust in programme implementation.

6.2. Conceptual Distinction: General Insurance vs. Bundled Products

It is important to distinguish between farmers' willingness to pay for agricultural insurance in general and their willingness to pay for insurance–input bundles specifically. While general insurance demand is influenced by risk perception, trust in insurers, and past compensation experiences, willingness to pay for bundled products additionally depends on farmers' evaluation of input quality and perceived complementarities between productivity gains and risk protection. When insurance is integrated with improved seeds, fertiliser, or credit services, farmers may perceive greater value in the package, which can increase their willingness to pay compared with stand-alone insurance products. This reflects economic theory on bundling, where combining risk reduction with productivity-enhancing inputs increases perceived utility and therefore willingness to pay.

6.3. Economic Determinants of WTP

Several studies reveal that farm size, farm income, and access to credit significantly influence farmers' ability to afford premiums and invest in bundled products [80,90,91]. Additional factors such as off-farm income, input prices, and expected returns from agricultural production further shape farmers' payment decisions by influencing liquidity and investment capacity. These factors collectively determine farmers' liquidity and expected returns, which shape their capacity and willingness to invest in risk-management

tools. Collectively, these factors determine farmers' liquidity position and expected returns, which shape their ability and willingness to invest in risk-management tools.

6.4. Socio-Demographic and Behavioural Influences

Willingness to pay is also shaped by socio-demographic factors. Education, age, gender, and household characteristics influence farmers' understanding of insurance products and openness to financial innovations [26,91,92]. Farmers with prior crop loss experience and those participating in farmer organisations tend to exhibit higher willingness to pay due to increased risk awareness and peer learning effects [71,93,94]. Psychological and perceptual factors such as trust in insurance providers, confidence in compensation mechanisms, and perceptions of fairness in bundled premium pricing also influence willingness to pay. Trust in insurance providers, perceived fairness of pricing, and confidence in compensation mechanisms strongly influence willingness to pay, while mistrust and negative payout experiences reduce participation intentions. Behavioural biases such as loss aversion and present bias shape how farmers evaluate costs relative to uncertain future benefits [87,88].

6.5. Price Sensitivity and Affordability Constraints

Price sensitivity remains a critical determinant of farmers' demand for insurance–input bundles. Empirical evidence suggests that even modest increases in premium costs may substantially reduce participation among financially constrained smallholder farmers [91,95]. On the other hand, partial premium subsidies and bundling insurance within input packages can enhance affordability and increase participation. However, farmers may be reluctant to adopt the product if the insurance significantly increases the total cost of inputs. This shows that affordability is a binding constraint, particularly where insurance premiums increase the overall cost of input packages.

6.6. Regional Comparative Insights

Empirical evidence across regions suggests that willingness to pay varies widely depending on institutional context, programme design, and farmers' previous experiences with insurance schemes. In several African countries, studies report moderate to low willingness to pay for agricultural insurance, largely reflecting financial constraints and reliance on government disaster relief programmes. However, higher willingness has been observed where insurance is integrated with input packages or supported by awareness campaigns and institutional partnerships [36,90,96,97]. This indicates that bundling insurance with productive inputs improves perceived value compared to stand-alone insurance products. Studies from Asia highlight that willingness to pay increases where government subsidies reduce premiums and where farmers face frequent climate-related shocks [98,99]. Conversely, cautious attitudes persist where insurance products are perceived as complex or poorly explained [100]. This revealed that transparency and simplicity in programme design are critical determinants of willingness to pay.

In Latin America, farmers participating in cooperatives and credit-linked programmes often show higher willingness to pay due to stronger institutional trust and improved access to financial services [101–103]. Conversely, reluctance is observed where perceived benefits do not justify costs or where trust in insurers is limited [92]. Across the region, institutional embedding through cooperatives and credit systems strengthens willingness to pay by reducing information asymmetry and increasing trust.

6.7. Final Synthesis

Taken together, the literature suggests that willingness to pay for insurance–input bundles is shaped by the interaction of economic capacity, perceived value of bundled

products, behavioural responses to risk, and institutional trust (Table 3). While affordability remains a key constraint, willingness to pay increases when insurance is perceived as both a productivity-enhancing and risk-reducing instrument. This indicates that WTP is not solely a measure of financial capacity but a reflection of how farmers evaluate the credibility, usefulness, and fairness of bundled insurance systems.

7. Determinants of Farmer Participation in Insurance–Input Schemes

Smallholder farmer participation in insurance–input schemes reflects both farmers' willingness and their actual ability to engage in formal risk protection mechanisms. This is central to the sustainability and scalability of bundled insurance–input programmes [16,99]. Farmers weigh perceived benefits against risks, costs, and alternative coping strategies, indicating that participation decisions are shaped by the interaction of economic incentives, institutional conditions, and social contexts. While participation in agricultural insurance in general depends on risk perception and trust in insurers, participation in bundled schemes additionally reflects farmers' evaluation of the integrated inputs and their complementarities with insurance protection.

Importantly, participation differs from willingness to pay, as farmers may express positive valuation but still fail to participate due to liquidity constraints, access barriers, or institutional limitations. This highlights a critical distinction between stated demand and realised participation, with the latter constrained by structural and institutional barriers. Therefore, understanding these determinants is important for designing inclusive programmes that reach the intended beneficiaries effectively. Empirical evidence consistently shows that participation is not determined by a single factor, but emerges from the interaction between economic capacity, institutional support, and social networks that jointly shape farmers' risk perceptions and evaluation of programme benefits.

7.1. Economic and Household-Level Determinants

Farmers' participation in bundled insurance–input schemes is influenced by socioeconomic characteristics, including wealth, farm size, and household income, which determine farmers' financial capacity to pay premiums and invest in bundled products. Studies reveal that higher income levels, larger landholdings, and off-farm earnings increase the likelihood of participation, while financial constraints limit adoption among resource-constrained farmers [104]. This indicates that participation is strongly conditioned by liquidity and the ability to absorb production risk. These findings reveal that participation is partly driven by farmers' ability to absorb risk and finance upfront costs associated with bundled products. Education improves farmers' understanding of insurance concepts and innovation adoption, while the perceived need for coverage is influenced by farm diversification, labour availability, and level of mechanisation. In addition, prior loss experiences and participation in farmer groups increase willingness to participate due to heightened risk awareness and peer influence [105]. This indicates the role of experiential learning and social exposure in shaping participation decisions. Generally, the individual farmers' economic capacity and risk exposure jointly determine both the ability and the motivation to participate in insurance–input schemes.

7.2. Institutional Determinants

Institutional factors are critical in facilitating or constraining farmer participation. Strong coordination among insurers, government agencies, input suppliers, and extension services reduces transaction costs, builds trust, and encourages participation [105]. In contrast, bureaucratic inefficiencies, weak institutions, and lack of transparency reduce farmer confidence and limit participation by increasing uncertainty regarding programme reliability and payout performance. This highlights the central role of institutional

credibility in bridging the gap between willingness and actual participation. Access to formal credit facilitates participation by reducing liquidity constraints, particularly when credit institutions integrate insurance into loans or input programmes [23,106]. This indicates that financial intermediation plays a key role in enabling participation where upfront costs would otherwise be prohibitive.

7.3. Market Access and Value Chain Integration

Access to markets is another important determinant. Farmers linked to output markets, cooperatives, or contract farming arrangements are more likely to adopt insurance–input bundles, as insurance helps stabilise production and safeguard revenues [96,107]. At the same time, poor infrastructure, information gaps, and limited market participation reduce farmers’ likelihood to participate, suggesting that weak market integration limits both access to bundled products and the incentives to adopt them. Furthermore, this demonstrates that participation is closely tied to value chain integration, where insurance functions as a complementary tool within broader market systems.

7.4. Social Networks and Collective Structures

Social capital, peer networks, and community structures shape participation by influencing trust, information flow, and shared experiences [104]. Farmers in cooperatives or associations benefit from shared knowledge, collective bargaining, and informal accountability, which facilitate adoption [104]. Weak social ties and low trust hinder participation, underscoring the importance of local networks, indicating that social embeddedness enhances both information diffusion and confidence in programme participation. Thus, social networks act as enabling mechanisms that reinforce institutional trust and reduce perceived risk.

7.5. Policy and Regulatory Environment

Supportive policies and regulatory environments increase participation through premium subsidies, clear rules, and public–private partnerships [108], while political interference and inconsistent programme administration erode credibility and discourage participation by undermining trust in programme sustainability and fairness.

7.6. Final Synthesis

The reviewed literature indicates that farmer participation in insurance–input schemes is multidimensional and context-dependent. Participation results from the interaction between economic, social, and institutional factors, with no single determinant fully explaining uptake (Table 4). Across contexts, participation is highest where three conditions converge: (i) sufficient financial capacity, (ii) strong institutional credibility, and (iii) effective integration into market and social networks. This suggests that single interventions are insufficient and that coordinated approaches addressing multiple constraints simultaneously are required. Participatory programme design, local adaptation, and feedback mechanisms are crucial for inclusivity and sustainability. Taken together, the evidence demonstrates that participation in insurance–input schemes is not merely a function of farmer willingness but an outcome of how effectively financial, institutional, and social systems align to support adoption.

8. Farmers’ Satisfaction with Insurance–Input Bundles

Farmer satisfaction serves as a vital measure of the effectiveness and long-term sustainability of insurance–input schemes, reflecting perceptions of trust, fairness, and value in the performance of both the insurance component and the associated input package

[109–112]. High levels of satisfaction encourage continued participation and community endorsement, while dissatisfaction can trigger withdrawal and erode trust in the programme, indicating that satisfaction functions not only as an outcome of programme performance but also as a determinant of continued participation and scheme sustainability. Whilst general satisfaction with agricultural insurance is often linked to payout reliability and premium affordability, farmers' satisfaction with insurance–input bundles depends on the quality, coordination, and timeliness of both input delivery and insurance services. This highlights the integrated nature of bundled schemes, where multiple components jointly shape farmer satisfaction rather than insurance performance alone.

8.1. Programme Implementation and Rollout

Evidence shows that the rollout phase of insurance–input schemes plays a crucial role in shaping farmer satisfaction, as it determines the efficiency of input distribution and insurance delivery [109,111]. Timely input delivery, smooth registration processes, and clear communication about insurance coverage build inclusion and trust. On the other hand, poor targeting, delays, and inadequate information reduce confidence and generate dissatisfaction. These early implementation experiences are critical, as they form initial perceptions that often persist and influence long-term participation decisions. Empirical evidence suggests that programmes incorporating farmer participation and local adaptation during implementation tend to achieve higher satisfaction and stronger programme loyalty. This indicates that, indicating that participatory and context-specific programme design enhances both perceived relevance and farmer satisfaction.

8.2. Insurance Payout Performance

Studies highlight that experiences with insurance payouts play a pivotal role in shaping farmer satisfaction [18,80,112,113]. Timely, transparent, and consistent compensation strengthens farmer confidence by undermining expectations of reliability and fairness in programme delivery. Efficient verification systems, clear procedures, and transparent communication relating to payout criteria further improve programme credibility [7]. Thus, payout reliability emerges as one of the strongest determinants of satisfaction across contexts.

8.3. Perceived Fairness and Institutional Credibility

Farmers' satisfaction is highly dependent on perceptions of fairness and transparency within bundled schemes [16]. Equitable premium structures, participatory monitoring mechanisms, and transparent claim procedures improve perceived legitimacy. At the same time, perceived favouritism, inconsistent input quality, and hidden costs weaken institutional credibility, thereby reducing satisfaction and discouraging continued participation. Institutional reliability further influences satisfaction, as farmers evaluate whether programme promises match actual performance [114]. This indicates that alignment between expected and realised outcomes is central to sustained satisfaction.

8.4. Service Quality and Delivery Systems

Service quality is another major determinant of satisfaction, encompassing professionalism, responsiveness, and accessibility of service providers [115]. Farmers' trust and programme loyalty are strengthened by personalised support, clear communication, and consistent input quality. Digital technologies such as mobile platforms for weather monitoring, payout tracking, and claim submission have improved service delivery [7,30,116]. These innovations reduce information asymmetries and enhance transparency, thereby strengthening farmer confidence and satisfaction.

