CASE STUDY

The effect of income and smallholder characteristics on cultivation, harvesting, and post-harvest management of natural rubber

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ABSTRACT

BACKGROUND AND OBJECTIVES: Indonesia is the second largest natural rubber producer, which it gets primarily from smallholders. However, smallholders are less and less competitive because of unsustainable agricultural practices, while there is huge potential for sustainable natural rubber. This study aimed to measure the effect of income and smallholder characteristics on cultivation, harvesting, and post-harvest management.

METHODS: Mixed methods with non-probability sampling were used for 100 natural rubber smallholders in Kapuas Hulu Regency, West Kalimantan, Indonesia, one of the regional centers of Indonesian natural rubber. Partial least square path modeling was used with SmartPLS software to estimate the complex cause-effect relationships of smallholder and farm factors for adopting sustainable agricultural practices.

FINDINGS: The effect of the relationship between income and smallholder characteristics on cultivation and income on post-harvest management was not significant. Age and education affected some harvesting parameters, such as tapping knives, bamboo and clean latex collection, and latex stimulus risk, and some post-harvest parameters, such as a risk of acid coagulation and storage. The worker’s income source, based on off-farm, on-farm, or non-farm activities, affected harvesting parameters, including tapping knives, bamboo and clean latex collection, and latex stimulus risk.

CONCLUSION: This study offers empirical evidence for sustainable agriculture management. The acceptance of sustainable cultivation and management of rubber practices uses smallholder and farm factors as constraints since they do not form a homogenous group, and the theory of planned behavior failed to provide an effective way to explain the behaviors. Good agricultural practices must be used at all steps, including cultivation, harvesting, and post-harvest management, to prevent problems.
INTRODUCTION

