

## REVIEW

# Sustainable Behaviour in Palm Oil Certification: A Systematic Review of ISPO and RSPO Adoption

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## ABSTRACT

This study aims to identify, classify, and analyse academic literature related to the adoption of sustainability certification in the palm oil sector, particularly Indonesian Sustainable Palm Oil (ISPO) and Roundtable on Sustainable Palm Oil (RSPO), using a Systematic Literature Review (SLR) approach. The method was applied to examine 164 academic articles, which were classified into five main dimensions: theoretical focus based on the Theory of Planned Behavior (TPB), the scope of certification policies, mapping of TPB onto ISPO and RSPO, and methodological approaches. The analysis revealed that literature exploring ISPO and RSPO certification practices dominates the corpus, with 110 articles (67.07%). A total of 46 articles (28.05%) focused on the theoretical application of TPB within agricultural and certification contexts. Two smaller yet significant categories, each representing 2.44%, mapped TPB to RSPO and ISPO, respectively. Quantitative approaches (47%) were the most prevalent, demonstrating the significant role of TPB in explaining adoption behaviour, although its explicit application within the ISPO context remains limited. Theoretical and qualitative methods (35%) were underutilised, while mixed-method studies accounted for only 18%. The novelty of this research lies in its systematic mapping across theoretical, policy, and methodological domains. Its originality is reflected in the integration of behavioural and policy perspectives

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within the sustainability context of the palm oil sector. The study concludes that further exploration of TPB in ISPO contexts and methodological diversification in future research are both urgently needed.

**Keywords:** Systematic Literature Review; ISPO; RSPO; Theory of Planned Behavior; Sustainability Certification Palm Oil

# 1. Introduction

Palm oil has become a strategic commodity and a major contributor to Indonesia's economy. Its role extends beyond generating foreign exchange through crude palm oil (CPO) exports; it also plays a vital part in job creation and poverty alleviation, particularly in rural areas<sup>[1-3]</sup>. Currently, Indonesia is the world's largest producer of palm oil, accounting for over 57% of the global supply, with a planted area exceeding 16 million hectares<sup>[4, 5]</sup>.

Amidst this dominance, the sector faces growing pressure from the international community regarding sustainability issues<sup>[6]</sup>. Concerns over the environmental and social impacts of palm oil production—such as deforestation<sup>[7]</sup>, peatland conversion, biodiversity loss, and violations of local community rights—have led to the emergence of various sustainability certification schemes<sup>[8, 9]</sup> and governance national policies<sup>[10]</sup>, such as the Indonesian Sustainable Palm Oil (ISPO), which aim to balance economic to green economic<sup>[11, 12]</sup>, social, and environmental interests<sup>[13]</sup>.

Although ISPO has been mandatory since 2011 and reinforced by Presidential Regulation No. 44 of 2020, its implementation at the grassroots level—especially among independent smallholders—remains highly challenging<sup>[14]</sup>. Data reveal that of the 42% of total oil palm plantations managed by smallholders, less than 5% are ISPO certified<sup>[15]</sup>. This reflects a significant implementation gap<sup>[16]</sup>, highlighting that the success of formal regulations is largely contingent on the behaviour and readiness of local actors, particularly small-scale farmers<sup>[17]</sup>.

To understand the low adoption rate of ISPO among farmers, the Theory of Planned Behavior (TPB), developed by Ajzen<sup>[18]</sup>, emerges as a highly relevant and widely applied theoretical framework. TPB posits that behavioural intention is shaped by three core constructs:

attitude toward the behaviour, subjective norms, and perceived behavioural control. Numerous studies in the context of sustainable agriculture have demonstrated TPB's effectiveness in explaining farmers' intentions to adopt innovations such as sustainability certification<sup>[19]</sup>.

However, many prior studies have limited their analyses to TPB's core variables, often neglecting deeper exploration of contextual and socio-cultural factors influencing farmers' behaviour in the field<sup>[20]</sup>. Research suggests that readiness for change serves as a key mediating variable between attitude and intention, while personal and social environment characteristics—such as age, education, peer influence, and capacity to adapt to regulations—also significantly affect adoption outcomes<sup>[21-24]</sup>.

Moreover, most existing research has relied on qualitative or descriptive approaches without employing quantitative tools capable of testing complex causal relationships. Quantitative techniques, such as Structural Equation Modelling (SEM), remain underutilised, despite their ability to offer deeper insight into the interactions between behavioural constructs<sup>[20]</sup>. Similarly, the Systematic Literature Review (SLR) method has rarely been applied to systematically map the relevant literature in terms of theoretical focus, policy scope, and research methodology.

In response to this gap and its underlying urgency, this article aims to identify, categorise, and analyse the academic literature concerning the adoption of sustainability certification in the palm oil sector, with a specific focus on ISPO and RSPO, using the SLR approach. The classification of articles is organised around five main dimensions:

## 1. Theoretical Literature Classification

Investigating and analysing literature grounded in the Theory of Planned Behavior (TPB), including

both its core constructs and extended frameworks that incorporate mediating, moderating, and contextual determinants of adoption behaviour in agricultural contexts.

## 2. Exploration of ISPO and RSPO Certification Practices

Reviewing literature focused on the implementation of ISPO and RSPO schemes, encompassing both farmer adoption and the challenges and strategies involved in certification.

## 3. Mapping TPB to RSPO

Examining literature where TPB is applied or related to studies on RSPO, particularly in supporting the formulation of behavioural constructs in sustainability certification.

## 4. Mapping TPB to ISPO

Analysing literature that applies TPB concepts in relation to ISPO research, forming the basis for behavioural construct development.

## 5. Methodological Approach Analysis

Reviewing the methodologies applied in the relevant literature, including quantitative approaches (e.g., SEM, regression), qualitative approaches, and mixed methods, to evaluate the validity of these approaches and identify future research opportunities<sup>[25]</sup>.

By integrating these five dimensions, this article seeks to address gaps in the literature related to the integration of economic<sup>[26]</sup>, sociological, and ecological perspectives in understanding awareness farmers' behaviour toward sustainability certification<sup>[27]</sup>. Theoretically, the study enriches TPB by incorporating the agrarian-local context, while practically, its findings are expected to provide strategic directions for accelerating ISPO certification through more participatory and evidence-based approaches.

# 2. Research Methodology

This article adopts a qualitative research approach grounded in a systematic literature review (SLR) to explore the behavioural dynamics of oil palm farmers in implementing the Indonesian Sustainable Palm Oil (ISPO) certification, viewed through the lens of the Theory of

Planned Behaviour (TPB). This approach aims to summarise, synthesise, and critically examine previous studies in order to identify patterns, knowledge gaps, and recent developments that are both theoretically and practically relevant.

The SLR method was chosen because it enables the synthesis of findings from a wide range of literature, both qualitative and quantitative, concerning sustainable behavioural dimensions of oil palm farmers in the context of ISPO implementation. Unlike meta-analysis, which requires homogeneity in research design, effect size reporting, and statistical compatibility among studies, SLR offers a more flexible and inclusive framework. It allows for the integration of empirical evidence, policy documents, and conceptual models from diverse disciplinary perspectives.

Given the heterogeneity of the reviewed literature—spanning qualitative approaches, normative legal analysis, descriptive-empirical studies<sup>[25]</sup>, and econometric models—SLR is considered more appropriate for identifying thematic patterns, uncovering research gaps, and constructing a conceptual framework by extending TPB to account for local socio-cultural contexts. Hence, SLR provides a robust foundation for theoretical development while maintaining the complexity of ISPO implementation issues at the farmer level.

This methodology is strongly aligned with the approach employed by Judijanto<sup>[28]</sup>, who utilised SLR to analyse the competitiveness of Indonesia's crude palm oil (CPO) in the European Union market, particularly in relation to the legitimacy of ISPO certification. Through a systematic engagement with the literature<sup>[28]</sup>, revealed the dynamics of trade imbalance that influence the credibility of local certification schemes like ISPO. In addition to the results of Judianto's research<sup>[29]</sup>, this study also applied a Qualitative Literature Review (QLR) to investigate the role of palm oil in balancing development and environmental conservation—positioning ISPO and RSPO as central elements in sustainability and farmer welfare.

This study is in line with both works in its use of SLR to generate a thematic synthesis of ISPO implementation at the smallholder level, and in its effort to explore behavioural determinants using the TPB frame-

work. By integrating socio-psychological, institutional, and public policy dimensions, this study not only fills sector-specific gaps in the literature but also provides a holistic understanding of farmers' readiness and adaptive behaviour in response to sustainability certification demands<sup>[30]</sup>.

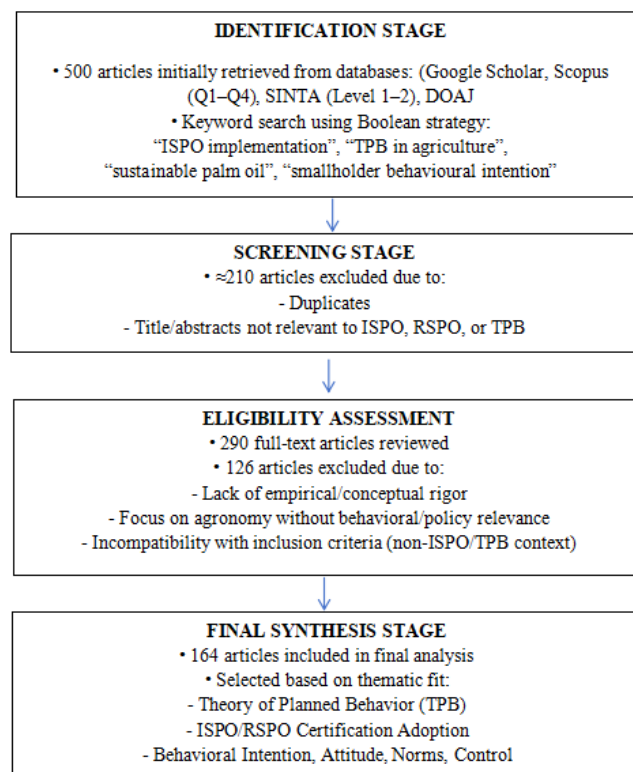
## 2.1. Type of Research and Methodological Approach

This study employs a qualitative research approach<sup>[25]</sup> using a Systematic Literature Review (SLR) methodology to synthesize scholarly findings and policy developments concerning sustainable palm oil certification<sup>[31]</sup>, with a specific focus on the Indonesian Sustainable Palm Oil (ISPO) and the Roundtable on Sustainable Palm Oil (RSPO) frameworks<sup>[32]</sup>. The SLR method was chosen to explore theoretical diversity and practice-based developments in the literature from 2010 to 2025. According to Boell and Cecez-Kecmanovic<sup>[33]</sup>, an SLR provides a structured, transparent process for collecting, filtering, and interpreting relevant publications within a particular research domain, offering analytical depth be-

yond traditional narrative reviews.