8.5. Programme Performance and Institutional Coordination

Evidence from successful and underperforming programmes highlights the importance of programme design and institutional coordination. Successful programmes demonstrate that accessibility, transparency, and institutional collaboration enhance satisfaction, while poorly performing schemes suffer from administrative complexity, weak coordination, and lack of transparency [12,57,116,117]. This entails that satisfaction is closely linked to how effectively different programme components are coordinated and delivered. Abrupt withdrawal of subsidies and failure to adapt programmes to local conditions reduce farmer confidence, indicating that policy inconsistency and lack of contextual adaptation undermine long-term satisfaction.

8.6. Social and Behavioural Influences

Social and behavioural factors also influence satisfaction. Peer experiences, trust in local agents, and participation in farmer networks shape how farmers interpret programme outcomes [51,118,119]. This shows that satisfaction is socially constructed and reinforced through community interactions. Behavioural factors such as loss aversion may amplify negative experiences, meaning that even minor programme failures can disproportionately affect perceptions [7,97]. This suggests that negative experiences have asymmetric effects, where dissatisfaction spreads more rapidly than positive perceptions.

8.7. Final Synthesis

Overall, the literature suggests that farmer satisfaction with insurance–input bundles stems from the interplay of payout performance, service quality, institutional credibility, and social trust. Across contexts, satisfaction is highest where three conditions are met: (i) reliable and timely payouts, (ii) efficient and transparent service delivery, and (iii) strong institutional credibility. This shows that monitoring both financial performance and farmer satisfaction is essential for ensuring long-term sustainability. Generally, the study identified that satisfaction is not merely an outcome indicator but a critical feedback mechanism that shapes continued participation, trust formation, and the scalability of insurance–input schemes.

9. Impacts of Insurance–Input Bundles on Farm Productivity and Performance

The integration of insurance with agricultural inputs creates a risk-management framework that may encourage farmers to adopt improved technologies and invest more confidently in agricultural inputs [17,22,120,121]. Bundled programmes reduce exposure to production shocks while encouraging investment in productivity-enhancing inputs such as improved seeds, fertilisers, and agrochemicals. This mechanism operates by lowering perceived production risk, thereby reducing risk aversion and enabling higher input use, thereby influencing farmer behaviour through increased input intensity and improved management practices. Across the reviewed literature, insurance–input bundles are therefore conceptualised as risk-management instruments that influence farmer behaviour by lowering perceived production risks and encouraging greater investment in improved technologies.

9.1. Evidence on Productivity and Yield Effects

Several empirical studies suggest that such arrangements can contribute to improved farm productivity and household welfare, although the magnitude of these effects varies across contexts and programme designs [7,106,122,123]. This shows that productivity outcomes are not uniform but depend on programme implementation and contextual

conditions. Empirical evidence indicates that insured farmers often achieve higher yields than uninsured counterparts because insurance reduces risk aversion and encourages the use of improved inputs and management practices [79,122,124,125]. For example, studies of weather index insurance bundled with input packages show that farmers may apply recommended fertiliser levels, adopt certified seeds, and follow agronomic advice more closely [17,47,112]. Some empirical studies report yield improvements among farmers participating in insurance–input programmes [14,126–128]. However, these results are not consistent across all studies, with some studies reporting limited or statistically insignificant impacts, highlighting substantial variation in outcomes across contexts. These variations arise because productivity outcomes are highly context-specific and depend on factors such as the reliability of insurance mechanisms, timely input delivery, and farmers’ technical capacity as well as the strength of supporting systems such as extension services and market access.

9.2. Regional- and Crop-Specific Evidence

Maize-focused insurance–input bundles have frequently been used to evaluate productivity impacts across several countries, including Zambia and Kenya [28,129,130]. For instance, evaluations of Kenya’s Kilimo Salama programme suggest that insured farmers may experience higher yields and greater resilience to weather shocks [14,130–132]. Similarly, studies in Zambia indicate improved resilience against rainfall variability and stronger gross margins [28,129]. These findings suggest that productivity gains are often accompanied by improved income stability and resilience to climate shocks. In some cases, insurance protection encourages farmers to expand cultivated area, intensify fertiliser use, and adopt hybrid varieties. Across other crop systems (cotton, rice, sorghum), similar patterns are observed, where insurance–input bundles encourage investment in improved practices, indicating that the primary impact pathway operates through increased input use and risk mitigation rather than direct productivity effects alone.

9.3. Role of Complementary Services

Most importantly, some studies emphasise that productivity benefits are strongest when insurance is complemented by extension services, credit access, and effective delivery systems [15,133,134]. This shows the importance of integrated programme design in maximising productivity outcomes. The literature also indicates that productivity gains are not evenly distributed, with wealthier or better-resourced farmers benefiting more due to greater access to inputs, information, and services [57,135]. This suggests that insurance–input bundles may reinforce existing inequalities if access constraints are not addressed.

9.4. Constraints Limiting Productivity Impacts

Other studies highlight that design and implementation challenges limit productivity impacts. These include high premium costs, basis risk in index insurance, and delays in payouts [106,112,136,137]. Additional constraints include poor coordination among stakeholders, limited trust in insurance institutions, inadequate extension support, and input packages that do not match local agronomic conditions [7,80,138,139]. This shows that programme effectiveness depends not only on design but also on the quality of implementation and institutional support systems.

9.5. Final Synthesis

Overall, the literature demonstrates that insurance–input bundles can improve productivity and farm performance, but these impacts are conditional. Across contexts, three key patterns emerge: (i) productivity gains occur primarily through increased input

use and reduced risk aversion, (ii) impacts are significantly enhanced by complementary services such as extension and credit, and (iii) outcomes vary widely depending on programme design, institutional quality, and agroecological conditions (Table 5). These findings suggest that insurance–input bundles should not be viewed as standalone solutions, but as components of broader agricultural development systems where insurance, inputs, extension, and markets function together to influence farmer productivity and resilience.

10. Synthesis of Cross-Cutting Determinants

The cross-cutting synthesis presented in Table 6 highlights that farmer adoption of insurance–input bundles is not driven by isolated factors, but by the interaction of economic, institutional, behavioural, and programme design elements. Across the reviewed literature, institutional trust and affordability emerge as the most consistent determinants, influencing both willingness to pay and actual participation. A key pattern is that awareness alone does not translate into adoption unless supported by trust in institutions and a clear understanding of insurance mechanisms. Similarly, economic capacity conditions participation, but its effects are often moderated by access to credit and subsidy support. The table further shows that programme design features, particularly payout reliability and input quality, play a critical role in sustaining participation by reinforcing farmer confidence.

Table 1. Farmer awareness of insurance–input bundles across regions.

Region	Level and Nature of Farmer Awareness	Key Factors Influencing Awareness	References
Africa	Awareness of insurance–input bundles remains uneven across smallholder farming communities. Many farmers are aware of input packages but not the insurance component embedded in the bundle. Awareness tends to increase where development organisations, extension services, or cooperatives actively promote the schemes.	Agricultural extension services, NGO awareness campaigns, cooperative membership, farmer training programmes, exposure to previous insurance initiatives	[7,55,78–80]
Asia	Awareness is generally higher in countries where governments actively promote agricultural insurance programmes. However, many farmers still have limited understanding of how insurance mechanisms work, particularly index-based insurance products.	Government-led awareness campaigns, financial literacy programmes, farmer field schools, previous exposure to crop insurance programmes	[81–83]
Latin America	Awareness is often linked to participation in cooperatives, contract farming arrangements, or credit-linked agricultural programmes. Farmers engaged in organised value chains tend to have greater awareness of bundled insurance schemes.	Cooperative membership, access to agricultural credit, value-chain participation, extension services	[56,84]

Table 2. Key findings on farmers’ attitudes and perceptions by region.

Region	Key Findings	References	Notes/Policy Implications
Africa	Positive perceptions linked to timely payouts, high-quality inputs, trust in institutions; negative perceptions where payouts are delayed or unclear	[7,18,79]	Emphasises need for transparent processes and institutional reliability

Asia	Positive perceptions with reliable weather index insurance payouts; complexity reduces trust	[82,133,134]	Policy focus on simplifying insurance packages and clear communication
Latin America	Trust in cooperatives and credit-linked programmes enhances positive perceptions	[100–102]	Strengthen community-based delivery and institutional credibility

Table 3. Willingness to pay for insurance–input bundles by region.

Region	Key Findings	References	Notes/Policy Implications
Africa	Affordability major barrier; higher WTP when insurance bundled with inputs or supported by subsidies	[36,90,137]	Target subsidies, ensure bundle value and institutional trust
Asia	WTP higher with government support; complexity and lack of transparency reduce willingness	[92,99,138,140]	Emphasise transparency and education
Latin America	Participation in cooperatives or credit-linked schemes increases WTP	[103–105,117,141]	Leverage existing social structures for insurance promotion

Table 4. Determinants of farmer participation in insurance–input schemes.

Determinant	Key Findings	References	Policy/Practical Implications
Economic	Income, farm size, off-farm earnings, education, labour availability, prior loss experiences increase participation; financial constraints reduce uptake	[47,103,115]	Target financial support for smallholders; tailor interventions by farm size and resources
Institutional	Trust in insurers, input suppliers, extension services, credit access, policy clarity; weak institutions reduce participation	[23,102,137,142,143]	Strengthen coordination among stakeholders; integrate insurance with credit and input programmes
Market and Social Networks	Access to output markets, cooperatives, contract farming, social capital, peer networks enhance participation; poor infrastructure and weak networks reduce uptake	[7,102,115,144–148]	Leverage cooperatives and farmer associations; improve market access and information flows

Overall, the synthesis demonstrates that adoption of insurance–input bundles is best understood as a systemic outcome, where financial capacity, institutional credibility, and effective programme delivery must align to enable sustained uptake among smallholder farmers.

Table 5. Productivity and farm performance impacts by region.

Region	Key Findings	References	Notes/Policy Implications
Africa	Yield gains 10–30%; better outcomes with credit access and extension support; context-dependent	[14,28,119,120]	Ensure timely delivery, link with extension, support smallholders
Asia	Bundled insurance improves technology adoption; magnitude varies with institutional quality	[12]	Tailor interventions to local institutions and market conditions
Latin America	Enhanced input use and stability of yields; stronger adoption with cooperatives	[100–102]	Strengthen cooperative frameworks and market access

Table 6. Cross-cutting determinants of farmer adoption of insurance–input bundles.