Indonesia is the second largest natural rubber producer (Statista.com, 2022), and its rubber SIR 20 is the second largest commodity exported after oil palm as an essential raw material for the industry, especially in the manufacturing sector (ETRMA, 2022). It contributes 0.52 % of Indonesia’s gross domestic product (GDP) or 88.61 trillion rupiahs for manufacturing (Satista.com, 2022). In 2021, Indonesia produced 3.12 million metric tons of natural rubber, making 4 billion U.S. dollars (USD), or 23.8 % of global sales (Statista.com, 2022). East Asia Pacific is the main importer of Indonesian rubber, followed by North America, the U.S., Europe, Central Asia, China, and Japan (WITS, 2020). The majority of natural rubber is produced by smallholders. Indonesian natural rubber constitutes about 80 % or 65–70 % of global production (Statista.com, 2022). Smallholders managed rubber farming as family-based agriculture with farms smaller than 10 ha (Gouyon, 2003). In 2021, dry rubber production of smallholders reached 92.81% (2.83 million tons), followed by state estates with 4.32% (0.13 million tons) and private estates with 2.87% (0.09 million tons). The majority of rubber originated from South Sumatera (29%), North Sumatra (11%), Riau (10%), Jambi (10%), and West Kalimantan (8%) (BPS, 2021). However, smallholders have faced challenges for decades, making them less competitive (Zuhdi and Anggraini, 2020). Indonesia produces 0.96 tons per hectare, way behind Thailand, Vietnam, and Malaysia, with 1.80, 1.72, and 1.51 tons per hectare, respectively (WWF, 2020). Smallholders are often forced to combine their holdings with other crops or increase land area (WWF, 2020), leading to decreased rubber exports (Fatahillah et al., 2022), degraded soil (Nguyen et al., 2020), and loss of forest ecosystems, biodiversity, and carbon storage (Panda and Sarkar, 2020; He and Martin, 2016). Limited downstream industries can only absorb 15% of the semi-finished goods (GBGI, 2016). Natural rubber markets also remain volatile due to distinct supply-side drivers of synthetic rubber (Wagner, 2020), fluctuations in oil prices, and political changes (Raju, 2016), leading to changes in farm prices and affecting smallholders’ profits in the short run (Srisuksai, 2020). Unsustainable agricultural practices are a challenge for smallholders (Inkonkoy, 2022). Most smallholders still use large amounts of chemical fertilizers (Kullawong et al., 2020), seedlings and unproven cultivars, outdated planting methods, few legumes cover crops, and high-frequency and low-quality tapping (Zaw and Myint, 2016). Their harvest and post-harvest methods are unsuitable (Yardha et al., 2022), and they lack systematic management. However, there is potential for sustainable practices in natural rubber production. Regarding environmental aspects, cultivating rubber emits little greenhouse gas (GHG), requires less fertilizer (Nguyen et al., 2020), and increases carbon sinks and sequestration (Pinizzotto et al., 2021), thus promoting soil health (Nguyen et al., 2020; Chotiphan et al., 2019), and biodiversity conservation (Wang et al., 2020; Lan et al., 2017). Mixtures of rubber trees with Eucalyptus and Acacia can enhance water use efficiency (Chotiphan et al., 2019), and changing the land use from the cultivation of edible crops does not threaten food availability (Kullawong et al., 2020). Regarding socioeconomic aspects, household incomes are increasing, with the possibility of moving households and communities out of poverty (Hauser et al., 2015). Sustainable agricultural practices for rubber cultivation can provide smallholders with quality assurance (Gouyon, 2003), increased productivity (Eshekade et al., 2021), improved livelihoods (Inkonkoy, 2022), compliance with relevant legislation (Leimona et al., 2015), and proper use of natural resources (Piñeiro et al., 2020). Adopting sustainable practices along the value chains will strengthen strong long-term resilience to climate change (Nkeuwa et al., 2022; Kangogo et al., 2020) and markets shocks (Davis et al., 2021) and meet current and future societal needs (Makate et al., 2017). The Indonesian government tried to support smallholders in improving their rubber cultivation and post-harvest management practices through The Sustainable Natural Rubber Platform of Indonesia (SNARPI) and cooperatives or other collective organizations in processing and marketing activities for higher prices and profits (Suttipong and Koichi, 2019). However, the results depend on how and whether smallholders can get measurable outcomes, such as a higher level of technical efficiency for enhancing productivity (Kuwanto et al., 2019), welfare (Danso-Abbeam and Baiyegunhi, 2020), and planning its implementation (WEF, 2016). Sustainable agricultural practices for rubber cultivation are not only a goal but a learning process (Garzón-Delvaux, 2020). Stimulating the adoption of intentions of self-identity can be a driving force to overcome the barriers of high costs and...
behavioral changes (Yanakittkul and Aungvaravong, 2020; Silva et al., 2020). This will be encouraged by providing assistance and transferring knowledge (Barbosa Junior et al., 2022), social awareness (Punzano et al., 2021), perceived ease of use, and attitudes based on experience and environmental sensibilities (Saengavut and Jirasathumb, 2021). The decision to adopt sustainable practices among smallholders has been a subject of scientific inquiry with different theoretical frameworks and is based on the interdependence of multiple factors (Kassie et al., 2015). The study tried to focus on the simultaneous relationship of smallholder characteristics, such as age, education level (Coulibaly et al., 2021), and income (Khanal et al., 2021), and farm factors, such as experience and farming methods (Coulibaly et al., 2021), as constraints for adopting rubber cultivation and management practices. Identifying the smallholder characteristics is necessary as they do not form a homogenous group (Fan and Rue, 2020) but dynamic and sensitive targets (Etana et al., 2020). Education, income, and experience are key characteristics of the success potential of smallholders to cultivate and manage rubber practices (Dissanayake et al., 2013), while age is linked to their ability to allocate production inputs (Kuswanto et al., 2019). Smallholders’ income initiates a process of using and combining inputs to acquire and assimilate information and technology (Rapsomanikis, 2015). Yet, smallholder’s history, culture, traditional knowledge, economic disparity, and geographic distribution reflect their different approaches to cultivating and managing rubber (Min et al., 2017). While the theory of planned behavior is commonly used to encourage the adoption of sustainable agricultural practices, it failed to provide an effective way for the intentions to explain the behaviors themselves (Norman and Conner, 2005). There are intention-behavior gaps (Nguyen et al., 2019) and significant variability within the strength connection (Fan and Rue, 2020). A sustainable agricultural practice uses good agricultural practices (GAP), defined as preventing problems before they occur (Shareen, 2016). Among the three steps of GAP, cultivation addresses the risks of farm work (APO, 2016), harvesting contributes to income and employment (Abdullah et al., 2021), and post-harvest ensures product quality (Coffelt et al., 2009) using natural coagulation, acid coagulation, air drying and ripening, storage, and sales (Henderson, 1977), and handling the losses (UNCAPSA, 2015). Little literature has proposed mediator factors for the behavior connection in the context of GAP adoption. The current study aims to determine the effect of income and smallholder characteristics on cultivation, harvesting, and post-harvest management. It was conducted in West Kalimantan, one of the regional centers of Indonesian natural rubber production, in 2022.