## 2.2. Data Sources and Collection Techniques

The data for this research were obtained exclusively from secondary sources, consisting of scholarly articles and institutional reports accessed through various academic and official databases. Primary sources included peer-reviewed journal articles indexed in Google Scholar, Web of Science, Elsevier Scopus content and Review (Q1–Q4), DOAJ and SINTA (levels 1 and 2). Additional data were drawn from policy documents issued by the Directorate General of Plantations<sup>[3]</sup> and the Indonesian Palm Oil Association<sup>[34]</sup>, as well as non-governmental organizations such as Sawit Watch. A Boolean search strategy was used with keyword combinations including “ISPO implementation,” “TPB in agriculture,” “sustainable palm oil,” and “smallholder behavioural intention.” Out of approximately 500 initial articles, a total of 164 were deemed eligible and relevant for full-text review and synthesis, can be seen in the **Figure 1** Systematic Literature Review (SLR) Flow Diagram below.



**Figure 1.** Systematic Literature Review (SLR) Flow Diagram.

## 2.3. Inclusion and Exclusion Criteria

Articles were included if they met the following criteria: (1) published in peer-reviewed journals or institutional reports in English or Bahasa Indonesia, (2) focused on ISPO or RSPO, Theory of Planned Behavior (TPB), or smallholder certification behavior, (3) published between 2010 and 2025, and (4) accessible in full text with empirical or conceptual rigor. Conversely, excluded sources included non-peer-reviewed commentaries, technical agronomic studies with no behavioral dimension, and opinion pieces not grounded in empirical research or theory. This rigorous screening process ensured the thematic consistency and analytical integrity of the dataset.

## 2.4. Unit of Analysis and Sampling Technique

Since this is a document-based review, the units of analysis are the articles themselves—not individual human subjects. The study employed purposive sampling to select publications that directly address behavioral dimensions of palm oil certification. Articles were classified based on thematic relevance, theoretical alignment (particularly with the Theory of Planned Behavior), and methodological rigor. No probabilistic sampling was employed, as the purpose was not to generalize to a population but to deepen conceptual understanding through targeted literature synthesis.

## 2.5. Data Analysis Procedure

A thematic content analysis was conducted in four sequential stages. First, articles were screened for topical relevance and quality. Second, manual coding was performed to extract core constructs such as attitudes, subjective norms, perceived behavioral control, and additional factors like readiness to change, policy incentives, and institutional support<sup>[35]</sup>. Third, studies were categorized into five thematic clusters: application of TPB, ISPO/RSPO practices<sup>[36–38]</sup>, TPB–RSPO mapping, TPB–ISPO mapping, and methodological trends. Finally, findings were narratively synthesized to draw theoretical insights and policy implications. This analytic process followed guidance from Snyder<sup>[39]</sup>, who empha-

sizes transparency and replicability in systematic literature synthesis.

## 2.6. Validity and Reliability

To ensure validity, the study applied Source Triangulation by consulting articles from multiple academic databases and institutional sources. Each article was critically assessed for its alignment with TPB constructs and its methodological credibility. Reliability was enhanced by documenting the literature search, screening, and analysis procedures in a systematic and replicable manner. The process adopted elements of the PRISMA approach (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) tailored to qualitative and mixed-method studies to ensure methodological transparency and robustness.

# 3. Results

Based on the findings from the Systematic Literature Review (SLR), this section presents a structured explanation of the core results, including literature synthesis, comparisons with previous studies, theoretical interpretations, and critical gap analysis. The discussion is organised into two major components:

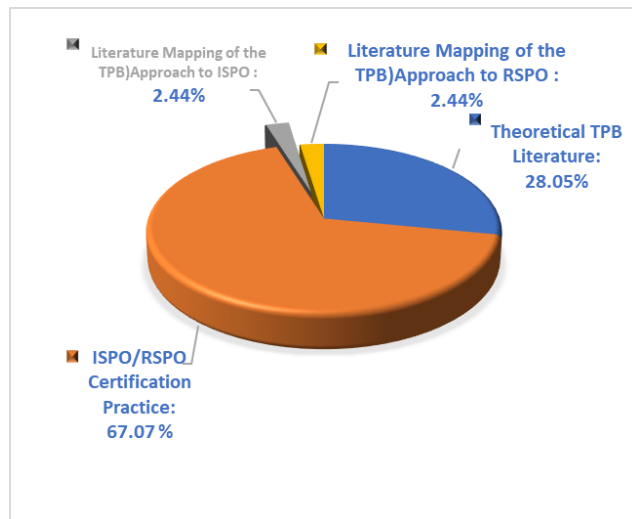
## 3.1. Systematic Mapping of Sustainability Certification Studies in the Palm Oil Sector

This study conducted a Systematic Literature Review (SLR) of 164 academic articles on sustainability certification in the palm oil sector, offering a structured and comprehensive synthesis across theoretical, policy, and methodological dimensions. Of these, 46 papers (28.05%) applied the Theory of Planned Behaviour (TPB) to agriculture and certification contexts, examining its core constructs—attitude, subjective norm, and perceived behavioural control—along with mediating and contextual variables. Empirical research on ISPO and RSPO certification accounted for 110 articles (67.07%), exploring farmers' certification behaviour, institutional challenges, and socio-environmental impacts. A smaller group of studies (2.48% each) bridged TPB

with RSPO and ISPO, linking behavioural frameworks to policy implementation. RSPO research largely focused on market actors and voluntary mechanisms<sup>[40]</sup>, whereas ISPO studies centred on national regulation, institutional trust, and local readiness for sustainability adoption.

The findings reveal that much of the existing literature remains fragmented and lacks interdisciplinary frameworks combining behavioural theory, policy, and methodology.

By synthesising these studies, this review provides a clearer conceptual structure connecting TPB applications, certification practices, and behavioural-policy integration in the ISPO and RSPO contexts (**Figure 2**). The following section presents the results of the filtered and classified literature in detail:

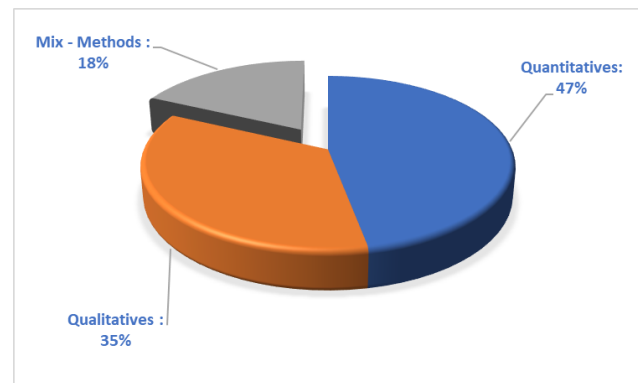


**Figure 2.** Findings and Synthesis of Literature Review Results.

## Methodological Patterns

The analysis shows a strong dominance of quantitative approaches, particularly Structural Equation Modelling (SEM)<sup>[41]</sup> and regression (**Figure 3**)—while qualitative and mixed methods remain underrepre-

sented<sup>[42]</sup>. This methodological imbalance limits understanding of the social, cultural, and institutional dimensions influencing smallholder adoption<sup>[43]</sup>. Therefore, future studies should incorporate diverse approaches such as mixed methods and SWOT analysis to generate deeper, context-sensitive insights into certification practices. Methodological diversity is essential for capturing the multi-level nature of sustainability adoption and for developing policies that better reflect field realities.



**Figure 3.** Methodological approaches identified in the literature.

Overall, the SLR approach employed in this article has successfully identified critical gaps in the academic literature while providing a conceptual map that is valuable for future research<sup>[44]</sup>. Its principal contribution lies in its ability to integrate theoretical analysis, policy frameworks, and methodological approaches into a coherent and systematic review structure. Consequently, this article not only enhances the understanding of the dynamics surrounding the adoption of sustainability certification in the palm oil sector but also advocates for the use of SLR as a valid and important method in environmental and agricultural policy studies.

The detailed findings of the study are presented in **Table 1**:

**Table 1.** Application of the Theory of Planned Behavior (TPB), ISPO, and RSPO.

| No.                                                                                           | Author (Year)                             | Methodology                                | Construct Variables              | Key Findings                                                                        |
|-----------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------|
| <b>I. Exploration of A Systematic Review, ISPO and RSPO Certification Practice Literature</b> |                                           |                                            |                                  |                                                                                     |
| 1                                                                                             | Abdul Majid et al. (2021) <sup>[45]</sup> | Literature Review & Focus Group Discussion | RSPO & ISPO Criteria 1 and 5     | Palm oil-producing countries actively developed ISPO as a counterbalance to RSPO.   |
| 2                                                                                             | Bhinekawati (2017) <sup>[46]</sup>        | Qualitative Study, Case Study              | CSR, SDGs, ISPO Criteria 2, 3, 5 | CSR was applied as a business strategy and tool for empowering smallholder farmers. |

Table 1. Cont.