Determinant Category	Specific Factor	Direction of Influence	Consistency Across Studies	Contextual Variation	Implication for Adoption
Economic Factors	Affordability (premium cost, input cost)	Positive when low cost; negative when high cost	High	Strong constraint in Africa; moderated by subsidies in Asia	Key barrier; subsidies and bundling improve uptake
	Farm income/liquidity	Positive	High	Stronger in resource-constrained systems	Determines ability to participate despite willingness
	Access to credit	Positive	High	More prominent in credit-linked systems (Latin America)	Enables participation by easing liquidity constraints
Institutional Factors	Trust in insurers and institutions	Positive	Very High	Universal across regions	Central driver linking awareness to adoption
	Extension services	Positive	High	Stronger in Asia; weaker in Africa	Improves awareness and understanding
	Programme transparency (payout clarity)	Positive	High	Critical in all regions	Builds credibility and sustained participation
	Policy support/subsidies	Positive	High	More structured in Asia	Enhances affordability and adoption
Behavioural Factors	Risk perception/risk aversion	Positive (higher risk → higher uptake)	Medium–High	Context-specific (climate risk exposure)	Drives demand for insurance protection
	Previous experience (payouts/losses)	Positive (if experience is good)	High	Strong in Africa and Asia	Reinforces trust or discourages adoption
	Behavioural biases (loss aversion, present bias)	Mixed	Medium	More evident in low-literacy contexts	May reduce willingness despite potential benefits
Information and Awareness	Awareness of bundled products	Positive but insufficient alone	High	Uneven in Africa; higher in Asia	Entry condition but not a driver of adoption alone
	Financial literacy	Positive	High	Low in many small-holder contexts	Enhances understanding of insurance mechanisms
	Information quality (clarity, communication)	Positive	High	Varies by delivery channel	Determines depth of understanding
Social Factors	Farmer networks/peer learning	Positive	Medium	Strong in Latin America (cooperatives)	Enhances diffusion and trust
	Cooperative membership	Positive	High	Strong in Latin America	Facilitates access and credibility
	Social trust/norms	Positive	Medium	Context-dependent	Reinforces or weakens institutional trust
Market and Value Chain Factors	Market access	Positive	Medium–High	Strong where value chains are organised	Increases incentive to protect production
	Contract farming participation	Positive	Medium	Context-specific	Bundles often embedded in contracts
Programme Design Factors	Bundling (insurance + inputs)	Positive	High	Universal	Increases perceived value compared to standalone insurance

Input quality and timeliness	Positive	High	Context-dependent	Affects both satisfaction and productivity outcomes
Basis risk (index insurance limitation)	Negative	Medium	More evident in index-based systems	Reduces trust and effectiveness
Payout timeliness and reliability	Positive	Very High	Universal	Strongest determinant of satisfaction and continued participation

Table 7 presents a thematic synthesis of key drivers shaping farmers' attitudes, willingness to pay, participation, satisfaction, and productivity outcomes, highlighting their direction of influence, consistency across studies, and contextual variation.

Table 7. Thematic synthesis of attitudes, WTP, participation, satisfaction and productivity.

Thematic Area	Core Drivers Identified	Direction of Influence	Consistency Across Studies	Contextual Variation	Implication for Adoption and Outcomes
Attitudes and Perceptions	Trust in institutions; perceived usefulness; past payout experience; input quality	Positive when trust and performance are high; negative when credibility is low	Very High	Strong trust effects in Africa and Asia; co-operative-based trust in Latin America	Trust and credibility determine whether farmers perceive bundled products as reliable risk-management tools
	Cultural beliefs; social norms; perception of risk	Mixed	Medium	More pronounced in traditional/rural contexts	May reduce perceived need for insurance despite risk exposure
	Behavioural biases (loss aversion, over-confidence)	Mixed	Medium	Stronger in low financial literacy contexts	Can distort perceived value of insurance
Willingness to Pay (WTP)	Affordability; income; credit access	Positive when financial capacity is sufficient	High	Strong constraints in Africa; subsidies important in Asia	Determines whether farmers can translate positive attitudes into demand
	Perceived value of bundle (inputs + insurance)	Positive	High	Stronger where inputs are high quality and timely	Bundling increases perceived utility compared to standalone insurance
	Trust and institutional credibility	Positive	Very High	Universal	Critical for converting willingness into actual payment decisions
	Price sensitivity	Negative when premiums increase	High	Strong among smallholders	Major barrier to uptake
Participation (Adoption)	Institutional coordination; extension; policy support	Positive	High	Stronger in structured systems (Asia)	Enables transition from willingness to actual uptake
	Economic capacity (income, farm size, credit)	Positive	High	More binding in low-income contexts	Limits participation despite willingness
	Social networks; co-operatives; market access	Positive	Medium–High	Strong in Latin America and contract systems	Facilitates access and reduces uncertainty
	Programme design (integration of inputs + insurance)	Positive	High	Context-dependent	Enhances attractiveness and practicality of schemes

Satisfaction	Payout reliability and timeliness	Positive	Very High	Universal	Strongest driver of continued participation
	Input quality and delivery efficiency	Positive	High	Context-specific	Affects perceived value of bundled products
	Transparency and fairness	Positive	High	Strong institutional effect	Builds long-term trust and programme legitimacy
	Service quality and communication	Positive	Medium–High	Varies by provider	Enhances user experience and confidence
Productivity and Performance	Adoption of improved inputs	Positive	High	Strong where extension support exists	Leads to yield and income improvements
	Risk reduction (insurance protection)	Positive	Medium–High	Context-specific (climate risk)	Encourages investment in higher productivity practices
	Complementary services (credit, extension, markets)	Positive	High	Stronger in integrated systems	Determines magnitude of productivity gains
	Programme design limitations (basis risk, delays)	Negative	Medium	More evident in index insurance systems	Reduces effectiveness and productivity impact

11. Thematic Synthesis Network of Insurance–Input Bundle Adoption Among Smallholder Farmers

Figure 3 illustrates the thematic relationships between key dimensions of insurance–input bundle adoption and clustered determinants. To complement the thematic synthesis and enhance analytical clarity, the figure integrates the key findings of the review into a unified framework, highlighting the interrelationships between awareness, attitudes, willingness to pay, participation, satisfaction, and productivity outcomes. The diagram further emphasises the non-linear and interactive nature of adoption processes, where institutional, economic, behavioural, and social factors simultaneously influence multiple stages of decision-making.

This visual representation is particularly important given that the adoption of insurance–input bundles cannot be fully captured through linear narrative synthesis alone. The figure provides a holistic and systems-level understanding of farmer decision-making by illustrating both sequential pathways (e.g., awareness → attitudes → participation) and cross-cutting influences (e.g., institutional trust and affordability affecting multiple stages). Overall, the diagram reinforces the central finding of this review that adoption is not driven by isolated factors, but emerges from the interaction of multiple determinants operating simultaneously across different contexts.

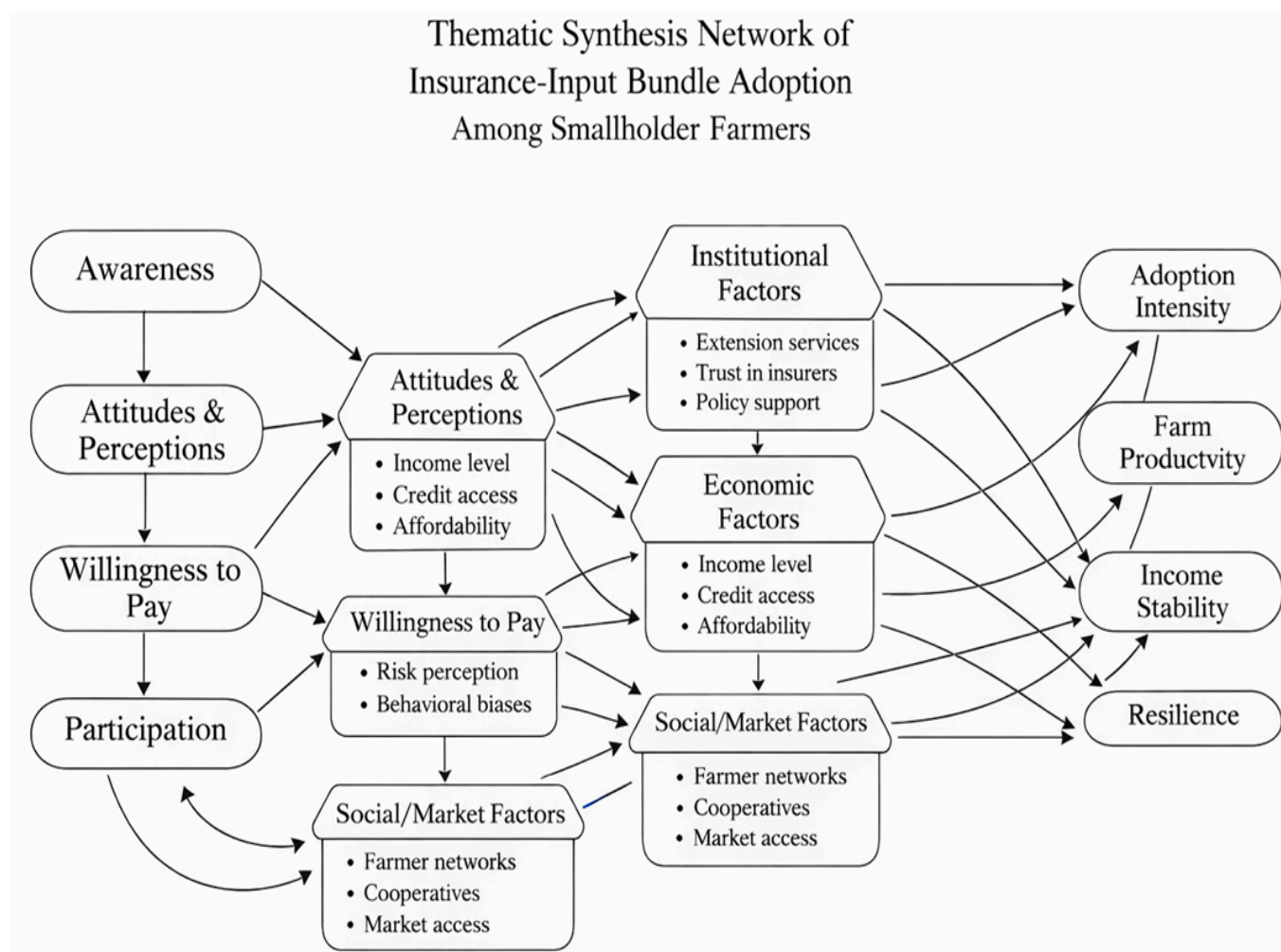


Figure 3. Thematic synthesis network of insurance–input bundle adoption among smallholder farmers.

12. Discussion and Future Research Directions

The introduction of insurance in the agricultural input bundles represents a risk-informed development strategy that mitigates both production shocks and incentivises investment in improved inputs. This effect, however, is not uniform across contexts, indicating that productivity gains are contingent on institutional functionality, behavioural responses, and implementation quality rather than the bundled design alone. Although empirical evidence revealed promising impacts, the heterogeneity of impacts across contexts highlights the need for better implementation strategies which account for local agroecological, socioeconomic, and institutional conditions. This heterogeneity is theoretically important because it challenges linear adoption assumptions in Technology Adoption Theory and static institutional explanations in institutional theory. Instead, adoption outcomes are co-determined by institutional functionality, behavioural constraints, and trust dynamics, suggesting that both theories must incorporate implementation quality and context sensitivity. This review contributed to the literature by synthesising evidence on how perceptions, awareness, willingness to pay, institutional design, and programme performance influence the adoption and impacts of insurance–input bundles. Unlike prior studies that treat adoption determinants in isolation, this synthesis shows that adoption operates as a sequential and interdependent process, where breakdown at any stage (e.g., awareness, trust, or affordability) can undermine the entire adoption pathway. From a behavioural economics perspective, adoption decisions are shaped by bounded rationality, trust constraints, and systematic biases in risk perception, which influence how

farmers interpret and value bundled insurance products under uncertainty. This extends the behavioural economics literature by demonstrating that cognitive biases influence not only willingness to pay, but also earlier stages of awareness formation and risk interpretation.

Farmer awareness and perceptions were proven to play a role in the success of insurance–input bundles. Also, participation was proven to be influenced by perceived benefits, social networks, and trust in intermediaries. Compared to the prior literature that conceptualises awareness as a mere information exposure variable, this review demonstrates that awareness operates as a cognitive filtering mechanism that shapes how farmers interpret and evaluate risk under uncertainty. This extends institutional theory by showing that institutional credibility not only reduces uncertainty in adoption decisions but also conditions how information is interpreted through trust-mediated cognitive processes. To overcome informational and behavioural barriers and ensure sustainable adoption of such innovations, it is important to include culturally sensitive and participatory awareness into rural development programmes. The literature consistently shows that limited awareness and misunderstandings about insurance coverage remain major constraints to adoption. This calls for iterative and contextually adapted awareness interventions that are embedded within existing community structures to reduce information asymmetries and improve farmers' trust.