| No.                                                                                           | Author (Year)                                 | Methodology                            | Construct Variables                                         | Key Findings                                                                                                  |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------|----------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>I. Exploration of A Systematic Review, ISPO and RSPO Certification Practice Literature</b> |                                               |                                        |                                                             |                                                                                                               |
| 3                                                                                             | Sithole and Olorunfemi (2024) <sup>[47]</sup> | Systematic literature review (PRISMA)  | SAP adoption, impacts, challenges                           | SAP adoption, impacts, challenges.                                                                            |
| 4                                                                                             | Hutabarat (2022) <sup>[48]</sup>              | Random Sampling                        | RSPO, ISPO Criterion 5                                      | Farmers continue using traditional practices; RSPO compliance presents significant challenges.                |
| 5                                                                                             | Fahamsyah and Pramudya (2017) <sup>[49]</sup> | Normative Legal Approach               | ISPO Legal System Theory, Criterion 1                       | ISPO requires reinforcement through presidential regulations and a better conceptual grasp of sustainability. |
| 6                                                                                             | Purba and Sipayung (2018) <sup>[50]</sup>     | Descriptive Empirical                  | Economic, Social, Ecological — ISPO Criteria 3 and 5        | Palm oil supports development; deforestation mainly affects degraded lands, not primary forests.              |
| 7                                                                                             | Kamanda et al. (2023) <sup>[51]</sup>         | Multiple regression quantitative study | Socio-demographics & farmer competence 5                    | Socio-demographics predict post-harvest competence.                                                           |
| 8                                                                                             | Hendrawan and Musshoff (2024) <sup>[52]</sup> | Extended TPB SEM analysis              | TPB factors, agroforestry intention                         | TPB predicts agroforestry adoption intention to ISPO.                                                         |
| 9                                                                                             | Chalil (2016) <sup>[53]</sup>                 | Econometric (VECM, SUR)                | CPO Market Integration and RSPO                             | The CPO market is integrated globally, though Europe is not the price leader.                                 |
| 10                                                                                            | Dharmawan et al. (2019) <sup>[21]</sup>       | Simple Random Sampling                 | ISPO Readiness: Legality, Environmental Awareness           | Farmers are not yet ready for ISPO; livelihood structure diversity is a key barrier.                          |
| 11                                                                                            | Hutabarat (2018) <sup>[54]</sup>              | Guttman Scale                          | ISPO Criteria 1–5, Farmer Profile                           | ISPO adoption depends on capacity and market access                                                           |
| 12                                                                                            | Bhinekawati (2017) <sup>[46]</sup>            | Qualitative Study, Case Study          | CSR, SDGs, ISPO Criteria 2, 3, and 5                        | CSR used as a business strategy and farmer empowerment.                                                       |
| 13                                                                                            | Oni Veriasa et al. (2024) <sup>[55]</sup>     | Panel Data Regression & Case Study     | RSPO Implementation, FFB Productivity                       | Farmer productivity increased by 15–20% at group level, not significant at landscape scale.                   |
| 14                                                                                            | Muchlis et al. (2023) <sup>[56]</sup>         | Quantitative survey                    | Farmers' perceptions & characteristics of ISPO principles   | Positive perceptions; education and income correlated of ISPO certifications.                                 |
| 15                                                                                            | Sari et al. (2022) <sup>[57]</sup>            | Descriptive Study                      | ISPO achievement by independent farmers                     | Farmers have not fully met ISPO standards.                                                                    |
| 16                                                                                            | Ambarita et al. (2023) <sup>[58]</sup>        | Survey & Regression                    | ISPO Implementation, Experience, Education, Household Count | Average implementation at 80%; sociodemographic factors significant.                                          |
| 17                                                                                            | Hutagaung et al. (2024) <sup>[59]</sup>       | Comparative Survey                     | Marketing efficiency of ISPO vs non-ISPO                    | No significant difference in margin or channel.                                                               |
| 18                                                                                            | Qadir et al. (2021) <sup>[60]</sup>           | State-of-the-art literature review     | Barriers, incentives, financing strategies                  | Incentives/strategies critical for RET financing certification adoption.                                      |
| 19                                                                                            | Gaveau et al. (2016) <sup>[61]</sup>          | Legal-Ecological Analysis              | Deforestation, Biodiversity, Climate from Palm              | Palm plantations cause deforestation and ecosystem damage.                                                    |
| 20                                                                                            | Dharmawan et al. (2023) <sup>[62]</sup>       | Literature Analysis                    | Land conversion, environmental quality                      | Massive palm oil cultivation reduces soil, water, and biodiversity quality.                                   |
| 21                                                                                            | Rosyadi et al. (2020) <sup>[9]</sup>          | Panel Regression (Gravity Model)       | RSPO Certification, Exchange Rate, Population               | RSPO and the exchange rate positively affect CPO exports.                                                     |
| 22                                                                                            | WWF–Indonesia (2024) <sup>[63]</sup>          | Case Study & Interviews                | RSPO Implementation, Productivity, Conservation             | Productivity and conservation improved; funding and audit challenges persist.                                 |
| 23                                                                                            | Jezeer et al. (2019) <sup>[64]</sup>          | Survey & Panel Regression              | RSPO, Fertiliser Use, Harvest Yield                         | RSPO farmers yield 22.5 tons/ha vs 14.5 tons/ha non-RSPO.                                                     |
| 24                                                                                            | Qadir et al. (2021) <sup>[60]</sup>           | Mixed Methods: Survey & Interview      | Incentives, FFB Price, Market Access                        | Incentives significantly accelerate certification.                                                            |
| 25                                                                                            | Pramudya et al. (2022) <sup>[35]</sup>        | Literature & Interviews                | Incentives, Farmer Readiness, Legality                      | Jambi Province incentives have a positive impact.                                                             |

Table 1. Cont.

| No.                                                                                           | Author (Year)                               | Methodology                                                                       | Construct Variables                                                                                                                                                                                                                                                                 | Key Findings                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------|---------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>I. Exploration of A Systematic Review, ISPO and RSPO Certification Practice Literature</b> |                                             |                                                                                   |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                   |
| 26                                                                                            | Dewi et al. (2021) <sup>[65]</sup>          | Survey & IPA Analysis                                                             | Legal, Organisational, Socio-environmental Readiness                                                                                                                                                                                                                                | Technically ready, socio-environmental aspects not yet ready.                                                                                                                                                                                                     |
| 27                                                                                            | Yanita et al. (2023) <sup>[66]</sup>        | Quantitative Survey                                                               | ISPO Compliance, Fertiliser Use, FFB Premium                                                                                                                                                                                                                                        | Farmers not following standards; no premium received.                                                                                                                                                                                                             |
| 28                                                                                            | Hutabarat (2022) <sup>[48]</sup>            | Survey                                                                            | Farmer Capacity, ISPO Adoption, Export Access                                                                                                                                                                                                                                       | Certification barriers include legality and global market access.                                                                                                                                                                                                 |
| 29                                                                                            | Irawan and Purwanto (2020) <sup>[67]</sup>  | Mixed Methods: Survey & Interviews                                                | Cost, Knowledge, Bureaucracy                                                                                                                                                                                                                                                        | Costs and bureaucracy hinder certification.                                                                                                                                                                                                                       |
| 30                                                                                            | Eggen et al. (2024) <sup>[68]</sup>         | Membership Analysis                                                               | Smallholder Representation in RSPO                                                                                                                                                                                                                                                  | 62% of members are smallholders, only 6% represented on the board.                                                                                                                                                                                                |
| 31                                                                                            | RSPO (2020) <sup>[14]</sup>                 | Community Case Study                                                              | Use of RSPO Premium                                                                                                                                                                                                                                                                 | Premium used for food and fertiliser.                                                                                                                                                                                                                             |
| 32                                                                                            | Rahutomo et al. (2025) <sup>[69]</sup>      | Descriptive Statistics & Audit                                                    | ISPO/RSPO, FFB Productivity                                                                                                                                                                                                                                                         | Certified farmers show +82% higher productivity.                                                                                                                                                                                                                  |
| 33                                                                                            | Suratiningsih et al. (2022) <sup>[70]</sup> | Qualitative: Interviews                                                           | ISPO Implementation, Policy Barriers                                                                                                                                                                                                                                                | Ambiguous regulations and poor coordination hinder implementation.                                                                                                                                                                                                |
| 34                                                                                            | Ambarita et al. (2023) <sup>[58]</sup>      | Regression & Guttman                                                              | ISPO Compliance, Farmer Demographics                                                                                                                                                                                                                                                | Average compliance at 80%.                                                                                                                                                                                                                                        |
| 35                                                                                            | Sari et al. (2022) <sup>[57]</sup>          | Descriptive Study                                                                 | ISPO Achievement by Independent Farmers                                                                                                                                                                                                                                             | Farmers have not fully complied with ISPO standards.                                                                                                                                                                                                              |
| 36                                                                                            | Oni Veriasa et al. (2024) <sup>[55]</sup>   | Panel Regression                                                                  | RSPO, FFB Productivity                                                                                                                                                                                                                                                              | Productivity increased 15–20% at the group level.                                                                                                                                                                                                                 |
| 37                                                                                            | Rosyadi et al. (2020) <sup>[9]</sup>        | Panel Gravity Regression                                                          | RSPO, CPO Exports                                                                                                                                                                                                                                                                   | RSPO certification boosts exports to target countries.                                                                                                                                                                                                            |
| 38                                                                                            | Hutabarat et al. (2018) <sup>[71]</sup>     | Cost-Benefit Analysis                                                             | Certification and Profitability                                                                                                                                                                                                                                                     | High upfront costs; low ROI for smallholders.                                                                                                                                                                                                                     |
| 39                                                                                            | Erina (2024) <sup>[17]</sup>                | Case Study                                                                        | RSPO/ISPO Role, Sustainability                                                                                                                                                                                                                                                      | Monitoring and human rights protection remain weak.                                                                                                                                                                                                               |
| 40                                                                                            | Suratiningsih et al. (2022) <sup>[70]</sup> | Qualitative                                                                       | ISPO, policy effectiveness                                                                                                                                                                                                                                                          | ISPO implementation in West Kalimantan remains low.                                                                                                                                                                                                               |
| 41                                                                                            | Bustomi (2025) <sup>[72]</sup>              | AHP & FGD                                                                         | Strategies to strengthen ISPO                                                                                                                                                                                                                                                       | Priority is placed on HR and waste management.                                                                                                                                                                                                                    |
| 42                                                                                            | Piñeiro et al. (2020) <sup>[73]</sup>       | Scoping review of incentive literature                                            | Incentives vs adoption & outcomes                                                                                                                                                                                                                                                   | Economic incentives most strongly motivate adoption.                                                                                                                                                                                                              |
| 43                                                                                            | Widyatmoko (2020) <sup>[74]</sup>           | Interview                                                                         | Land legality, traceability, ISPO                                                                                                                                                                                                                                                   | Formalisation supports market sustainability for farmers.                                                                                                                                                                                                         |
| 44                                                                                            | Harsono et al. (2012) <sup>[75]</sup>       | Qualitative in-depth expert interviews                                            | ISPO success factors, strategies                                                                                                                                                                                                                                                    | Institutional conditions and strategies critical.                                                                                                                                                                                                                 |
| 45                                                                                            | Afrizal et al. (2023) <sup>[76]</sup>       | Mixed methods qualitative-quantitative conflict analysis                          | RSPO conflict accessibility, justice outcomes                                                                                                                                                                                                                                       | RSPO CRM biased, limited justice remedy.                                                                                                                                                                                                                          |
| 46                                                                                            | von Geibler (2010) <sup>[77]</sup>          | RSPO standards, institutional sustainability                                      | RSPO standards, institutional sustainability                                                                                                                                                                                                                                        | RSPO standards support sustainable development.                                                                                                                                                                                                                   |
| 47                                                                                            | Nurliza and Dolorosa (2017) <sup>[78]</sup> | Quantitative explanatory research design using Structural Equation Modeling (SEM) | Economic Sustainability (income stability, production efficiency, access to markets) Social Sustainability (farmer institutions, participation, human capital) Environmental Sustainability (land management, environmentally friendly practices) Institutional Support (government | Economic, social, and environmental sustainability, supported by institutional strengthening, significantly determine the readiness of independent smallholder oil palm farmers to achieve sustainable palm oil development and adopt ISPO certification systems. |

Table 1. Cont.

| No.                                                                                           | Author (Year)                                 | Methodology                                                                                             | Construct Variables                                                        | Key Findings                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>I. Exploration of A Systematic Review, ISPO and RSPO Certification Practice Literature</b> |                                               |                                                                                                         |                                                                            |                                                                                                                                                                                                                                                                                                                                                   |
| 48                                                                                            | Salman et al. (2017) <sup>[79]</sup>          | Cross-sectional survey                                                                                  | RSPO standards, costs, profitability                                       | Certification costs offset by 17% operational efficiency gains.                                                                                                                                                                                                                                                                                   |
| 49                                                                                            | Zhang et al. (2024) <sup>[80]</sup>           | Panel data correlation & mediation analysis                                                             | Financial incentives, Fiscal incentives, financing constraints, innovation | Fiscal incentives improve innovation via financing and price strengthen compliance.                                                                                                                                                                                                                                                               |
| 50                                                                                            | Yuwati et al. (2021) <sup>[81]</sup>          | Comprehensive literature review synthesis                                                               | Peat restoration policy, practice, outcomes                                | 3Rs approach critical for peat restoration.                                                                                                                                                                                                                                                                                                       |
| 51                                                                                            | LaFave et al. (2025) <sup>[82]</sup>          | Consumption-based empirical test with survey                                                            | Farm profits, prices, household behavior                                   | Incomplete markets shape smallholder behavior.                                                                                                                                                                                                                                                                                                    |
| 52                                                                                            | Dharmawan et al. (2023) <sup>[62]</sup>       | Literature review overviewing SWC impacts                                                               | Soil & water conservation impacts on ecology                               | SWC positively affects ecosystem processes. SWC improves infiltration, biodiversity, microclimate conditions.                                                                                                                                                                                                                                     |
| 53                                                                                            | Santosa et al. (2024) <sup>[83]</sup>         | Descriptive quantitative household income analysis                                                      | Agroforestry income structure, livelihoods                                 | Diverse income streams strengthen households.                                                                                                                                                                                                                                                                                                     |
| 54                                                                                            | Firmansyah et al. (2024) <sup>[84]</sup>      | Qualitative + quantitative social innovation evaluation                                                 | Social innovation, empowerment, sustainability impacts                     | Innovation enhances social, economic, environmental outcomes.                                                                                                                                                                                                                                                                                     |
| 55                                                                                            | Hajar et al. (2024) <sup>[85]</sup>           | Quantitative econometric approach: Difference-in-Differences (DID) and Multiple Linear Regression (MLR) | ISPO, CPO exports, price, production                                       | ISPO insignificantly influences export volume.                                                                                                                                                                                                                                                                                                    |
| 56                                                                                            | Nahib and Suryanta (2018) <sup>[86]</sup>     | Logistic model and GIS analysis                                                                         | Deforestation, carbon emissions measurement, ISPO policy                   | Deforestation significantly increases regional carbon emissions.                                                                                                                                                                                                                                                                                  |
| 57                                                                                            | Hasnah et al. (2021) <sup>[87]</sup>          | Qualitative field assessment of ISPO implementation                                                     | ISPO adoption, farmer practices, constraints                               | Farmers struggle with ISPO criteria compliance.                                                                                                                                                                                                                                                                                                   |
| 58                                                                                            | Asmara and Randhir (2024) <sup>[88]</sup>     | SWOT+ ecohydrologic watershed modelling                                                                 | Oil palm land-use impact on hydrology                                      | Plantations increase runoff, degrade water quality                                                                                                                                                                                                                                                                                                |
| 59                                                                                            | Renner et al. (2024) <sup>[89]</sup>          | Panel household observational regression analysis                                                       | RSPO certification, productivity, agrochemical use                         | RSPO linked to productivity and agrochemical changes.                                                                                                                                                                                                                                                                                             |
| 60                                                                                            | Rodthong et al. (2023) <sup>[90]</sup>        | Survey analysis with weighted averages                                                                  | RSPO perception; adopter vs non-adopter                                    | Adopters positive; support influences adoption.                                                                                                                                                                                                                                                                                                   |
| 61                                                                                            | Hasim et al. (2025) <sup>[91]</sup>           | Systematic literature review using PRISMA                                                               | RSPO awareness, implementation stages                                      | Low RSPO awareness, adoption challenges.                                                                                                                                                                                                                                                                                                          |
| 62                                                                                            | Oni Veriasa et al. (2024) <sup>[55]</sup>     | Panel Regression & Case Study                                                                           | RSPO certification, productivity, land expansion                           | Yields increased by 15–20%, but no impact at the landscape scale.                                                                                                                                                                                                                                                                                 |
| 63                                                                                            | Eggen et al. (2024) <sup>[68]</sup>           | Governance Analysis                                                                                     | Smallholder participation, RSPO structure                                  | Smallholders make up 62% of members, but only 6% on RSPO board.                                                                                                                                                                                                                                                                                   |
| 64                                                                                            | de Vos et al. (2023) <sup>[92]</sup>          | Qualitative interviews with smallholder groups                                                          | Smallholder conditions; certification barriers                             | Pre-conditions and facilitators shape certification.                                                                                                                                                                                                                                                                                              |
| 65                                                                                            | Choiruzzad et al. (2021) <sup>[93]</sup>      | Historical policy analysis with qualitative data                                                        | Historical policy analysis with qualitative data                           | ISPO coherence, governance rescaling, state transformation.                                                                                                                                                                                                                                                                                       |
| 66                                                                                            | Listiyarini (2023) <sup>[94]</sup>            | Policy commentary with empirical certification data                                                     | ISPO, RSPO, certification harmonisation, market barriers                   | ISPO–RSPO harmonisation needed to expand certification. Current national ISPO certification covers ~3.65 million ha and RSPO ~2.42 million ha of oil palm plantations; overlapping mechanisms and high certification costs limit uptake, particularly among smallholders, undermining sustainability goals and competitiveness in global markets. |
| 67                                                                                            | Wulandari and Nasution (2021) <sup>[95]</sup> | Comparative Descriptive                                                                                 | RSPO, ISPO, MSPPO coverage                                                 | RSPO is more comprehensive (77/100) compared to ISPO (56/100).                                                                                                                                                                                                                                                                                    |

Table 1. Cont.

| No.                                                                                           | Author (Year)                                            | Methodology                                                               | Construct Variables                                                                     | Key Findings                                                                                                                                  |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>I. Exploration of A Systematic Review, ISPO and RSPO Certification Practice Literature</b> |                                                          |                                                                           |                                                                                         |                                                                                                                                               |
| 68                                                                                            | UNDP (2015) <sup>[96]</sup>                              | Comparative Study                                                         | ISPO vs RSPO principles & oral mechanisms                                               | Overlaps and gaps exist in implementation and enforcement.                                                                                    |
| 69                                                                                            | Winarti et al. (2023) <sup>[97]</sup>                    | Delphi + TOPSIS challenge prioritization                                  | CSR implementation challenges, stakeholder coordination, regulations                    | Coordination, regulation complexity, economic uncertainty dominate. Poor stakeholder coordination is primary CSR barrier.                     |
| 70                                                                                            | RSPO (2020) <sup>[98]</sup>                              | Policy Report                                                             | RSPO standards for independent smallholders                                             | National RSPO standards officially formulated.                                                                                                |
| 71                                                                                            | Suhardjo and Suparman <sup>[32]</sup>                    | Theoretical Governance Analysis                                           | ISPO/RSPO legitimacy, stakeholder motivation                                            | ISPO focuses on national legitimacy; RSPO on global; stakeholder conflict.                                                                    |
| 72                                                                                            | Alemu and Zewide (2021) <sup>[99]</sup>                  | Literature review of degraded land rehabilitation research                | Land degradation, rehabilitation techniques, ecosystem restoration                      | Passive and active measures restore degraded lands. Rehabilitation. effective with combined biological, physical strategies.                  |
| 73                                                                                            | Soeharno et al. (2022) <sup>[100]</sup>                  | Survey, TPB-based quantitative analysis                                   | Attitude, subjective norms, perceived control                                           | TPB significantly explains participation behavior. Attitude strongest participation determinant.                                              |
| 74                                                                                            | Gartika et al. (2024) <sup>[101]</sup>                   | Mixed methods policy implementation analysis (quantitative + qualitative) | Bureaucratic simplification, civil servant performance, feasibility dimensions          | Policy simplifies positions but needs feasibility improvements. Simplification improved position distribution; feasibility needs enhancement. |
| 75                                                                                            | Meijaard et al. (2020) <sup>[102]</sup>                  | Case-based biodiversity good-practice assessment                          | RSPO certification; biodiversity conservation practices                                 | Well-managed RSPO sites retain significant biodiversity. Certified plantations can support biodiversity with varied strategies.               |
| 76                                                                                            | Chrystella et al. (2025) <sup>[103]</sup>                | Panel Regression                                                          | Foreign investment, adoption, local GDP                                                 | Foreign investment increased by 12%.                                                                                                          |
| 77                                                                                            | Schmidt and De Rosa (2020) <sup>[104]</sup>              | Life Cycle Assessment (ISO 14040/14044)                                   | RSPO certification vs non-certified palm oil.                                           | Certified production yields lower GHG emissions. RSPO palm oil emits ~35% less GHG.                                                           |
| 78                                                                                            | Hidayat et al. (2015) <sup>[105]</sup>                   | Exploratory livelihood framework assessment with comparative analysis     | Certification status, market access, vulnerability, productivity                        | Certification does not improve market access. Organizational change boosts productivity despite weak certification.                           |
| 79                                                                                            | Hilmi et al. (2025) <sup>[106]</sup>                     | SWOT Analysis                                                             | Consumer preference, premium price, ISPO/RSPO                                           | 62% are eco-aware consumers, but most lack premium spending power                                                                             |
| 80                                                                                            | RSPO (2020) <sup>[107]</sup>                             | Standards development via consensus stakeholder process policy            | Certification requirements, audit procedures, compliance criteria                       | Certification system standardizes audit and compliance. Framework ensures consistent RSPO auditing and certification.                         |
| 81                                                                                            | AWS and ISEAL Alliance (2022) <sup>[108]</sup>           | Standards comparison and gaps analysis                                    | Water stewardship alignment vs RSPO criteria                                            | AWS covers water outcomes broader than RSPO. RSPO-AWS overlap ~48%; gaps in catchment focus.                                                  |
| 82                                                                                            | Afrizal et al. (2023) <sup>[76]</sup>                    | Qualitative                                                               | Land conflict, consultation and communication                                           | RSPO certification reduces conflict by 30%.                                                                                                   |
| 83                                                                                            | Low et al. (2023) <sup>[109]</sup>                       | Systematic literature review with thematic analysis Methods               | Mixed farming, agroforestry, value chain integration                                    | Integration improves yields but faces cost barriers. Mixed systems enhance efficiency but face fixed cost challenges.                         |
| 84                                                                                            | Moreno-Peñaranda et al. (2015) <sup>[110]</sup>          | Quantitative + qualitative stakeholder perception analysis                | Stakeholder perceptions on sustainability barriers                                      | Perceptions diverge across stakeholder groups. RSPO stakeholders' views differ; shared technical optimism.                                    |
| 85                                                                                            | Putro (2022) <sup>[111]</sup>                            | Gas sampling + GC analysis of POME ponds                                  | CH <sub>4</sub> , CO <sub>2</sub> emissions; renewable energy potential ISPO palm ponds | High CH <sub>4</sub> & CO <sub>2</sub> emissions from POME. POME emits significant GHG; energy potential identified.                          |
| 86                                                                                            | EAI (Energy Analytics Institute) (2024) <sup>[112]</sup> | Conference report on sustainability initiatives                           | RSPO standards, partnerships, smallholders, emissions                                   | RSPO updates standards, expands climate partnerships. Revised standards strengthen traceability, smallholder climate mitigation.              |

Table 1. Cont.