At the same time, farmers' economic capacity, risk perceptions, and institutional trust were identified to have a significant influence on farmers' willingness, indicating that adoption is contingent on both perceived economic benefits and confidence in institutional reliability. This reflects behavioural economics theory, which emphasises that decision-making under uncertainty is shaped by perceived trust, framing effects, and cognitive biases rather than purely financial considerations. These findings revealed that willingness to pay does not depend only on financial affordability, but the perceived reliability and value of the bundled programme play a significant role. Therefore, bundle designers must balance affordability, perceived value, and flexible payment mechanisms with design choices based on farmer characteristics to avoid excluding resource-deprived households. Insurance–input bundles enhance farm productivity and resilience by increasing yields, gross margins, and farmer confidence to invest in improved technologies, while simultaneously incentivising adherence to best agronomic practices. However, unlike earlier studies that attribute productivity gains directly to input intensification, this review shows that gains are primarily mediated through risk reduction effects that alter farmers' behavioural thresholds for input use. From a resilience theory perspective, these outcomes demonstrate that insurance–input bundles strengthen adaptive capacity by enabling farmers to absorb shocks, adjust production strategies, and maintain income stability under climate variability. However, productivity gains were highly context-specific, with larger and more stable gains reported in areas with strong institutional support, complementary extension services and reliable input delivery.

Effective scaling of insurance–input bundles depends on coordinated, inclusive, and forward-looking policy and institutional frameworks. These frameworks should integrate regulation, digital infrastructure, and public–private partnerships to support sustainable programme implementation. However, contrary to some studies that suggest insurance adoption is primarily driven by financial incentives alone, this review shows that institutional trust and service reliability are equally, if not more, important determinants of sustained adoption. The evidence reviewed in this study suggests that institutional reliability, efficient service delivery, and farmer trust are central mechanisms influencing the scalability of bundled insurance programmes. A novel insight from this synthesis is that insurance–input bundles operate as integrated socio-technical systems, where adoption is co-determined by behavioural, institutional, and market dynamics rather than by

insurance design alone. However, the discussion here focuses less on prescriptive policy and more on the mechanisms underlying scaling: institutional reliability, effective service delivery, and farmer trust emerge as critical enablers. Regardless of the growing evidence on insurance–input bundles, there remain several critical research gaps, which include a lack of longitudinal empirical evidence capturing long-term productivity, ecological or environmental and economic outcomes. Secondly, there is limited understanding of behavioural and gendered adoption patterns. Lastly, there is insufficient evaluation of the impacts of digital tools and market linkages. Much of the existing literature focuses on short-term programme outcomes.

The economic and environmental impacts of insurance–input bundles are not well understood, indicating the need for unified studies that consider financial performance, climate adaptation outcomes, input-use efficiency, and environmental sustainability. To address these gaps, studies should combine smallholder farmers' economic, environmental, and institutional perspectives. Most importantly, future research should focus on large-scale, longitudinal, and mixed-methods studies that assess the sustained impacts of insurance–input bundles. Also, they should analyse the digital innovations, behavioural and gender analyses, cross-country comparisons, and private-sector incentives with the aim of understanding not only adoption, but the long-term productivity, equity outcomes and resilience to generate insights for scalable and inclusive programme design.

On the theoretical front, future research should include behavioural economics, institutional, risk-management, and resilience frameworks, alongside socioeconomic systems modelling. This provides a more holistic understanding of farmers' risk navigation systems, institutional constraints, and technological innovations in various agricultural systems. These inter-disciplinary frameworks may also assist in explaining the adoption dynamics and capture relationships between farmers, markets, and institutions in this rapidly changing agricultural system. The development of such integrated analytical approaches is important for advancing the evidence base on insurance–input bundles and informing future agricultural risk-management policies. However, unlike earlier studies that attribute productivity gains directly to input intensification, this review shows that gains are primarily mediated through risk reduction effects that alter farmers' behavioural thresholds for input use.

13. Policy Implications and Lessons for Scaling Insurance–Input Bundles

- (i) The evidence reviewed indicates that the sustainability and scalability of insurance–input bundles depend on the convergence of institutional reliability, farmer-centred design, and enabling policy environments. Strong institutional coordination, including clear roles for government agencies, insurers, input suppliers, and extension services, is critical for building trust, ensuring timely service delivery, and maintaining programme credibility [119]. This supports institutional theory, which emphasises that adoption outcomes are shaped not only by programme design but also by the coherence and strength of institutional arrangements governing implementation. This study extends this perspective by showing that institutional influence operates beyond formal governance structures to include perceived reliability and service delivery performance, which shape behavioural responses under uncertainty. Policies should support participatory governance and cross-sector collaboration to reduce fragmentation and enhance accountability.
- (ii) Farmer-centred design emerged as a key determinant of adoption and satisfaction. Therefore, bundled products designed for local agronomic conditions, which align with farmers' financial realities, and marketed using simple and culturally relevant approaches improve trust and uptake. From a behavioural economics perspective,

simplifying product design and communication reduces cognitive overload and improves decision-making under uncertainty, thereby increasing adoption likelihood. Studies from Kenya, Zambia, and Ethiopia revealed that incorporating insurance with farmer education, extension services, and financial literacy programmes reduces risk aversion, increases understanding, and encourages their likelihood to invest in improved inputs [14,97].

- (iii) Thirdly, technological innovations offer opportunities to increase efficiency, accessibility and transparency. These include digital platforms for enrolment monitoring and payouts, which improve service delivery and reduce transaction costs [7,25,121]. These innovations also strengthen resilience by improving the speed and reliability of risk-response mechanisms, thereby enhancing farmers' adaptive capacity under climate variability. To improve farmer satisfaction, policies that invest in rural connectivity and data systems should strengthen institutional credibility and ensure fair and timely compensation among farmers for accurate loss assessment [18].
- (iv) Public-private partnerships (PPPs) facilitate a highly cost-effective and socially inclusive delivery of insurance-input bundles by providing a mechanism that combines public-sector and private-sector actors, which increases inclusivity and efficient dissemination of innovations to farmers [139,149–152]. However, the effectiveness of PPPs depends on regulatory strength and accountability mechanisms, as weak oversight may lead to information asymmetries and uneven service delivery.
- (v) Financing mechanisms are critical for equitable access and long-term viability of insurance-input bundles. Therefore, cost-effective subsidies, risk-sharing arrangements, and sustainable finance frameworks can help make farming affordable for lower-resource farmers, while not compromising on the sustainability of the programme [17,47]. This highlights a key trade-off between inclusion and fiscal sustainability, where overly generous subsidies may enhance short-term uptake but risk long-term dependency and financial strain. Policies should balance inclusivity with financial resilience to ensure that insurance schemes remain effective across different farmer categories.
- (vi) The scaling of insurance-input bundles will require combining these inputs with other agricultural strategies. The creation of policies that connect insurance, credit, extension, and market access through continuous data collection and feedback loops can lead to increased participation, higher productivity, and sustainable adoption over time. This systems-based approach aligns with resilience theory, which emphasises that agricultural transformation outcomes emerge from the interaction of multiple interconnected support systems rather than isolated interventions.
- (vii) Lessons learned from programmes in Africa that are designed to meet local socioeconomic conditions, supported by credible institutions, and capable of adapting to climate and market conditions have better chances of creating sustainable agricultural growth and resilience than those that are not [28,118].

In conclusion, farmer-centric, technologically enabled, context-adaptable, financially sustainable, evidence-based and institutionally coordinated policy frameworks are likely to support the scaling and long-term success of insurance-input bundles. Importantly, successful scaling depends not only on policy design but on continuous institutional learning, behavioural adaptation, and system-wide coordination across agricultural value chains.

14. Conclusions

In this review, insurance–input bundles have been critically assessed as a strategic mechanism that addresses production risks, input access, and financial protection in smallholder maize production. Empirical evidence was synthesised on determinants of participation adoption patterns, farmer satisfaction, and productivity effects, highlighting that uptake is highly influenced by institutional reliability and social networks' economic capacity. The evidence indicates that integrating insurance with productivity-enhancing inputs encourages investment in improved farming practices, reduces production uncertainty, and strengthens farmers' resilience to climatic and market shocks. A key contribution of this review is the identification of context-specific determinants such as service quality, institutional coordination, behavioural responses, and digital facilitation, which significantly influence adoption and sustained participation, while also highlighting critical gaps in long-term productivity, equity, and environmental impacts. In addition, the review provides a clearer framework for scaling insurance–input bundles by emphasising the interaction between institutional reliability, behavioural responses, and an enabling policy environment.

Scaling such innovations requires adaptive policy frameworks, strong multi-stakeholder collaboration, and technological support systems that enhance efficiency, transparency, and resilience under climate and market uncertainty. In addition, the success of insurance–input bundles in developing countries significantly depends on evidence-based design, sustained farmer participation and adaptive governance. This emphasises the need for programmes that are responsive to farmer feedback and are context-specific. Future research should evaluate the long-term socioeconomic, productivity, and environmental outcomes of bundled products, with particular attention to digital innovation, gender dynamics, and behavioural factors. Interdisciplinary studies, which include institutional theory, behavioural economics, resilience theory, and risk-management frameworks, are essential to guide programme design and for unpacking the adoption dynamics. Furthermore, partnerships between researchers, private actors and policymakers are necessary to ensure practical relevance, evidence-based scaling, and improved implementation outcomes. In conclusion, farmer-centred, technologically enabled, context-adaptable, financially sustainable, evidence-based, and institutionally coordinated policy frameworks are likely to support the scaling and long-term success of insurance–input bundles.

Author Contributions: Conceptualisation, T.M. and A.M.; methodology, T.M., N.V.B. and A.M.; validation, T.M., N.V.B. and A.M.; investigation, T.M., N.V.B. and A.M. resources, T.M., N.V.B. and A.M.; writing—original draft preparation, T.M., N.V.B. and A.M.; writing—review and editing, T.M., N.V.B. and A.M.; visualisation, T.M., N.V.B. and A.M.; supervision, N.V.B. and A.M.; project administration, N.V.B. and A.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: No new data were created or analysed in this study.

Acknowledgments: The University of Fort Hare is thanked for the overall research support.

Conflicts of Interest: The authors declare no conflicts of interest.