| No.                                                                                           | Author (Year)                                  | Methodology                                                | Construct Variables                                                                | Key Findings                                                                                                                     |
|-----------------------------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>I. Exploration of A Systematic Review, ISPO and RSPO Certification Practice Literature</b> |                                                |                                                            |                                                                                    |                                                                                                                                  |
| 87                                                                                            | Hadi et al. (2024) <sup>[113]</sup>            | Model development via program synergy analysis             | ISPO acceleration model, smallholder certification                                 | Synergized model enhances certification pathways. PSR-ISPO synergy improves independent smallholder certification                |
| 88                                                                                            | Barton (2025) <sup>[114]</sup>                 | Descriptive environmental impact overview                  | Palm oil production, pollution types and effects                                   | Palm oil industry significantly contributes to pollution. Deforestation, effluent pollution, greenhouse emissions, habitat loss  |
| 89                                                                                            | Rizal et al. (2023) <sup>[115]</sup>           | Quantitative survey + PLS-SEM analysis                     | Social interaction, shared identity, RSPO adoption                                 | Social ties and identity significantly influence adoption. Communication drives certified sustainability practice adoption.      |
| 90                                                                                            | Yusuf et al. (2025) <sup>[116]</sup>           | Life Cycle Assessment (OpenLCA, three mills)               | EFB utilization, GHG emissions, synthetic fertilizer use                           | EFB recycle cuts fertilizer use and emissions. Organic fertilizer reduces synthetic use ~75% and emissions.                      |
| 91                                                                                            | Septiyarini et al. (2022) <sup>[117]</sup>     | Multidimensional scaling (Rapfish) sustainability analysis | CSR dimensions (social, economic, environmental)                                   | Environmental & economic CSR more sustainable; social less. CSR environment moderate; social dimension unsustainable reflection  |
| 92                                                                                            | Swaine et al. (2025) <sup>[118]</sup>          | Field Trial                                                | Pesticides, ISPO, soil health                                                      | Pesticide use fell 40%, and soil quality improved                                                                                |
| 93                                                                                            | Shahimi et al. (2023) <sup>[119]</sup>         | Panel regression of certified vs non-certified producers   | RSPO, MSPO, ISPO certification and profitability                                   | International certification reduces profitability modestly. RSPO yields ~5% lower profitability vs local.                        |
| 94                                                                                            | Pareira (2023) <sup>[120]</sup>                | stakeholder interviews                                     | ISPO-RSPO harmonization, traceability gaps                                         | Harmonized certification improves supply chain traceability. Harmonized ISPO-RSPO enhances full traceability and sustainability. |
| 95                                                                                            | Santika et al. (2020) <sup>[121]</sup>         | Counterfactual multidimensional poverty analysis           | RSPO certification, village well-being, livelihoods                                | Certification impacts vary by livelihood type. RSPO reduces poverty in market-based villages only.                               |
| 96                                                                                            | Fahamsyah and Pramudya (2017) <sup>[49]</sup>  | Normative legal research using legal system theory         | ISPO legal framework, institutional mechanisms, sustainability interpretation      | Strengthening legal basis and institutional support required. ISPO needs stronger law, institutions, sustainability clarity.     |
| 97                                                                                            | Tey et al. (2022) <sup>[122]</sup>             | Monte Carlo probabilistic cost-benefit simulation          | RSPO costs, benefits, net profitability metrics                                    | RSPO yields variable economic viability among smallholders. Projected net benefits depend on yield and price.                    |
| 98                                                                                            | Putri et al. (2022) <sup>[123]</sup>           | Qualitative governance analysis via interviews & FGDs      | ISPO governance, institutional capacity, policy gaps                               | Governance barriers impede ISPO certification effectiveness Low-functioning governance limits ISPO sustainability outcomes.      |
| 99                                                                                            | Sibhatu (2023) <sup>[124]</sup>                | Scoping literature review on socioeconomic impacts         | Oil palm expansion, socioeconomic outcomes, inequality                             | Oil palm yields mixed socioeconomic benefits and harms. Boom raises income yet intensifies inequality and conflict.              |
| 100                                                                                           | Amalia (2023) <sup>[125]</sup>                 | 2SLS Regression                                            | ISPO, access to financing, business scale                                          | Business financing increases by 30% with ISPO certification                                                                      |
| 101                                                                                           | Hendrawan, and Musshoff (2024) <sup>[52]</sup> | TPB SEM analysis                                           | TPB factors, agroforestry intention                                                | TPB predicts agroforestry adoption intention to ISPO.                                                                            |
| 102                                                                                           | Gupta et al. (2024) <sup>[126]</sup>           | Gender Survey                                              | Women's empowerment,                                                               | Women actively manage 40% of farmer groups.                                                                                      |
| 103                                                                                           | Garcia-Torres et al. (2024) <sup>[127]</sup>   | Quantitative Analisis                                      | Traceability, transparency, stakeholder collaboration, supply chain sustainability | Transparency and collaboration significantly enhance sustainable supply chains.                                                  |
| 104                                                                                           | Saleh et al. (2021) <sup>[128]</sup>           | Field Trial                                                | Soil sensors + ISPO                                                                | Real-time monitoring improved land quality by 18%.                                                                               |

Table 1. Cont.

| No.                                                                                                            | Author (Year)                                | Methodology                                                           | Construct Variables                                                         | Key Findings                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>I. Exploration of A Systematic Review, ISPO and RSPO Certification Practice Literature</b>                  |                                              |                                                                       |                                                                             |                                                                                                                                                                     |
| 105                                                                                                            | Pramudya et al (2024) <sup>[129]</sup>       | Qualitative interviews with RSPO smallholder groups                   | RSPO certification impacts   village SDGs outcomes                          | RSPO certification contributes selectively to SDGs. Boosts SDGs 4, 9, 10; mixed overall.                                                                            |
| 106                                                                                                            | Nurliza et al. (2019) <sup>[130]</sup>       | Literature Review                                                     | Legal aspects, farmer organisations, sustainability (ISPO Criteria 1, 3, 5) | No direct impact yet, but farmer organisations play a key role through legal-institutional links.                                                                   |
| 107                                                                                                            | Judijanto (2025) <sup>[29]</sup>             | Systematic Literature Review (SLR)                                    | Conceptual framework, trade policy, sustainability frameworks               | ISPO influences Indonesia's CPO export competitiveness in EU markets.                                                                                               |
| 108                                                                                                            | Judijanto (2025) <sup>[28]</sup>             | Qualitative Literature Review (QLR)                                   | 40 academic articles and policy reports                                     | Balance sought between economic growth and environmental conservation in the ISPO/RSPO context.                                                                     |
| <b>II. Classification of Theoretical Literature on the Application of the Theory of Planned Behavior (TPB)</b> |                                              |                                                                       |                                                                             |                                                                                                                                                                     |
| No.                                                                                                            | Author. (Year)                               | Methodology                                                           | Construct Variables                                                         | Key Findings                                                                                                                                                        |
| 1                                                                                                              | Yutika et al. (2019) <sup>[131]</sup>        | Questionnaire + SEM                                                   | TPB: Attitudes, norms, perceived control, past behaviour                    | Attitudes, perceived control, and past behaviour significantly affect plasma farmers' intentions.                                                                   |
| 2                                                                                                              | La Barbera and Ajzen (2021) <sup>[132]</sup> | Preregistered behavioral study in Europe                              | Attitude, subjective norm, perceived behavioral control                     | Perceived control moderates attitude-intention link. Higher control strengthens attitude impact on intentions.                                                      |
| 3                                                                                                              | Islam and Khan (2024) <sup>[133]</sup>       | Quantitative survey analysis SEM-PLS                                  | Attitude, environmental awareness, perceived impact                         | Attitudes, awareness drive green purchase intention. Environmental values, attitude significantly predict sustainable purchases ISPO/RSPO green purchase intention. |
| 4                                                                                                              | Machová et al. (2022) <sup>[134]</sup>       | Questionnaire survey, chi-square, and Cramer's V                      | Green marketing, consumer palm oil behavior                                 | Green marketing had limited influence on choices. Consumers reluctant to avoid palm oil products                                                                    |
| 5                                                                                                              | Tama et al. (2021) <sup>[135]</sup>          | Extended TPB with SEM and hierarchical regression                     | Extended TPB with SEM and hierarchical regression                           | Attitude, SN, PBC, Knowledge, Climatic threat Knowledge had highest total influence on intention.                                                                   |
| 6                                                                                                              | Yanita et al. (2023) <sup>[66]</sup>         | Quantitative Survey                                                   | ISPO Compliance, Fertiliser Use, FFB Premium                                | Farmers not following standards; no premium received.                                                                                                               |
| 7                                                                                                              | Suroso et al. (2023) <sup>[136]</sup>        | Structural Equation Modeling (PLS) survey                             | Attitude, subjective norm, control, TPB environmental concern               | Behavioral factors influence certification adoption. Attitude, social norms, control drive adoption intent.                                                         |
| 8                                                                                                              | Cheah et al. (2023) <sup>[137]</sup>         | Comprehensive literature review on circular bioeconomy of palm sector | Palm oil waste reuse, bioeconomy practices, sustainability outcomes         | Circular bioeconomy improves environmental, economic sustainability Recycling and valorization reduce environmental impacts significantly.                          |
| 9                                                                                                              | Cahyadi et al. (2021) <sup>[138]</sup>       | Survey SEM-PLS dengan Theory of Planned Behavior                      | Attitude, subjective norms, perceived control, past behavior                | Attitude, control, past behavior boost sustainable intent. Attitude and experience raise sustainable practice intention.                                            |
| 10                                                                                                             | Fatimah et al. (2022) <sup>[139]</sup>       | Policy & certification instrument review                              | ISPO gender provisions, palm oil gender issues                              | ISPO gender criteria insufficiently address real issues. Gender aspects weakly integrated into ISPO standards.                                                      |
| 11                                                                                                             | Maulana and Rizki (2024) <sup>[140]</sup>    | Policy analysis                                                       | TPB + organic fertiliser subsidy                                            | Subsidy increases intention by 30%.                                                                                                                                 |
| 12                                                                                                             | Taraghi and Yoder (2025) <sup>[141]</sup>    | Systematic review of TPB in agent-based modeling                      | TPB constructs (attitude, norms, control) in ABM                            | TPB operationalization inconsistent across studies. Attitudes, norms, control vital for behavior simulation.                                                        |
| 13                                                                                                             | Devi (2024) <sup>[142]</sup>                 | Survey + regression                                                   | TPB + crop diversification                                                  | Diversification driven by a positive attitude and control.                                                                                                          |
| 14                                                                                                             | Purnomo (2024) <sup>[143]</sup>              | Field experiment                                                      | Fertilisation tech                                                          | Intervention raises adoption intention by 45%.                                                                                                                      |

Table 1. Cont.

| II. Classification of Theoretical Literature on the Application of the Theory of Planned Behavior (TPB) |                                            |                                                                                                                        |                                                                                                                     |                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| No.                                                                                                     | Author. (Year)                             | Methodology                                                                                                            | Construct Variables                                                                                                 | Key Findings                                                                                                                              |
| 15                                                                                                      | Haryono et al. (2025) <sup>[144]</sup>     | Online survey, PLS-SEM analysis                                                                                        | Green pricing, green promotion, physical evidence, TPB constructs                                                   | Pricing and promotion significantly affect sustainable buying. Green pricing, promotion drive pro-environmental purchasing.               |
| 16                                                                                                      | Abdul Majid et al. (2021) <sup>[145]</sup> | FGD + SEM                                                                                                              | TPB + community participation                                                                                       | Social control and norms support sustainable palm participation.                                                                          |
| 17                                                                                                      | Siahaani et al. (2024) <sup>[145]</sup>    | Study on partner farmers using questionnaires with Cluster proportional random sampling method. and SmartPLS analysis. | TPB : Seven variables: attitude, subjective norms, behavioral control, moral norms, knowledge, intention, behavior. | Factors influence intention, intention affects behavior, but practices remain suboptimal.                                                 |
| 18                                                                                                      | Paoli et al. (2011) <sup>[146]</sup>       | Policy/governance analysis via literature and stakeholder evaluation (qualitative governance review).                  | Governance, policy implementation, sustainability barriers and frameworks                                           | Policy/practice disconnect impedes sustainable governance. Weak multi-level governance hampers sustainability implementation.             |
| 19                                                                                                      | Bonke and Musshoff (2025) <sup>[147]</sup> | Online survey + PLS-SEM modeling                                                                                       | Attitude, perceived control, group norms                                                                            | Attitude and norms drive sustainable adoption. Attitude, control, group norms predict adoption intention.                                 |
| 20                                                                                                      | Ajeng et al. (2020) <sup>[148]</sup>       | Greenhouse experiment with three fertilizer treatments (biofertilizer + chemical)                                      | Biofertilizer application perceptions, soil fertility, oil palm growth, nutrient uptake                             | Biofertilizer enhances growth and soil nutrients. Biofertilizers improve seedling growth and nutrient uptake.                             |
| 21                                                                                                      | Sasono and Yuni (2019) <sup>[149]</sup>    | FGD + SEM                                                                                                              | TPB + traditional cultural norms                                                                                    | Traditional norms enhance control by 60%.                                                                                                 |
| 22                                                                                                      | Emanuel et al. (2012) <sup>[150]</sup>     | Cross-sectional survey using TPB constructs                                                                            | Attitude, perceived control, perceived norms                                                                        | Attitudes and control mediate gender intake. Attitudes, perceived control explain intake gap.                                             |
| 23                                                                                                      | Putri et al. (2024) <sup>[151]</sup>       | Policy model                                                                                                           | TPB + carbon tax incentives                                                                                         | Incentives increase farmers' intentions by 45%.                                                                                           |
| 24                                                                                                      | Phuong Dung et al. (2023) <sup>[152]</sup> | Survey quantitative using TPB + TAM framework                                                                          | Attitude, perceived control, norms, tech acceptance factors                                                         | Tech acceptance and TPB significantly explain intention. Digital marketing intent driven by attitude, TPB × TAM.                          |
| 25                                                                                                      | Liao (2024) <sup>[153]</sup>               | VBSEM & ANN dual analysis of survey data                                                                               | Social media exposure, attitude, norms, intention                                                                   | Social media shapes attitudes, intentions, moderated by control. Media effects attitudes, intention amplifies pro-environmental behavior. |
| 26                                                                                                      | Wibowo et al. <sup>[154]</sup>             | Policy analysis                                                                                                        | TPB + RSPO-ISPO integration                                                                                         | Integration boosts behavioural control and intention by 55%.                                                                              |
| 27                                                                                                      | Man et al. (2019) <sup>[155]</sup>         | Quantitative survey with SPSS & AMOS analysis                                                                          | Attitude, social norms, intention, adaptation practices                                                             | Attitude, norms, intention significantly influence adaptation. Attitude, norms, intention explain adaptation practices.                   |
| 28                                                                                                      | Smith and Tanjung (2023) <sup>[156]</sup>  | Qualitative interview                                                                                                  | TPB + CSR perception                                                                                                | CSR perception increases sustainable palm oil buying intention.                                                                           |
| 29                                                                                                      | Kamalanon et al. (2022) <sup>[157]</sup>   | Online survey + Structural Equation Modeling (SEM).                                                                    | Attitude, subjective norms, perceived behavioral control, environmental concern.                                    | Attitude and environmental concern strongly influence purchase intention. Positive attitudes & concerns drive green purchases.            |
| 30                                                                                                      | Kumar and Mohan (2021) <sup>[158]</sup>    | Quantitative survey + PLS-SEM analysis                                                                                 | Collectivism orientation, environmental concern, price sensitivity                                                  | Collectivism and concern boost purchase intention. Collectivism and concern increase green purchase intention.                            |
| 31                                                                                                      | Sohail (2023) <sup>[159]</sup>             | Quantitative survey using PLS-SEM (900 farmers).                                                                       | Awareness factors (attitude, assets, social influence, etc.) and climate change awareness                           | Attitude, assets, social influence strongly predict awareness (for ISPO/RSPO).                                                            |
| 32                                                                                                      | Hassan et al. (2024) <sup>[160]</sup>      | Literature review                                                                                                      | Palm oil expansion, policy countermeasures, biorefinery                                                             | RSPO & MSPO sertifikasi tingkatkan keberlanjutan produksi.                                                                                |

Table 1. *Cont.*

| II. Classification of Theoretical Literature on the Application of the Theory of Planned Behavior (TPB) |                                             |                                                          |                                                                            |                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| No.                                                                                                     | Author. (Year)                              | Methodology                                              | Construct Variables                                                        | Key Findings                                                                                                                                  |
| 33                                                                                                      | Sundaraja et al. (2023) <sup>[161]</sup>    | COM-B review;                                            | Capability–opportunity–motivation, SPO purchasing variables                | RSPO label awareness belum kurangi intention–behavior gap.                                                                                    |
| 34                                                                                                      | Martinez et al. (2024) <sup>[162]</sup>     | FGD + SEM                                                | Social norm, environmental attitude                                        | Social norm is a dominant factor in sustainable oil adoption.                                                                                 |
| 35                                                                                                      | Hamdani (2025) <sup>[163]</sup>             | literature review                                        | RSPO, ISPO, MSPO, market access;                                           | RSPO dominan, ISPO/MSPO perlu harmonisasi sertifikasi.                                                                                        |
| 36                                                                                                      | Chen et al. (2018) <sup>[164]</sup>         | Experimental economics                                   | TPB + government subsidy                                                   | Intention increases 25% with subsidies.                                                                                                       |
| 37                                                                                                      | Mahfud et al. (2019) <sup>[165]</sup>       | Quantitative survey using structural equation modelling  | Social capital, entrepreneurial attitude, psychological capital, intention | Entrepreneurial capital supports RSPO/ISPO sustainability adoption pathways.                                                                  |
| 38                                                                                                      | Maes et al. (2009) <sup>[166]</sup>         | Theory of Planned Behavior survey (multi-group analysis) | Gender, attitude, perceived control, subjective norm, intention            | Gender mediates TPB intention variables; sustainability framing relevance minimal.                                                            |
| 39                                                                                                      | Triani et al. (2025) <sup>[167]</sup>       | PLS-SEM survey integrating TAM and TPB                   | Perceived control, attitude, info, environment, intention                  | Control shapes participation, supports biomass sustainability.                                                                                |
| 40                                                                                                      | Fischer et al. (2019) <sup>[168]</sup>      | Cross-cultural meta-analysis of TPB norms effects        | Norm–intention, norm–behavior relationships across cultures                | Norm effects vary culturally; informs sustainability compliance behavior.                                                                     |
| 41                                                                                                      | Natsir et al. (2025) <sup>[169]</sup>       | Survey data analysis (TPB and signaling theory)          | Awareness of Organic JAS label, RSPO label, willingness to pay             | RSPO awareness weakens Organic JAS premium willingness (eco-labels).                                                                          |
| 42                                                                                                      | Nguyen (2022) <sup>[170]</sup>              | SEM                                                      | TPB + Social environment                                                   | Family support increases intention to buy sustainable CPO.                                                                                    |
| 43                                                                                                      | Garg et al. (2023) <sup>[171]</sup>         | Survey with PLS-SEM analysis                             | Consumer decision style, emotional advertising, purchase intention         | Emotional ads shape intention; suggests sustainability messaging potential. Emotional advertising meaningfully influences purchase intention. |
| 44                                                                                                      | Musa et al. (2024) <sup>[172]</sup>         | Quantitative survey using PLS-SEM                        | TPB+Attitude, norm, perceived control, awareness, government support       | Awareness & support drive participation; implies sustainability adoption potential. Enhance adoption of sustainability certifications.        |
| 45                                                                                                      | Savari and Khaleghi (2023) <sup>[173]</sup> | Questionnaire survey with SEM analysis                   | Attitude, subjective norm, PBC, risk perception, sense of belonging        | Risk perception + attitude predict sustainable intentions, informs RSPO/ISPO outreach.                                                        |
| 46                                                                                                      | Suroso et al. (2023) <sup>[136]</sup>       | PLS-SEM survey of West Borneo farmers                    | TPB + Attitude, subjective norm, perceived control, environmental concern  | Behavioral factors drive sustainable certification uptake (RSPO/ISPO).                                                                        |
| III. Mapping the Theory of Planned Behavior (TPB) Approach to RSPO                                      |                                             |                                                          |                                                                            |                                                                                                                                               |
| 1                                                                                                       | Suroso et al. (2023) <sup>[136]</sup>       | PLS-SEM survey of West Borneo farmers                    | TPB + Attitude, subjective norm, perceived control, environmental concern  | Behavioral factors drive sustainable certification uptake (RSPO/ISPO)                                                                         |
| 2                                                                                                       | Hamdani (2025) <sup>[163]</sup>             | literature review                                        | RSPO, ISPO, MSPO, market access;                                           | RSPO dominan, ISPO/MSPO perlu harmonisasi sertifikasi.                                                                                        |
| 3                                                                                                       | Natsir et al. (2025) <sup>[169]</sup>       | Survey data analysis (TPB and signaling theory)          | Awareness of Organic JAS label, RSPO label, willingness to pay             | RSPO awareness weakens Organic JAS premium willingness (eco-labels).                                                                          |
| 4                                                                                                       | Wibowo et al. (2023) <sup>[154]</sup>       | Policy Analysis                                          | TPB + RSPO–ISPO Integration                                                | Coordination improves behavioural control and intention by 55%; effective harmonisation.                                                      |
| IV. Mapping TPB Approaches toward ISPO Implementation                                                   |                                             |                                                          |                                                                            |                                                                                                                                               |
| 1                                                                                                       | Hamdani (2025) <sup>[163]</sup>             | literature review                                        | RSPO, ISPO, MSPO, market access;                                           | RSPO dominan, ISPO/MSPO perlu harmonisasi sertifikasi.                                                                                        |

Table 1. *Cont.*

| No.                                                          | Author (Year)                          | Methodology         | Construct Variables                                           | Key Findings                                                                                                                                  |
|--------------------------------------------------------------|----------------------------------------|---------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IV. Mapping TPB Approaches toward ISPO Implementation</b> |                                        |                     |                                                               |                                                                                                                                               |
| 2                                                            | Wibowo et al. (2023) <sup>[154]</sup>  | Policy Analysis     | TPB + RSPO–ISPO Integration                                   | Coordination improves behavioural control and intention by 55% (Effective harmonisation).                                                     |
| 3                                                            | Nurliza et al. (2019) <sup>[130]</sup> | Literature Review   | Legal aspects, farmer organisation, ISPO criteria 1, 3, and 5 | ISPO shows no direct impact on sustainability; farmer organisations play a key role via legal–institutional interaction.                      |
| 4                                                            | Yutika et al. (2019) <sup>[131]</sup>  | Questionnaire + SEM | TPB: Attitudes, norms, perceived control, past behaviour      | Attitude, perceived control, and past behaviour affect plasma farmers' intention; subjective norms are less relevant for independent farmers. |

Source: Processed research data, 2025.

### 3.2. Explaining ISPO Adoption through the Theory of Planned Behaviour

Three main constructs from the Theory of Planned Behaviour (TPB), attitude toward behaviour, subjective norm, and perceived behavioural control, explain farmers' intentions to adopt ISPO.