References

- Hussain, A.; Elkarmout, A.F.; Mansour, E.Z.; Awais, M.; Usman, M.; Ahmad, H.; Faisal, M.; Ahmad, T. An Environment Friendly Practice, the Climate Smart Agriculture Crop Production and Soil Management Systems: A Review. *J. Sustain. Agric. Environ. Sci.* **2024**, *3*, 101–124.
- Nega, A. Climate Change Impacts on Agriculture: A Review of Plant Diseases and Insect Pests in Ethiopia and East Africa, With Adaptation and Mitigation Strategies. *Adv. Agric.* **2025**, *2025*, 5606701. <https://doi.org/10.1155/aia/5606701>.
- Ansah, I.G.K.; Gardebroek, C.; Ihle, R. Shock Interactions, Coping Strategy Choices and Household Food Security. *Clim. Dev.* **2020**, *13*, 414–426. <https://doi.org/10.1080/17565529.2020.1785832>.
- Verma, S.; Sudan, F.K. Impact of Climate Change on Marginal and Small Farmers' Livelihood and Their Adaptation Strategies—A Review. *Reg. Econ. Dev. Res.* **2021**, *2*, 96–112. <https://doi.org/10.37256/redr.222021896>.
- Nkurunziza, F.; Kabanda, R.; McSharry, P. Determinants of Shock-Coping Mechanisms Adoption and Rural Household Consumption in Rwanda: A Two-Stage Analysis Considering Both Idiosyncratic and Covariate Shocks. *Cogent Econ. Financ.* **2023**, *11*, 2238462. <https://doi.org/10.1080/23322039.2023.2238462>.
- Johnson, L. Rescaling Index Insurance for Climate and Development in Africa. *Econ. Soc.* **2021**, *50*, 248–274. <https://doi.org/10.1080/03085147.2020.1853364>.
- Nshakira-Rukundo, E.; Kamau, J.W.; Baumüller, H. Determinants of Uptake and Strategies to Improve Agricultural Insurance in Africa: A Review. *Environ. Dev. Econ.* **2021**, *26*, 605–631. <https://doi.org/10.1017/s1355770x21000085>.
- Zougmore, R.B.; Läderach, P.; Campbell, B.M. Transforming Food Systems in Africa under Climate Change Pressure: Role of Climate-Smart Agriculture. *Sustainability* **2021**, *13*, 4305. <https://doi.org/10.3390/su13084305>.
- Adeoti, S.O.; Moses, A.; Adedamola, A.M. *Bundling of Insurance with Agricultural Inputs: A Better Way of Introducing Insurance Product to Farmers*; LAP LAMBERT Academic Publishing: Saarbrücken, Germany, 2020.
- Mishra, K.; Gallenstein, R.A.; Sam, A.G.; Miranda, M.J.; Toledo, P.; Mulangu, F. Does Bundling Credit with Index Insurance Boost Agricultural Technology Adoption? Evidence from Ghana. *Agric. Econ.* **2023**, *54*, 778–792. <https://doi.org/10.1111/agec.12806>.
- Obianefo, C.A.; Ng'ombe, J.N.; Gbughemobi, O.B.; Okoroji, N.O. The Effect of Anambra State Value Chain Development Programme Partnership with Nigerian Agricultural Insurance Corporation (NAIC) on Farmer's Production Security and Risk Management. *Int. J. Agric. Ext. Soc. Dev.* **2021**, *4*, 51–58. <https://doi.org/10.33545/26180723.2021.v4.i2a.104>.
- Adelesi, O.O.; Kim, Y.-U.; Schuler, J.; Zander, P.; Njoroge, M.M.; Waithaka, L.; Abdulai, A.L.; MacCarthy, D.S.; Webber, H. The Potential for Index-Based Crop Insurance to Stabilize Smallholder Farmers' Gross Margins in Northern Ghana. *Agric. Syst.* **2024**, *221*, 104130. <https://doi.org/10.1016/j.agsy.2024.104130>.
- Kousky, C.; Wiley, H.; Shabman, L. Can Parametric Microinsurance Improve the Financial Resilience of Low-Income Households in the United States? *Econ. Disaster. Clim. Chang.* **2021**, *5*, 301–327. <https://doi.org/10.1007/s41885-021-00088-1>.
- Muleke, P.A.; Ji, Y.; Fu, Y.; Kipkoge, S. Weather Index Insurance and Input Intensification: Evidence from Smallholder Farmers in Kenya. *Sustainability* **2025**, *17*, 5206. <https://doi.org/10.3390/su17115206>.
- Yu, L.; Song, Y.; Wu, H.; Shi, H. Credit Constraint, Interlinked Insurance and Credit Contract and Farmers' Adoption of Innovative Seeds—Field Experiment of the Loess Plateau. *Land* **2023**, *12*, 357. <https://doi.org/10.3390/land12020357>.
- Munkombwe, J.; Phiri, J.; Siankwilimba, E. Financial Innovation among Smallholder Farmers: Enhancing the Uptake of Weather Index Insurance through a Pragmatic Approach. *J. Soc. Sci. Adv.* **2022**, *3*, 01–19. <https://doi.org/10.52223/jssa22-030101-27>.
- Ayalew, H.; Chamberlin, J.; Newman, C. Site-Specific Agronomic Information and Technology Adoption: A Field Experiment from Ethiopia. *J. Dev. Econ.* **2022**, *156*, 102788. <https://doi.org/10.1016/j.jdeveco.2021.102788>.
- Madaki, M.Y.; Kaechele, H.; Bavorova, M. Agricultural Insurance as a Climate Risk Adaptation Strategy in Developing Countries: A Case of Nigeria. *Clim. Policy* **2023**, *23*, 747–762. <https://doi.org/10.1080/14693062.2023.2220672>.
- Al-Maruf, A.; Mira, S.A.; Rida, T.N.; Rahman, M.S.; Sarker, P.K.; Jenkins, J.C. Piloting a Weather-Index-Based Crop Insurance System in Bangladesh: Understanding the Challenges of Financial Instruments for Tackling Climate Risks. *Sustainability* **2021**, *13*, 8616. <https://doi.org/10.3390/su13158616>.
- Tappi, M.; Nardone, G.; Santeramo, F.G. On the Relationships among Durum Wheat Yields and Weather Conditions: Evidence from Apulia Region, Southern Italy. *Bio-Based Appl. Econ.* **2022**, *11*, 123–130. <https://doi.org/10.36253/bae-12160>.
- Darkoh, G.O.; Laweh, N.; Dasori, E.A.; Abilla, M.L.; Orji, N.; Amfo, S.J. Determinants of weather index-based insurance adoption among ghanaiian farmers: Insights for climate risk mitigation and sustainable agriculture. *EPRA Int. J. Agric. Rural. Econ. Res.* **2025**, *13*, 1–25. <https://doi.org/10.36713/epra19711>.

22. Lu, Y.; Yu, L.; Li, W.-J.; Aleksandrova, M. Impacts and Synergies of Weather Index Insurance and Microcredit in Rural Areas: A Systematic Review. *Environ. Res. Lett.* **2022**, *17*, 103002. <https://doi.org/10.1088/1748-9326/ac9244>.
23. Okpukpara, B.C.; Adebayo, O.; Ukwuaba, I.C. Smallholder Farmers' Access to Agricultural Insurance Schemes: An Analysis of the Inhibitors in Kogi State, Nigeria. *Turk. J. Agric. Food Sci. Technol.* **2021**, *9*, 2159–2165. <https://doi.org/10.24925/turjaf.v9i12.2159-2165.4381>.
24. Alabi, O.O.; Makarau, S.B.; Aluwong, J.; Bayei, J.; Lyocks, J.S.; Man, A.; Drisu, T.; Anekwe, C.E.; Safugha, G.F.; Alabuja, F.; et al. Evaluation of Maize Farmers' Attitude towards Risk Management and Preference for Crop Insurance in Nigeria. *Int. J. Agric. Environ. Food Sci.* **2023**, *7*, 62–69. <https://doi.org/10.31015/jaefs.2023.1.7>.
25. Adjabui, J.A.; Tozer, P.R.; Gray, D.I. Willingness to Participate and Pay for Index-Based Crop Insurance in Ghana. *Agric. Financ. Rev.* **2019**, *79*, 491–507. <https://doi.org/10.1108/AFR-01-2019-0001>.
26. Ngango, J.; Nkurunziza, F.; Ndagijimana, J. Assessing Rural Farmers' Willingness to Pay for Crop Insurance Scheme: Evidence from Rwanda. *Cogent Econ. Financ.* **2022**, *10*, 2104780. <https://doi.org/10.1080/23322039.2022.2104780>.
27. Abetu, T.A.; Ingenbleek, P.T.M.; Giller, K.E.; van der Lans, I.A.; Wolde-Meskel, E. Bundling of Inputs and Services for Sustainable Smallholder Agriculture: The Concepts, Theoretical Arguments and Bundle Designs Using Conjoint Analysis. *Int. J. Agric. Sustain.* **2024**, *22*, 2322193. <https://doi.org/10.1080/14735903.2024.2322193>.
28. Van Asseldonk, M.; Onumah, G.; Lensink, R. Credit-Linked Insurance Bundles in Zambia: Evidence from the Aftermath of a Shock. *Agric. Financ. Rev.* **2021**, *82*, 857–870. <https://doi.org/10.1108/afr-05-2021-0067>.
29. Ayalewu, T.S.; Alemu, A.G.; Wassie, H.M. Enhancing Structural Integrity of Magnesium with Hydroxyapatite and Tantalum Reinforcement. *Sci. Rep.* **2025**, *15*, 8306. <https://doi.org/10.1038/s41598-025-91912-1>.
30. Mapanje, O.; Karuaihe, S.; Machethe, C.; Amis, M. Financing Sustainable Agriculture in Sub-Saharan Africa: A Review of the Role of Financial Technologies. *Sustainability* **2023**, *15*, 4587. <https://doi.org/10.3390/su15054587>.
31. Amarnath, G.; Taron, A.; Alahacoon, N.; Ghosh, S. Bundled Climate-Smart Agricultural Solutions for Smallholder Farmers in Sri Lanka. *Front. Sustain. Food Syst.* **2023**, *7*, 1145147. <https://doi.org/10.3389/fsufs.2023.1145147>.
32. Dehmel, N.; Ran, Y.; Osborne, M.; Verschoor, A.; Lambe, F.; Balungira, J.; Tabacco, G.A.; Pérez-Viana, B.; Widmark, E.; Holmlid, S. Combining Service Design and Discrete Choice Experiments for Intervention Design: An Application to Weather Index Insurance. *MethodsX* **2021**, *8*, 101513. <https://doi.org/10.1016/j.mex.2021.101513>.
33. Waithaka, B. Policies and Mechanisms for Providing Insurance and Risk Management Tools to Livestock Farmers to Protect Them against Production Risks. *J. Livest. Policy* **2024**, *3*, 31–41. <https://doi.org/10.47604/jlp.v3i1.2518>.
34. van Paassen, A.; Osei-Amponsah, C.; Klerkx, L.; van Mierlo, B.; Essegbey, G.O. Partnerships Blending Institutional Logics for Inclusive Global and Regional Food Value Chains in Ghana; with What Smallholder Effect? *Eur. J. Dev. Res.* **2022**, *34*, 2179–2203. <https://doi.org/10.1057/s41287-022-00530-4>.
35. Visser, M.; Jumare, H.; Brick, K. Risk Preferences and Poverty Traps in the Uptake of Credit and Insurance amongst Small-Scale Farmers in South Africa. *J. Econ. Behav. Organ.* **2020**, *180*, 826–836. <https://doi.org/10.1016/j.jebo.2019.05.007>.
36. Bulte, E.; Cecchi, F.; Lensink, R.; Marr, A.; van Asseldonk, M. Does Bundling Crop Insurance with Certified Seeds Crowd-in Investments? Experimental Evidence from Kenya. *J. Econ. Behav. Organ.* **2020**, *180*, 744–757. <https://doi.org/10.1016/j.jebo.2019.07.006>.
37. Fisher, E.; Hellin, J.; Greatrex, H.; Jensen, N. Index Insurance and Climate Risk Management: Addressing Social Equity. *Dev. Policy Rev.* **2019**, *37*, 581–602. <https://doi.org/10.1111/dpr.12387>.
38. Brooks, S. Configuring the Digital Farmer: A Nudge World in the Making? *Econ. Soc.* **2021**, *50*, 374–396. <https://doi.org/10.1080/03085147.2021.1876984>.
39. Veettil, P.C.; Yashodha, Y.; Vecchi, J. Hypothetical Bias and Cognitive Ability: Farmers' Preference for Crop Insurance Productst. *Am. J. Agric. Econ.* **2024**, *107*, 888–924. <https://doi.org/10.1111/ajae.12506>.
40. Capitanio F., Risk and Uncertainty in Agriculture: Theory, Tools Boundary and Public Role, *Sustainability* **2026**, *18*(4), 1751; <https://doi.org/10.3390/su18041751>
41. Stanslaus, V.; Mmari, F.W. Financial Inclusion and Youth Agriculture Involvement in Tanzania: A Case of Misenyi District, Kagera Region. *Int. J. Acad. Res. Bus. Soc. Sci.* **2021**, *11*, 436–449. <https://doi.org/10.6007/ijarbss/v11-i2/8848>.
42. Shkempi, E.; Trebicka, B.; Gjoni, L. Insurance for Green Produce: Ensuring Agricultural Sustainability. *Interdiscip. J. Res. Dev.* **2024**, *11*, 61. <https://doi.org/10.56345/ijrdv11n309>.
43. Makhanova, A.; Haidabrus, B.; Kantarbayeva, S. State Regulation of Insurance in Agriculture: Global Experience, Analysis of the Current Situation, Prospects. *Probl. AgriMarket* **2024**, *2*, 126–136. <https://doi.org/10.46666/2024-2.2708-9991.10>.

44. Fu, H.; Zhang, Y.; An, Y.; Zhou, L.; Peng, Y.; Kong, R.; Turvey, C.G. Subjective and Objective Risk Perceptions and the Willingness to Pay for Agricultural Insurance: Evidence from an in-the-Field Choice Experiment in Rural China. *Geneva Risk Insur. Rev.* **2021**, *47*, 98–121. <https://doi.org/10.1057/s10713-021-00071-6>.
45. Manganyi, B.; Jourdain, D.; Karuaihe, S. Preferences for Index-Based Pasture Insurance: A Choice Experiment in Limpopo Province, South Africa. *Agrekon* **2024**, *63*, 148–165. <https://doi.org/10.1080/03031853.2024.2387342>.
46. Van Zonneveld, M.; Turmel, M.-S.; Hellin, J. Decision-Making to Diversify Farm Systems for Climate Change Adaptation. *Front. Sustain. Food Syst.* **2020**, *4*, 32. <https://doi.org/10.3389/fsufs.2020.00032>.
47. Bulte, E.; Haagsma, R. The Welfare Effects of Index-Based Livestock Insurance: Livestock Herding on Communal Lands. *Environ. Resour. Econ. (Dordr.)* **2021**, *78*, 587–613. <https://doi.org/10.1007/s10640-021-00545-1>.
48. Zhao, N.; Lv, D. Can Joining the Agricultural Industry Chain Alleviate the Problem of Credit Rationing for Farmers? *Agriculture* **2023**, *13*, 1382. <https://doi.org/10.3390/agriculture13071382>.
49. Chapagain, R.; Ghimire, R.; Boro, L. Assessing the Impact of Farmers' Awareness Level and Risk Management Perception on Agriculture Insurance Satisfaction: Mediating Role of Non-Financial Satisfaction. *Insur. Mark. Co.* **2024**, *15*, 1–13. [https://doi.org/10.21511/ins.15\(2\).2024.01](https://doi.org/10.21511/ins.15(2).2024.01).
50. Viana, J.G.A.; Waquil, P.D. Institutions and Agricultural Economics: A Theoretical Framework from Evolutionary Institutionalism. *Stud. Agric. Econ.* **2022**, *124*, 1–9.
51. Ali, W.; Abdulai, A.; Goetz, R.; Owusu, V. Risk, Ambiguity and Willingness to Participate in Crop Insurance Programs: Evidence from a Field Experiment*. *Aust. J. Agric. Resour. Econ.* **2021**, *65*, 679–703. <https://doi.org/10.1111/1467-8489.12434>.
52. Hebsale Mallappa, V.K.; Pathak, T.B. Climate Smart Agriculture Technologies Adoption among Small-Scale Farmers: A Case Study from Gujarat, India. *Front. Sustain. Food Syst.* **2023**, *7*, 1202485. <https://doi.org/10.3389/fsufs.2023.1202485>.
53. Kirungi, D.; Senyange, B.; Wesana, J.; Sseguya, H.; Gellynck, X.; De Steur, H. Entrepreneurial and Attitudinal Determinants for Adoption of Climate-Smart Agriculture Technologies in Uganda. *Cogent Food Agric.* **2023**, *9*, 2282236. <https://doi.org/10.1080/23311932.2023.2282236>.
54. Ambong, R.M.A. Methods of Rice Technology Adoption Studies in the Philippines and Other Asian Countries: A Systematic Review. *Res. World Agric. Econ.* **2022**, *3*, 15–24. <https://doi.org/10.36956/rwae.v3i2.513>.
55. Isaac, C.; Matiku, E.J.; Wikety, E.J. Effects of Awareness Creation on Smallholder Crop Farmers' Willingness to Join Crop Insurance Schemes in Tanzania: A Case of Iringa Rural District. *East Afr. J. Agric. Biotechnol.* **2023**, *6*, 439–452. <https://doi.org/10.37284/eajab.6.1.1552>.
56. Kousar, R.; Ahmad, T.I.; Abbas, S.; Bhatti, M.A. Factors Affecting Farmers' Willingness to Pay for Agricultural Insurance: A Literature Survey (2004–2023). *Irasd J. Econ.* **2023**, *5*, 598–611. <https://doi.org/10.52131/joe.2023.0502.0149>.
57. Ankrah, D.A.; Kwapong, N.A.; Eghan, D.; Adarkwah, F.; Boateng-Gyambiby, D. Agricultural Insurance Access and Acceptability: Examining the Case of Smallholder Farmers in Ghana. *Agric. Food Secur.* **2021**, *10*, 19. <https://doi.org/10.1186/s40066-021-00292-y>.
58. Abdu-Raheem, K.A.; Worth, S.H. Suggesting a New Paradigm for Agricultural Extension Policy: The Case of West African Countries. *South Afr. J. Agric. Ext. (SAJAE)* **2016**, *44*, 216–230. <https://doi.org/10.17159/2413-3221/2016/v44n2a425>.
59. Popoola, O.O.; Yusuf, S.F.G.; Monde, N. South African National Climate Change Response Policy Sensitization: An Assessment of Smallholder Farmers in Amathole District Municipality, Eastern Cape Province. *Sustainability* **2020**, *12*, 2616. <https://doi.org/10.3390/su12072616>.
60. Bizikova, L.; Nkonya, E.; Minah, M.; Hanisch, M.; Turaga, R.M.R.; Speranza, C.I.; Karthikeyan, M.; Tang, L.; Ghezzi-Kopel, K.; Kelly, J.; et al. A Scoping Review of the Contributions of Farmers' Organizations to Smallholder Agriculture. *Nat. Food* **2020**, *1*, 620–630. <https://doi.org/10.1038/s43016-020-00164-x>.
61. Murindangabo, Y.T.; Kopecký, M.; Konvalina, P. Adoption of Conservation Agriculture in Rwanda: A Case Study of Gicumbi District Region. *Agronomy* **2021**, *11*, 1732. <https://doi.org/10.3390/agronomy11091732>.
62. Eduafo, I.; Osei, C.K.; Bakang, J.-E.A.; Tham-Agyekum, E.K. Could Social Media Be a Game-Changer in Improving Agricultural Extension Delivery in Ghana? *Heliyon* **2024**, *10*, e33293. <https://doi.org/10.1016/j.heliyon.2024.e33293>.
63. Masanja, I.; Shausi, G.L.; Kalungwizi, V.J. Factors Influencing Rural Farmers' Access to Agricultural Extension Services Provided by Private Organizations in Kibondo District, Tanzania. *Eur. J. Agric. Food Sci.* **2023**, *5*, 115–122. <https://doi.org/10.24018/ejfood.2023.5.5.722>.
64. Mnisi, C.M.; Marareni, M.; Manyeula, F.; Madibana, M.J. A Way Forward for the South African Quail Sector as a Potential Contributor to Food and Nutrition Security Following the Aftermath of COVID-19: A Review. *Agric. Food Secur.* **2021**, *10*, 48. <https://doi.org/10.1186/s40066-021-00331-8>.

65. Noble, E.; Moinul, D.; Khairy Djim Sylla, O.; Friedmann, S.; Amick, K.; Rowhani, N.; Dua, R.; Mannan, N.; Seaman, C.; Ayo, O.; et al. Downward Accountability Mechanism Effectiveness by Non-Governmental Organizations in Low- and Middle-Income Countries: A Qualitative Systematic Review. *PLoS ONE* **2025**, *20*, e0324098. <https://doi.org/10.1371/journal.pone.0324098>.
66. Stevens, J.; Nyathi, P.; Salomons, M. Sustainability of Conservation Agriculture Adoption and the Role Lead Farmers Play in Zimbabwe. *South Afr. J. Agric. Ext. (SAJAE)* **2021**, *49*, 1–14. <https://doi.org/10.17159/2413-3221/2021/v49n2a12783>.
67. Fuseini, M.N.; Sulemana, M.; Abdulai, I.A.; Ibrahim, M.G.; Azure, E. Role of Non-Governmental Organizations in Poverty Reduction in the Global South: Evidence from World Vision Ghana, Kintampo South District. *SN Soc. Sci.* **2022**, *2*, 240. <https://doi.org/10.1007/s43545-022-00545-y>.
68. Okumu, J.J.; Sibiko, K.W.; Mose, P.B.; Ouko, K.O. Determinants of Smallholder Farmers' Extent of Participation in Climate-Smart Agricultural Projects in Kakamega County, Kenya. *Cogent Soc. Sci.* **2023**, *9*, 2220236. <https://doi.org/10.1080/23311886.2023.2220236>.
69. Amaza, P.; Mailumo, S.; Silong, A. *The Political Economy of the Maize Value Chain in Nigeria*; Institute of Development Studies (IDS): Brighton, UK, 2021.
70. Johari, M.H.; Saili, A.R.; Ahmad, M.K.; Azam, N.H.M. Factors Influencing the Paddy Farmers' Intention to Purchase Crop Insurance: A Study Case in Kedah. *Int. J. Acad. Res. Bus. Soc. Sci.* **2024**, *14*, 1–2. <https://doi.org/10.6007/ijarbs/v14-i1/20416>.
71. Bao, X.; Zhang, F.; Guo, S.; Deng, X.; Song, J.; Xu, D. Peer Effects on Farmers' Purchases of Policy-Based Planting Farming Agricultural Insurance: Evidence from Sichuan Province, China. *Int. J. Environ. Res. Public Health* **2022**, *19*, 7411. <https://doi.org/10.3390/ijerph19127411>.
72. Slijper, T.; Urquhart, J.; Poortvliet, P.M.; Soriano, B.; Meuwissen, M.P.M. Exploring How Social Capital and Learning Are Related to the Resilience of Dutch Arable Farmers. *Agric. Syst.* **2022**, *198*, 103385. <https://doi.org/10.1016/j.agsy.2022.103385>.
73. Siankwilimba, E.; Hiddlestone-Mumford, J.; Hoque, M.E.; Hang'ombe, B.M.; Mumba, C.; Hasimuna, O.J.; Maulu, S.; Mphande, J.; Chibesa, M.; Moono, M.B.; et al. Sustainability of Agriculture Extension Services in the Face of COVID-19: A Study on Gender-Specific Market Systems. *Cogent Food Agric.* **2023**, *9*, 2284231. <https://doi.org/10.1080/23311932.2023.2284231>.
74. Mwalupaso, G.E.; Geng, X.; Yasin, S.I. Financial Inclusion for Sustainable Agriculture: Pathways among Smallholder Women Farmers in Rural Zambia. *PLoS ONE* **2025**, *20*, e0326980. <https://doi.org/10.1371/journal.pone.0326980>.
75. Wang, H.L.; Liu, H.; Wang, D.Y. Agricultural Insurance, Climate Change, and Food Security: Evidence from Chinese Farmers. *Sustainability* **2022**, *14*, 9493. <https://doi.org/10.3390/su14159493>.
76. Adamsone-Fiskovica, A.; Grivins, M. Understanding the Potential of Sustainability Turn in Farming: Review of Sociotechnical Adoption Factors of Agri-Environmental Cropping Practices. *Renew. Agric. Food Syst.* **2024**, *39*, e16. <https://doi.org/10.1017/s1742170524000085>.
77. Anugrah, I.S.; Hestina, J.; Pasaribu, S.M. Rice Crop Insurance Scheme to Protect Farmers from Natural Disaster Risks: Field Application Experience. *BIO Web Conf.* **2024**, *119*, 04004. <https://doi.org/10.1051/bioconf/202411904004>.
78. Onyinye, O.; Osabuohien, E.O.; Falola, H. Act of God or Ignorance: Perception of Rural Farmers on Effect of Climate Change and Flood Insurance. *Kampala Int. Univ. Interdiscip. J. Humanit. Soc. Sci.* **2024**, *5*, 29–43. <https://doi.org/10.59568/kijhus-2024-5-2-03>.
79. Tang, Z.; Zhao, M.; Dong, H.; Fan, Y.; Liu, Y.; Li, F.; Wang, L.; Hou, X. The Positive Effects of Insurance on Livestock Production and Grassland Ecological Benefits: Evidence from Qinghai-Tibet Plateau of China. *Ecol. Soc.* **2025**, *30*, 23. <https://doi.org/10.5751/es-16138-300223>.
80. Jiba, P.; Christian, M.; Nxumalo, K.; Mmbengwa, V. Preferences for Index-Based Crop Insurance in South Africa. *Jamba J. Disaster Risk Stud.* **2024**, *16*, 7. <https://doi.org/10.4102/jamba.v16i1.1611>.
81. Omar, I.A.; Jayaraman, R.; Salah, K.; Hasan, H.R.; Antony, J.; Omar, M. Blockchain-Based Approach for Crop Index Insurance in Agricultural Supply Chain. *IEEE Access* **2023**, *11*, 118660–118675. <https://doi.org/10.1109/access.2023.3327286>.
82. Samota, S.D.; Dangi, K.L.; Yadav, S.L.; Yadav, R.K. Farmers Perceptions towards Agricultural Insurance Schemes in Southern Rajasthan: The Case of National Agricultural Insurance Scheme (NAIS) and Weather Base Crop Insurance Scheme (WBCIS). *Asian J. Agric. Ext. Econ. Sociol.* **2024**, *42*, 210–214. <https://doi.org/10.9734/ajaees/2024/v42i62480>.
83. Anil, K.; Bhat, P.P.; Prasad, R.; Rajesh, C.M.; Jadhav, A.; Manohar, K.N.; Nandini, H.M. A Review on Impact of Modern Agricultural Extension Services on Smallholder Farm Productivity and Sustainability in India. *J. Exp. Agric. Int.* **2024**, *46*, 1161–1172. <https://doi.org/10.9734/jeai/2024/v46i72669>.
84. Lóránt, A.; Farkasné Fekete, M. More Insurance Subsidies for European Farmers—Is It Needed? *Appl. Stud. Agribus. Commer.* **2015**, *9*, 33–38. <https://doi.org/10.19041/apstract/2015/4/4>.