**Attitude toward Behaviour:** Farmers with positive evaluations of ISPO 101, seeing it as beneficial for productivity, market access<sup>[137]</sup>, and financial gain, exhibit stronger behavioural intentions. Ajzen<sup>[18]</sup> confirms that favourable attitudes strengthen intention formation. Studies by Suroso et al.<sup>[19]</sup>, Nguyen<sup>[170]</sup>, Denashurya et al.<sup>[174]</sup>, and Aisyah et al.<sup>[175]</sup>, consistently show that positive perceptions of sustainability and certification readiness increase ISPO adoption<sup>[176]</sup>.

**Subjective Norm:** expectations from peers, cooperatives, buyers, and institutional actors significantly raise farmers' willingness to comply with certification standards. Research by Brandi et al.<sup>[177]</sup> and Brandi<sup>[178]</sup>, and Sapawi et al.<sup>[179]</sup> underscores how cooperative and buyer encouragement drive participation in sustainable practices. Yutika et al.<sup>[131]</sup> also identify peer influence and field extension services as critical social motivators.

**Perceived Behavioural Control (PBC):** Confidence in implementing ISPO depends on farmers' access to resources, training, and financial support. Ajzen<sup>[18]</sup>, Rahman et al.<sup>[180]</sup>, and Harun and Salleh<sup>[181]</sup> emphasise PBC as a direct predictor of intention and action. Cahyadi et al.<sup>[138]</sup> confirm that training and institutional assistance enhance self-efficacy, whereas Hendrawan and Musshoff<sup>[52]</sup> highlight financial and technical barriers that weaken perceived control among smallholders. Em-

pirical patterns suggest that while TPB explains adoption effectively among nucleus (plasma) farmers, it is less predictive for independent (swadaya) farmers. Yutika et al. and Saadun et al.<sup>[131, 182]</sup> found that subjective norms were statistically insignificant for independent farmers, implying differing social dynamics in loosely structured systems. Across studies, attitude, subjective norm, and perceived behavioural control consistently emerge as key determinants of ISPO adoption<sup>[183]</sup>, validating<sup>[18]</sup> the TPB model across diverse socio-structural settings.

### 3.3. Extended Determinants of ISPO Adoption beyond the Classical TPB Framework

#### 3.3.1. Readiness to Change as an Additional Psychological Determinant

Findings show that the inclusion of readiness to change enhances TPB's explanatory power in ISPO adoption<sup>[184]</sup>, especially among independent smallholders. While TPB assumes that intention drives behaviour<sup>[18]</sup>, many farmers face psychological and structural barriers that weaken this relationship, such as perceptions that palm oil-free products are healthier or more environmentally friendly<sup>[30]</sup>. This, in turn, weakens farmers' behavior in managing sustainable oil palm plantations. Drawing from Stages of Change Model<sup>[20]</sup>, readiness reflects farmers' movement from conventional to sustainable practices<sup>[185]</sup>. Supriatna et al.<sup>[30]</sup> identify that readiness is shaped by cognitive capacity, perceived benefits, and external support. In practice, certification is often viewed as demanding and slow to yield benefits, mak-

ing readiness a mediating factor between intention and actual behaviour. Empirical studies further show that readiness correlates with training access, innovation experience, and interaction with extension services indicating that it combines internal motivation with external enablers.

### 3.3.2. Demographic Characteristics and Farmer Response Variation

Demographic factors such as age, education, experience, and land ownership significantly influence how farmers interpret TPB constructs and their willingness to adopt ISPO<sup>[162]</sup>. Education and experience enhance understanding of sustainability values and certification procedures<sup>[169, 171, 186]</sup>, while age and leadership status strengthen social influence within farmer groups. Land ownership increases motivation by reducing perceived risk, since owner-farmers have more autonomy in decision-making. Studies in Nepal<sup>[187]</sup> and Malaysia<sup>[32]</sup> support that demographics act as contextual enablers shaping attitudes, norms, and control beliefs<sup>[162]</sup>. These findings affirm that demographic variables serve not only as background factors but as independent constructs influencing certification behaviour.

### 3.3.3. Peer Influence as a Strong Horizontal Social Dimension

Peer-to-peer interaction emerged as a stronger determinant of ISPO adoption than top-down institutional pressure. Unlike classical TPB's emphasis on formal authority, horizontal influence through local networks and observational learning shapes intention formation more effectively. Wauters et al. and Lakew et al.<sup>[188, 189]</sup>, and de Leeuw et al. and Ajzen and Fishbein<sup>[190–192]</sup> confirm that peer norms and social learning drive behavioural change. Practical interventions such as peer learning, farmer groups, and demonstration plots<sup>[192]</sup>. Mills et al.<sup>[22]</sup> are found to increase participation. Peer influence should thus be recognised as an independent predictor of behavioural intention within TPB-based ISPO models.

### 3.3.4. Farm Characteristics: Technical and Geographical Determinants

Farm attributes—size, location, productivity, and organisation type (plasma vs independent)—directly af-

fect certification readiness. Larger farms can bear certification costs more easily, while remote farms face limited access to markets and training<sup>[21]</sup>. Plasma farms supported by core companies display greater readiness due to institutional backing, unlike independent smallholders who often lack resources and organisational structure<sup>[19]</sup>. These characteristics act as structural determinants rather than mere contextual variables, illustrating that ISPO adoption depends on both behavioural and infrastructural capacity.

## 3.4. Institutional, Economic, and Policy Dimensions of ISPO Adoption

### 3.4.1. ISPO and Sustainability: The Role of Farmer Organisations, Legal Status, and Institutional Support

Research indicates that ISPO certification has a limited impact on smallholder sustainability when implemented in isolation<sup>[193]</sup>. Without robust farmer organisations and institutional backing, certification remains symbolic rather than transformative<sup>[130]</sup>. This reflects a behavioural gap where intention fails to translate into action due to weak infrastructure. Critical moderators such as land legality and organisational capacity are essential for substantive behavioural change, supporting Ajzen and Fishbein's<sup>[192]</sup> argument that structural context is vital for bridging the intention-behaviour gap.

### 3.4.2. Harmonisation of RSPO and ISPO: Strengthening Perceived Behavioural Control

Scholarship highlights the value of harmonising ISPO with voluntary schemes like the RSPO. Abdul Majid et al.<sup>[45]</sup> and Wibowo et al.<sup>[154]</sup> report that such coordination increases farmers' perceived behavioural control by up to 55%, fostering greater confidence in meeting requirements. Under the Theory of Planned Behaviour (TPB), this harmonization offers dual benefits: reducing administrative redundancy and costs while enhancing the legitimacy of certification processes. Streamlined audits further strengthen the local ecosystem<sup>[194]</sup>, empowering farmers and increasing their motivation to adopt<sup>[96]</sup>.

### 3.4.3. Economic and Policy Dimensions: Incentives, Training, and Institutional Support

Economic incentives and policy mechanisms are decisive in driving ISPO adoption. Price premiums serve as powerful motivators, directly linking financial benefits to improved compliance attitudes<sup>[195]</sup>. Empirical evidence confirms<sup>[196]</sup> view on price differentiation; premiums increase adoption willingness by 15%, while combining certification with training can boost intention by up to 80%<sup>[93]</sup>. Furthermore, training programmes serve a dual purpose: enhancing technical knowledge and strengthening perceived behavioural control. Consequently, policy frameworks supporting capacity-building provide the necessary enabling environment to complement these economic incentives.

### 3.4.4. Theoretical and Conceptual Integration within TPB

The TPB framework offers valuable insights into the drivers of ISPO adoption, where intention is shaped by attitudes, norms, and perceived control alongside structural enablers<sup>[18]</sup>. In the palm oil sector, farmer organisations act as key moderators, strengthening the link between perceived control and actual behaviour.

Standard harmonisation reinforces this by reducing complexity, while price premiums serve as psychological levers connecting intention to action. Ultimately, these findings necessitate integrated models that combine behavioural constructs with structural and economic dimensions, moving beyond simple compliance assessments toward comprehensive adoption frameworks<sup>[196]</sup>.

### 3.4.5. Comparative Alignment of Studies

**Table 2** consolidates these insights by juxtaposing previous studies with current findings, highlighting thematic convergence across behavioural, institutional, and economic domains. The evidence demonstrates that successful ISPO implementation requires a holistic approach where institutional support, harmonised standards, and economic incentives converge. This synergy strengthens both farmers' behavioural intentions and their perceived control. This comparative analysis affirms the alignment of past and present research, establishing a robust foundation for future sustainability policies and interventions.

This analysis confirms that the convergence of psychological and structural factors is essential for the effective adoption of sustainable certification<sup>[98]</sup>.

**Table 2.** Comparison of Studies and Alignment of Findings in the RSPO and ISPO Literature Synthesis.

| Research Focus          | Previous Findings                                                | Current Findings                                                      |
|-------------------------|------------------------------------------------------------------|-----------------------------------------------------------------------|
| ISPO Certification      | Limited direct influence on sustainability <sup>[130, 197]</sup> | Requires formal institutional support and mentoring for effectiveness |
| RSPO-ISPO Harmonisation | Simplified auditing procedures <sup>[96, 198]</sup>              | Strengthens perceived behavioural control by up to 55%                |
| Price Premium           | Enhanced strategic behaviour <sup>[195]</sup>                    | Reinforces behavioural intention and adoption attitude                |
| Training and Policy     | Improved farmers' capacity <sup>[169]</sup>                      | Recognised as a critical behavioural intervention strategy            |

Source: Data processed through systematic literature review, 2025.

## 4. Discussion

### 4.1. Intention-Behaviour Gaps and Methodological Constraints in Certification Adoption

The results underscore the critical gap between behavioural intention and actual certification adoption, highlighting the need for stronger institutional and the-

oretical integration. While TPB provides a robust base for analysing behaviour, the literature shows that intention alone does not ensure compliance—contextual enablers such as training, organisational capacity, and institutional legitimacy are equally vital. The heavy reliance on quantitative designs restricts theoretical development<sup>[199]</sup>, as it overlooks cultural and experiential factors shaping farmers' decision-making.

Integrating qualitative and participatory ap-

proaches would strengthen understanding of how behavioural constructs operate in real-world sustainability contexts. Overall, these findings suggest that policy frameworks for ISPO and RSPO should move beyond compliance metrics toward more behaviourally informed interventions—linking psychological readiness with institutional support and practical incentives<sup>[93]</sup>.

This SLR is limited by its reliance on peer-reviewed literature up to 2025, excluding grey literature and unpublished local studies that may contain relevant insights. The variability in methodological rigour across studies also restricts cross-comparative depth. Moreover, while this synthesis maps theoretical and methodological gaps, it does not empirically test new frameworks, leaving room for future field-based validation.

#### **4.2. Behavioural Determinants of ISPO Adoption within the TPB Framework**

The findings reaffirm TPB's explanatory power in predicting ISPO adoption but also reveal contextual nuances that limit its universality. Farmers' attitudes and perceived control play stronger roles than social norms in determining certification behaviour, particularly among independent smallholders. This suggests that behavioural intention alone does not ensure compliance without enabling institutional and economic conditions. Subjective norms exert greater influence where cooperative structures and buyer linkages exist—indicating that horizontal networks and local institutions are pivotal in driving behavioural alignment with ISPO standards. Similarly, PBC emerges as the most practical determinant: farmers' confidence grows when external training, financial aid, and institutional guidance are available.