85. Isaboke, H.N. Determinants of Participation of Smallholder Farmers in Weather Index Insurance in Embu County, Kenya. *J. Agric. Ext.* **2021**, *25*, 1–12. <https://doi.org/10.4314/jae.v25i3.1>.
86. Nyoman, Y.; Pratiwi, L.P.K.; Budiasa, M. Effectiveness of Agricultural Insurance Program as A Sustainable Agricultural Development Effort. *SEAS Sustain. Environ. Agric. Sci.* **2022**, *6*, 134–143. <https://doi.org/10.22225/seas.6.2.5856.134-143>.
87. Rao, N.M. Farmers Perception and Awareness about Agriculture Insurance Scheme—A Study of North Karnataka. *J. Manag. Sci.* **2021**, *10*, 33–40. <https://doi.org/10.26524/jms.10.11>.
88. Mato-Amboage, R.; Touza, J.; Soliño, M. Understanding Farmers’ Preferences Towards Insurance Schemes That Promote Biosecurity Best Management Practices. *Int. J. Disaster Risk Sci.* **2022**, *13*, 705–715. <https://doi.org/10.1007/s13753-022-00435-0>.
89. Flores-Contró, J.M.; Henshaw, K.; Loke, S.-H.; Arnold, S.; Constantinescu, C. Subsidizing Inclusive Insurance to Reduce Poverty. *North Am. Actuar. J.* **2024**, *29*, 44–73. <https://doi.org/10.1080/10920277.2024.2311673>.
90. Bhujel, R.R.; Joshi, H.G. Unveiling Sustainable Agriculture Dynamics: A Socio-Psychological Exploration among Smallholder Farmers in Sikkim, India. *Cogent Soc. Sci.* **2024**, *10*, 2350118. <https://doi.org/10.1080/23311886.2024.2350118>.
91. Doherty, E.; Mellett, S.; Norton, D.; McDermott, T.K.J.; Hora, D.O.; Ryan, M. A Discrete Choice Experiment Exploring Farmer Preferences for Insurance against Extreme Weather Events. *J. Environ. Manag.* **2021**, *290*, 112607. <https://doi.org/10.1016/j.jenvman.2021.112607>.
92. Russo, S.; Caracciolo, F.; Salvioni, C. Effects of Insurance Adoption and Risk Aversion on Agricultural Production and Technical Efficiency: A Panel Analysis for Italian Grape Growers. *Economies* **2022**, *10*, 20. <https://doi.org/10.3390/economies10010020>.
93. Li, Y.; Hu, K.; Wu, H.; Luo, W.; Li, Z. A Study of the Impact of Policy-Based Agricultural Insurance on Farmers’ Willingness to Adopt pro-Environmentally Production Behaviors: Evidence from Jiangxi Province in China. *Front. Sustain. Food Syst.* **2025**, *9*, 1556958. <https://doi.org/10.3389/fsufs.2025.1556958>.
94. Nyamayevu, D.; Nyagumbo, I.; Chiduwa, M.; Liang, W.; Li, R. Understanding Crop Diversification Among Smallholder Farmers: Socioeconomic Insights from Central Malawi. *Sustainability* **2024**, *16*, 9078. <https://doi.org/10.3390/su16209078>.
95. Zhang, J.; Mei, Z.; Zhang, F.; Zhou, Q. An Evolutionary Game Study on the Cooperation Behavior of the “Government, Banks, and Guarantee Institutions” in Financing Guarantee for China’s New Agricultural Entities. *Front. Phys.* **2023**, *11*, 1121374. <https://doi.org/10.3389/fphy.2023.1121374>.
96. Messabia, N.; Beauvoir, E.; Kooli, C. Governance and Management of a Savings and Credit Cooperative: The Successful Example of a Haitian SACCO. *Vision* **2023**, *27*, 397–409.
97. Neto, F.; Gómez-Martín, M.B. Water Safety Plan Integrated to the Land Use and Occupation Measures: Proposals for Caraguatatuba-SP, Brazil. *Land Use Policy* **2020**, *97*, 104732. <https://doi.org/10.1016/j.landusepol.2020.104732>.
98. Parra Saiani, P.; Ivaldi, E.; Ciacchi, A.; Di Stefano, L. Broken Trust. Confidence Gaps and Distrust in Latin America. *Soc. Indic. Res.* **2024**, *173*, 269–281.
99. Maganga, A.M.; Chiwaula, L.S.; Kambewa, P. Parametric and Non-Parametric Estimates of Willingness to Pay for Weather Index Insurance in Malawi. *Int. J. Disaster Risk Reduct.* **2021**, *62*, 102406. <https://doi.org/10.1016/j.ijdr.2021.102406>.
100. Budhathoki, N.K.; Lassa, J.A.; Pun, S.; Zander, K.K. Farmers’ Interest and Willingness-to-Pay for Index-Based Crop Insurance in the Lowlands of Nepal. *Land Use Policy* **2019**, *85*, 1–10. <https://doi.org/10.1016/j.landusepol.2019.03.029>.
101. Huang, Z.; Su, K.; Wang, S. The Role of Agricultural Insurance in Promoting Farmers’ Green Production Behavior: The Moderating Effect of Legal Trust. *Financ. Res. Lett.* **2025**, *80*, 107269. <https://doi.org/10.1016/j.frl.2025.107269>.
102. Hartono, R.; Retnoningsih, D.; Rahman, M.S.; Wijayanto, H.W. Does Farmer Group Participation Affect Agricultural Insurance Adoption? Evidence from Indonesian Rice Farmers. *J. Pembang. Dan Alam Lestari* **2025**, *14*, 76–86. <https://doi.org/10.21776/ub.jp.al.2023.014.02.06>.
103. Cabeza-Ramírez, L.J.; Guerrero-Baena, M.D.; Luque-Vílchez, M.; Sánchez-Cañizares, S.M. Assessing Farmers’ Intention to Adopt Drought Insurance. A Combined Perspective from the Extended Theory of Planned Behavior and Behavioral Reasoning Theory. *Int. J. Disaster Risk Reduct.* **2024**, *113*, 104818. <https://doi.org/10.1016/j.ijdr.2024.104818>.
104. Boldt, L.; Lloyd-Smith, P.; Belcher, K.; Pattison-Williams, J.; Bergen, G.; Blechinger, K.; Paulson, I. Agronomic and Economic Effects of Wetlands on Crop Yields Using Precision Agriculture Data. *Agric. Syst.* **2025**, *222*, 104169. <https://doi.org/10.1016/j.agry.2024.104169>.
105. Blackmore, E.; Guarín, A.; Nicolini, G. *Making Crop Insurance Work for Small-Scale Farmers*; IIED: London, UK, 2025.
106. Belissa, T.K. Effects of Weather Index Insurance Adoption on Household Food Consumption and Investment in Agricultural Inputs in Ethiopia. *J. Agric. Food Res.* **2024**, *16*, 101043. <https://doi.org/10.1016/j.jafr.2024.101043>.
107. Rahman, S. Women’s Labour Contribution to Productivity and Efficiency in Agriculture: Empirical Evidence from Bangladesh. *J. Agric. Econ.* **2010**, *61*, 318–342. <https://doi.org/10.1111/j.1477-9552.2010.00243.x>.

108. Guo, X.; Zhao, Y.; Arshad, M.U.; Gong, Y. Farmers' Willingness to Pay a High Premium for Different Types of Agricultural Insurance: Evidence from Inner Mongolia, China. *Discrete Dyn. Nat. Soc.* **2022**, *2022*, 8476087. <https://doi.org/10.1155/2022/8476087>.
109. Liu, K.; Prommawin, B.; Schroyen, F. Health Insurance, Agricultural Production and Investments. *J. Health Econ.* **2024**, *97*, 102918. <https://doi.org/10.1016/j.jhealeco.2024.102918>.
110. Mejía-Delgado, O.; Paredes, M.R. The Role of Trust in Purchase Intentions in Collaborative Consumption in Emerging Economies: A Colombian Perspective. *Cogent Bus. Manag.* **2023**, *10*, 2287789.
111. Belissa, T.K.; Lensink, R.; Marr, A. The Impact of Bundling Index Insurance with Credit and Input Vouchers: Experimental Evidence from Ethiopia. *J. Econ. Behav. Organ.* **2025**, *234*, 107013. <https://doi.org/10.1016/j.jebo.2025.107013>.
112. Li, T.; Chen, L.; Li, X.; Li, S.; Chen, H.; Ji, H. The Impact of Cost-of-Production Insurance on Input Expense of Fruit Growing in Ecologically Vulnerable Areas: Evidence from Shaanxi Province of China. *Sustainability* **2021**, *13*, 12083. <https://doi.org/10.3390/su132112083>.
113. Zhong, Z.; Jiang, W.; Li, Y. Bridging the Gap between Smallholders and Modern Agriculture: Full Insight into China's Agricultural Cooperatives. *J. Rural Stud.* **2023**, *101*, 103037. <https://doi.org/10.1016/j.jrurstud.2023.103037>.
114. Le-Dinh, T. Exploring the Relationship between Willingness to Participate in Insurance and Bank Loan Approval for Coffee Farmers in Dak Lak Province: A Bayesian Model Averaging Approach. *J. East. Eur. Cent. Asian Res. (JEECAR)* **2023**, *10*, 1076–1087.
115. Rabuh, A.A.; Teeuw, R.M.; Oakey, D.R.; Argyriou, A.V.; Foxley-Marrable, M.; Wilkins, A. Sustainable Geoinformatic Approaches to Insurance for Small-Scale Farmers in Colombia. *Sustainability* **2024**, *16*, 5104.
116. Mwale, T.; Mwangi, A. Assessing the Constraints of Value Addition to Agricultural Products of Small and Medium Scale Farmers in Chongwe District, Zambia. *Afr. J. Commer. Stud.* **2025**, *6*, 127–147. <https://doi.org/10.59413/ajocs/v6.i2.12>.
117. Rana, R.H.; Adeyinka, A.A.; Mushtaq, S.; Barratt, J.; Alam, K. The Impact of Agricultural Insurance on Farmers' Mental Health: What We Can Learn from the Literature. *Environ. Dev. Sustain.* **2024**. <https://doi.org/10.1007/s10668-024-05515-3>.
118. Chirwa, W.; Pangapanga-Phiri, I.; Phiri, H.; Tufa, A.; Ngoma, H. Does Adoption of Improved Soybean Varieties and Their Complementary Agronomic Practices Enhance Household Food Security among Smallholder Farmers in Malawi. *Afr. J. Agric. Resour. Econ.* **2024**, *19*, 147–165. [https://doi.org/10.53936/afjare.2024.19\(2\).9](https://doi.org/10.53936/afjare.2024.19(2).9).
119. Silva, J.V.; Baudron, F.; Ngoma, H.; Nyagumbo, I.; Simutowe, E.; Kalala, K.; Habeenzu, M.; Mphatso, M.; Thierfelder, C. Narrowing Maize Yield Gaps across Smallholder Farming Systems in Zambia: What Interventions, Where, and for Whom? *Agron. Sustain. Dev.* **2023**, *43*, 26. <https://doi.org/10.1007/s13593-023-00872-1>.
120. Dalhaus, T.; Barnett, B.J.; Finger, R. Behavioral Weather Insurance: Applying Cumulative Prospect Theory to Agricultural Insurance Design under Narrow Framing. *PLoS ONE* **2020**, *15*, e0232267. <https://doi.org/10.1371/journal.pone.0232267>.
121. Mwangi, T.M. Analysis of Tomato Market Diversity among Rural Smallholder Farmers in Kirinyaga County, Kenya. *Open Access J. Agric. Res.* **2023**, *8*, 1–14. <https://doi.org/10.23880/oajar-16000324>.
122. Zhang, Y.Y.; Wu, X.T. Risk Management Effects of Insurance Purchase and Organization Participation: Which Is More Effective? *Agriculture* **2023**, *13*, 1927. <https://doi.org/10.3390/agriculture13101927>.
123. Mensah, N.O.; Asare, J.K.; Mensah, E.T.-D.; Amrago, E.C.; Tutu, F.O.; Donkor, A. Determinants and Framework for Implementing Sustainable Climate-Smart Aquaculture Insurance System for Fish Farmers: Evidence from Ghana. *Aquaculture* **2024**, *581*, 740354. <https://doi.org/10.1016/j.aquaculture.2023.740354>.
124. Ncube, D. The Importance of Contract Farming to Small-Scale Farmers in Africa and the Implications for Policy: A Review Scenario. *Open Agric. J.* **2020**, *14*, 59–86. <https://doi.org/10.2174/1874331502014010059>.
125. Ghimire, R.; Chapagain, R. Farmers' Satisfaction towards the Agriculture Insurance: A Case of Chitwan and Kaski Districts of Nepal. *Int. Res. J. Manag. Sci.* **2023**, *8*, 123–139. <https://doi.org/10.3126/irjms.v8i1.60707>.
126. Akinyi, D.P.; Ng'ang'a, S.K.; Girvetz, E.H. Trade-Offs and Synergies of Climate Change Adaptation Strategies among Smallholder Farmers in Sub-Saharan Africa: A Systematic Review. *Reg. Sustain.* **2021**, *2*, 130–143. <https://doi.org/10.1016/j.reg-sus.2021.05.002>.
127. Ituriaga, J.; Mariñas, K.A.; Saflor, C.S. Enhancing Government Services to Rice Farmers in the Philippines: A Service Quality–Sustainability-Focused Approach for Long-Term Agricultural Resilience. *Sustainability* **2024**, *16*, 8108. <https://doi.org/10.3390/su16188108>.
128. Yao, W.; Sun, Z. The Impact of the Digital Economy on High-Quality Development of Agriculture: A China Case Study. *Sustainability* **2023**, *15*, 5745. <https://doi.org/10.3390/su15075745>.

129. Stoeffler, Q.; Carter, M.; Guirking, C.; Gelade, W. The Spillover Impact of Index Insurance on Agricultural Investment by Cotton Farmers in Burkina Faso. *World Bank Econ. Rev.* **2021**, *36*, 114–140. <https://doi.org/10.1093/wber/lhab011>.
130. Emeana, E.M.; Trenchard, L.; Dehnen-Schmutz, K. The Revolution of Mobile Phone-Enabled Services for Agricultural Development (m-Agri Services) in Africa: The Challenges for Sustainability. *Sustainability* **2020**, *12*, 485. <https://doi.org/10.3390/su12020485>.
131. Dadzie, S.K.N.; Ndebugri, J.; Inkoom, E.W.; Akuamoah-Boateng, S. Social Networking and Risk Attitudes Nexus: Implication for Technology Adoption among Smallholder Cassava Farmers in Ghana. *Agric. Food Secur.* **2022**, *11*, 41. <https://doi.org/10.1186/s40066-022-00376-3>.
132. Ofolsha, M.D.; Kenée, F.B.; Bimirew, D.A.; Tefera, T.L.; Wedajo, A.S. The Effect of Social Networks on Smallholder Farmers' Decision to Join Farmer-Base Seed Producer Cooperatives (FBS): The Case of Hararghe, Oromia, Ethiopia. *Sustainability* **2022**, *14*, 5838. <https://doi.org/10.3390/su14105838>.
133. Masiza, W.; Chirima, J.G.; Hamandawana, H.; Kalumba, A.M.; Magagula, H.B. Do Satellite Data Correlate with In Situ Rainfall and Smallholder Crop Yields? Implications for Crop Insurance. *Sustainability* **2022**, *14*, 1670. <https://doi.org/10.3390/su14031670>.
134. Fang, L.; Hu, R.; Mao, H.; Chen, S. How Crop Insurance Influences Agricultural Green Total Factor Productivity: Evidence from Chinese Farmers. *J. Clean. Prod.* **2021**, *321*, 128977. <https://doi.org/10.1016/j.jclepro.2021.128977>.
135. Oppong Mensah, N.; Owusu-Sekyere, E.; Adjei, C. Revisiting Preferences for Agricultural Insurance Policies: Insights from Cashew Crop Insurance Development in Ghana. *Food Policy* **2023**, *118*, 102496. <https://doi.org/10.1016/j.foodpol.2023.102496>.
136. Bjornlund, V.; Bjornlund, H.; Van Rooyen, A.F. Why Agricultural Production in Sub-Saharan Africa Remains Low Compared to the Rest of the World—A Historical Perspective. *Int. J. Water Resour. Dev.* **2020**, *36*, S20–S53. <https://doi.org/10.1080/07900627.2020.1739512>.
137. Adeyinka, A.A.; Kath, J.; Nguyen-Huy, T.; Mushtaq, S.; Souvignat, M.; Range, M.; Barratt, J. Global Disparities in Agricultural Climate Index-Based Insurance Research. *Clim. Risk Manag.* **2022**, *35*, 100394. <https://doi.org/10.1016/j.crm.2022.100394>.
138. Stoeffler, Q.; Opuz, G. Price, Information and Product Quality: Explaining Index Insurance Demand in Burkina Faso. *Food Policy* **2022**, *108*, 102213. <https://doi.org/10.1016/j.foodpol.2021.102213>.
139. Karakara, A.A.-W. Intra-Household Farm Decisions, Agricultural Risks, and Household Welfare: Evidence from Smallholder Farmers in Four SSA Countries. *Sci. Afr.* **2025**, *28*, e02693. <https://doi.org/10.1016/j.sciaf.2025.e02693>.
140. Belissa, T.; Bulte, E.; Cecchi, F.; Gangopadhyay, S.; Lensink, R. Liquidity Constraints, Informal Institutions, and the Adoption of Weather Insurance: A Randomized Controlled Trial in Ethiopia. *J. Dev. Econ.* **2019**, *140*, 269–278. <https://doi.org/10.1016/j.jdevec.2019.06.006>.
141. Gebretsadik, Y.H.; Tesfay, K.G. Impact of Weather Index Crop Insurance on Smallholder Farmers' Multidimensional Food Security: Evidence from Ethiopia. *Int. J. Agric. Sustain.* **2023**, *21*, 2255451. <https://doi.org/10.1080/14735903.2023.2255451>.
142. Addey, K.A.; Jatoo, J.B.D. Implications of Crop Yield Distributions for Multiperil Crop Insurance Rating in Ghana: A Lasso Model Application. *Agric. Financ. Rev.* **2024**, *84*, 246–265. <https://doi.org/10.1108/afr-05-2024-0078>.
143. Kayula, M.; Odoyo, C.O.; Sichinsambwe, C. Effects of Crop Insurance and Finance on Small-Scale Maize Productivity in Zambia. *Int. Bus. Res.* **2022**, *15*, 48. <https://doi.org/10.5539/ibr.v15n10p48>.
144. Mutuku, E.A.; Roobroeck, D.; Vanlauwe, B.; Boeckx, P.; Cornelis, W.M. Maize Production under Combined Conservation Agriculture and Integrated Soil Fertility Management in the Sub-Humid and Semi-Arid Regions of Kenya. *Field Crops Res.* **2020**, *254*, 107833. <https://doi.org/10.1016/j.fcr.2020.107833>.
145. Simtowe, F.; Makumbi, D.; Worku, M.; Mawia, H.; Rahut, D.B. Scalability of Adaptation Strategies to Drought Stress: The Case of Drought Tolerant Maize Varieties in Kenya. *Int. J. Agric. Sustain.* **2020**, *19*, 91–105. <https://doi.org/10.1080/14735903.2020.1823699>.
146. Mohtasin, F. A Case Study on Disaster Insurance in Kenya. *Res. Agric. Livest. Fish.* **2021**, *8*, 57–64. <https://doi.org/10.3329/ralf.v8i1.53268>.
147. Horvey, S.S.; Odei-Mensah, J.; Liebenberg, A.P. Insurance Market Development and Economic Growth in Africa: Contingencies and Thresholds of Structural Transformation. *Heliyon* **2024**, *10*, e40046. <https://doi.org/10.1016/j.heliyon.2024.e40046>.
148. Bou-Karroum, L.; Iaia, D.G.; El-Jardali, F.; Abou Samra, C.; Salameh, S.; Sleem, Z.; Masri, R.; Harb, A.; Hemadi, N.; Hilal, N.; et al. Financing for Equity for Women's, Children's and Adolescents' Health in Low- and Middle-Income Countries: A Scoping Review. *PLoS Global Public Health* **2024**, *4*, e0003573. <https://doi.org/10.1371/journal.pgph.0003573>.
149. Aheeyar, M.; Amarasinghe, U.; Amarnath, G.; Alahacoon, N. Factors Affecting Willingness to Adopt Climate Insurance among Smallholder Farmers in Sri Lanka. *Clim. Risk Manag.* **2023**, *42*, 100575. <https://doi.org/10.1016/j.crm.2023.100575>.

150. Hill, R.V.; Kumar, N.; Magnan, N.; Makhija, S.; de Nicola, F.; Spielman, D.J.; Ward, P.S. Ex Ante and Ex Post Effects of Hybrid Index Insurance in Bangladesh. *J. Dev. Econ.* **2019**, *136*, 1–17. <https://doi.org/10.1016/j.jdeveco.2018.09.003>.
151. Otieno, E.; Mukasa, N.; Ajok Odoch, F.; Ddamulira, C.; Nuwagaba, D.; Namyalo, J.; Walimbwa, A.; Basaza, R.K. Perceptions and Experiences of Willingness to Pay for Community-Based Health Insurance: A Qualitative Study. *Health Econ. Manag. Rev.* **2025**, *6*, 130–145. <https://doi.org/10.61093/hem.2025.1-08>.
152. Wong, H.L.; Wei, X.; Kahsay, H.B.; Gebreegziabher, Z.; Gardebroek, C.; Osgood, D.E.; Diro, R. Effects of Input Vouchers and Rainfall Insurance on Agricultural Production and Household Welfare: Experimental Evidence from Northern Ethiopia. *World Dev.* **2020**, *135*, 105074. <https://doi.org/10.1016/j.worlddev.2020.105074>.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.