Despite broad empirical support, TPB applications in ISPO studies remain limited by their reliance on quantitative models, often overlooking cultural and contextual variables. Moreover, differences between plasma and independent farmers reveal that TPB alone cannot fully explain certification behaviour without integrating social capital, institutional trust, and market access variables. Future research should therefore combine TPB with context-sensitive frameworks to capture the socio-structural diversity of Indonesian smallholders.

#### **4.3. Contextualising TPB: Socio-Demographic and Local Extensions of Behavioural Models**

The results suggest that TPB, though useful, requires contextual enrichment to explain smallholders' ISPO adoption. The addition of “readiness to change” bridges the gap between intention and behaviour, emphasising the role of psychological preparedness and external facilitation. Demographic and farm characteristics demonstrate that behavioural outcomes are filtered through experience, resource control, and local socio-economic structures<sup>[200]</sup>. Peer influence further highlights that behavioural change is socially embedded and occurs through horizontal learning rather than institutional enforcement. Integrating these contextual variables extends TPB's theoretical relevance and offers policymakers a more nuanced framework for promoting sustainable certification in diverse rural settings<sup>[201]</sup>.

Empirical evidence on extended TPB constructs remains limited, as most studies use cross-sectional, self-reported data that cannot capture long-term behavioural change. The influence of readiness, demographics, and peer learning has yet to be quantitatively validated in structural models. Future research should adopt longitudinal and mixed-method approaches to confirm the causal relationships between psychological readiness, contextual factors, and sustainable certification behaviour.

#### **4.4. Integrating Behavioural and Institutional Perspectives: A Synthesis of ISPO and RSPO Studies**

The synthesis confirms that behavioural theories such as TPB alone are insufficient to explain certification adoption without accounting for institutional and structural realities. ISPO success depends on contextual enablers—legal certainty, organisational support<sup>[202]</sup>, training access, and economic incentives—that convert intention into sustained behaviour<sup>[57]</sup>. The harmonisation of RSPO and ISPO creates operational efficiency and boosts farmer confidence, demonstrating how perceived behavioural control can be structurally reinforced. In-

tegrating these external factors within TPB frameworks deepens understanding of farmers' motivation and highlights the importance of institutional design in sustainable certification systems.

Despite its integrative insights, the literature remains constrained by fragmented methodologies and overreliance on descriptive data. Few studies employ longitudinal or model-based approaches (e.g., SEM-PLS) to test relationships among behavioural, institutional, and economic variables. Moreover, contextual elements—such as peer learning, land characteristics, and local regulation—are rarely operationalised in TPB models. Future research should adopt empirical, context-sensitive designs to examine how these variables jointly shape readiness and behavioural outcomes in ISPO implementation for climate change<sup>[203]</sup>.

## 4.5. Research Gaps and Contributions of the RSPO and ISPO Literature Synthesis

A literature synthesis on RSPO and ISPO reveals several critical gaps in current research, particularly regarding the behavioral models applied to sustainability certification in oil palm cultivation, and the complementarity and antagonism between state regulations and private standards<sup>[204]</sup>. While the Theory of Planned Behaviour (TPB) has been widely utilised, existing studies often overlook key structural and contextual variables that influence farmer adoption<sup>[19, 205, 206]</sup>. **Table 3** outlines the main research gaps identified in the literature and highlights how this synthesis contributes to addressing these gaps through an expanded theoretical and empirical framework<sup>[32, 44]</sup>.

**Table 3.** Research Gaps and Contributions of the Literature Synthesis on RSPO and ISPO.

| Identified Research Gaps                                                                                                        | Main Contribution of this Synthesis                                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gap 1: Limited integration of institutional and legal variables in TPB-based models for ISPO adoption.                          | Introduces RSPO–ISPO harmonisation, price premiums <sup>[207]</sup> , training, and institutional capacity as external variables in the TPB model <sup>[65, 206, 208]</sup>                                                                               |
| Gap 2: Lack of understanding of the mechanisms through which RSPO–ISPO harmonisation strengthens perceived behavioural control. | Offers a multidimensional framework to analyse readiness and implementation of ISPO among smallholders <sup>[32, 163]</sup>                                                                                                                               |
| Gap 3: Premium price and training variables are rarely measured as independent constructs in TPB.                               | Provides empirical insights that can guide policymakers and stakeholders in designing holistic interventions that incorporate legal, institutional, economic, and psychological aspects (Pareira <sup>[120]</sup> and Marshall et al. <sup>[209]</sup> ). |

Source: Data processed through Systematic Literature Review, 2025.

## 5. Critical Analysis, Study Comparisons, and Research Gaps

### 5.1. Comparison with Previous Studies

**Table 4** summarizes the key similarities and differences between this study and previous literature.

### 5.2. Research Gaps

Although the Theory of Planned Behaviour (TPB) has been widely applied to explain farmers' intentions and behaviours in adopting sustainable agricultural practices<sup>[214]</sup>, most studies tend to treat its core variables—attitude, subjective norms, and perceived

behavioural control—in isolation<sup>[212, 213, 215, 216]</sup>. This approach neglects the influence of contextual factors such as socio-demographic attributes, land characteristics, and horizontal social interactions<sup>[195]</sup>. In reality, the decision-making processes of smallholder farmers are not only shaped by psychological predispositions but also by structural and social conditions, including age, education, farming experience, and land tenure status<sup>[216]</sup>. Previous research suggests that such factors significantly condition behavioural intention, yet their integration into TPB-based models of ISPO adoption remains limited<sup>[18, 169, 210, 217]</sup>.

In addition, most TPB-related studies in agricultural certification overlook the role of readiness to change as a mediating variable. The majority of empir-

ical work focuses only on the direct influence of attitude, subjective norms, and perceived behavioural control on intention or behaviour. However, behavioural change theories such as the Transtheoretical Model (TTM) highlight readiness as a critical transitional stage between cognitive predispositions and the actual intention to act<sup>[187, 206]</sup>. Without recognising readiness to change, existing models risk oversimplifying the complex psychological processes that farmers undergo before adopting standards such as ISPO<sup>[20, 65, 209, 217, 218]</sup>. Incorporating this mediating factor could therefore provide a more accurate and dynamic understanding of the behavioural mechanisms at play<sup>[212]</sup>.

Furthermore, local contextual dimensions—such as peer influence, plantation typology (plasma versus independent smallholders), and regional regulations—have been acknowledged in both national and international literature as pivotal determinants of certification outcomes<sup>[45, 189, 219, 220]</sup>. Peer-to-peer learning and neighbour influence, for instance, play a strong role in shaping farmers' perceptions of risk and benefit<sup>[189, 192, 221, 222]</sup>. Similarly, plantation characteristics<sup>[223]</sup> and geographical conditions affect not only fea-

sibility but also farmers' perceived behavioural control<sup>[163]</sup>. Yet, these factors are seldom operationalised within TPB-based quantitative models of ISPO adoption<sup>[21, 192, 205]</sup>. Addressing these gaps would allow for a more context-sensitive model that better reflects the realities faced by smallholder farmers in Indonesia<sup>[32]</sup>.

Lastly, current evaluations of ISPO implementation remain predominantly descriptive and normative<sup>[207]</sup>, focusing on compliance levels<sup>[224]</sup>, training activities, or policy enforcement<sup>[222, 225–227]</sup>. While such approaches provide useful insights into procedural aspects, they fall short of explaining the deeper psychological and structural determinants of adoption<sup>[212, 228–231]</sup>. There is thus an urgent need for theoretically grounded and empirically tested models such as Structural Equation Modelling (SEM-PLS)<sup>[224, 232–236]</sup> to statistically measure the interplay among social, psychological, and external factors influencing farmers' readiness and intention to adopt ISPO<sup>[57, 65, 157, 213, 237–240]</sup>. Such models would not only contribute to academic discourse but also offer practical guidance for policymakers and stakeholders seeking to accelerate the uptake of sustainable certification schemes<sup>[210, 227, 228, 235, 236, 238, 239, 241]</sup>.

**Table 4.** Comparison between This Research and Previous Literature.

| Aspect                         | Previous Studies                                      | Research Gaps Addressed by This Study                                                   |
|--------------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <b>Theoretical Focus</b>       | Pure TPB or TPB + 1 external variable                 | TPB + contextual and socio-demographic variables <sup>[210]</sup>                       |
| <b>Unit of Analysis</b>        | Plasma/independent farmers, institutions              | Independent smallholders <sup>[136, 211]</sup>                                          |
| <b>Mediating Factors</b>       | Rarely explored (focus only on intention → behaviour) | Introduces “ <i>readiness to change</i> ” as a mediating variable <sup>[212, 213]</sup> |
| <b>Methodological Approach</b> | Mainly standard quantitative or FGD                   | Combination of SLR, theoretical literature, and field studies <sup>[213]</sup>          |
| <b>Local Perspective</b>       | Minimal (mostly macro or multi-country studies)       | Strong (adapted to the local/regional context of Bengkulu) <sup>[195, 206, 208]</sup>   |

Source: Data processed through Systematic Literature Review, 2025.

## 6. Conclusion

The expansion of the Theory of Planned Behavior (TPB) through the integration of contextual and socio-demographic variables significantly enhances the model's ability to explain smallholder farmers' intentions and behaviours regarding the implementation of the Indonesian Sustainable Palm Oil (ISPO) standard.

Readiness to change serves as a bridge between perception and realisation, while farmer characteristics, peer influence, and farm conditions emerge as critical contextual differentiators in behavioural analysis. These findings address gaps in prior TPB-based studies that were often overly normative and tended to generalise without considering the local structural and social complexities present in the field.

Further insights from the literature confirm that certification alone is insufficient. Instead, institutional support, harmonisation of certification systems, price incentives, and training play a crucial role in reinforcing the TPB elements—attitude, subjective norms, and perceived behavioural control. This research fills the gap by presenting a more holistic and applicable integrative model tailored to the context of independent oil palm smallholders.

## Recommendations

1. Literature on the effectiveness of certification harmonisation at the smallholder level remains limited and should be further explored.
2. Most existing studies rely on cross-sectional data; longitudinal analyses are needed to understand changes in intention and behaviour over time.
3. Variables such as price premium and training should be tested using mixed-method approaches that combine quantitative data with in-depth interviews.

## Author Contributions

All authors contributed equally to the conception, design, data collection, analysis, and writing of this study. All authors have read and agreed to the published version of the manuscript.

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## Institutional Review Board Statement

Ethical review and approval were waived for this study due to the fact that the research was conducted as a systematic literature review, which involved the analysis of previously published academic sources and did

not include any human participants, animals, or personally identifiable data.

## Informed Consent Statement

Not applicable.

## Data Availability Statement

No new data were created or analysed in this study. The research is based entirely on a systematic literature review of previously published and publicly accessible academic sources concerning ISPO (Indonesian Sustainable Palm Oil) and RSPO (Roundtable on Sustainable Palm Oil) certification. All data supporting the results of this study are derived from these published works, which are cited in the References section of the article. Consequently, data sharing is not applicable to this article as no new datasets were generated or processed during the current study.

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## Conflicts of Interest

The authors declare no conflict of interest. The research was conducted independently, without any commercial or financial relationships that could be construed as a potential conflict of interest. The study received no external funding or material support from any organisation, institution, or company associated with

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