MATERIALS AND METHODS

Mixed methods were used to answer research questions that could not be addressed by a singular approach (Doyle et al., 2009). The study was conducted in five districts Kapuas Hulu, West Kalimantan, Indonesia: Emabaloh Hulu, Batang Lumar, Boyan Tanjung, Kalis, and Hulu Gerung (Fig. 1). The area has a very wet climate, and most of the land is covered by forest (Lusiana et al., 2008).

Non-probability sampling was used as a valid and efficient non-random method (Tongco, 2007) for 100 smallholders (Purwanto and Sudargini, 2021) through a semi-structured questionnaire and an in-depth interview (Brounéus, 2011). The study was composed of three phases. First, the smallholder characteristics, including age, formal education (Coulibaly et al., 2021), household income (i.e., on-farm, off-farm, non-farm activities) (Khanal et al., 2021), and farm experience (Coulibaly et al., 2021) were identified using quantitative descriptive with percentage (%) tabulation. Second, the characteristics of cultivation, harvesting, and post-harvest management of natural rubber (Shareen, 2016; APO, 2016) were identified based on good rubber (Hevea brasiliensis) cultivation guidelines from the Indonesian Ministry of Agriculture, Directorate General of Plantations (Kementan, 2014) and sustainable natural rubber production and post-harvest management (Henderson, 1977) were determined using quantitative description with percentage tabulation. The cultivation/Skillfar parameter includes pests and diseases/Y11 (i.e., pesticide usage, integrated pest management and diseases, and usage of chemical pesticides); land/Y12 (i.e., organic material, soil organisms, fertilizer, the role of forests, soil erosion control, and terracing); processed products/Y13 (i.e., costs and benefits of farming, cider cone, trees layers, products and services, use of local trees, and waste management); cultivation/Y14 (i.e., sustainable farming, optimal...
growing conditions, optimal density, thinning for density control, pruning, and weeding); and labor/ Y15 (i.e., child labor and safety, workers’ rights, and community relations). The harvesting /Skillharv parameter includes time/Y21 (i.e., tapping time and frequency); step/Y22 (i.e., tapping technique); tools and materials/Y23 (i.e., tapping knife, bamboo latex collector, clean latex collection, and latex stimulus risk). Finally, the post-harvest/ Skillphar parameter includes results and sales/Y31 (i.e., quality processing, air drying, maturation, and sales) and risk/Y32 (i.e., acid coagulation and storage). Third, simultaneous effects of cultivation/Skillfar/Y1, harvesting/Skilharv/Y2, and post-harvest/Skilphar/Y3 management on household income (i.e., on-farm/X11, off-farm/X12, and non-farm/X13), and smallholder characteristics (i.e., formal education/X21, age/X22, and farm experience/X23) were studied using a partial least square (PLS) path modeling with a PLS structural equation modeling (PLS-SEM or Smart-PLS) software due to its efficiency for small sample sizes and complex models (Willaby et al., 2015). PLS-SEM includes two elements: the structural/inner model and the measurement/outer model (Hair et al., 2021). They include the following steps: i) reflective measurement model; ii) evaluation of formative measurement models; and iii) evaluation of the inner/structural model (Purwanto and Sudargini, 2021). In the reflective measurement model, a model is tested for the interrelationship between the variables using composite reliability (CR) > 0.70, which tends to give an estimate higher than Cronbach’s alpha (α), for the internal consistency/reliability of the constructs due to the different weights of each indicator. The average variance extracted (AVE) > 0.50 is used to assess the construct validity of a measurement procedure (Chan and Lay, 2018). In formative measurement models, the content specification must relate to the scope of the latent construct using a variance inflated factor (VIF) < 10 to ensure no multicollinearity data. The accuracy of the prediction is indicated by the R-squared ($R^2$) and Q-squared ($Q^2$) values. $R^2 < 0.19$ is considered unacceptable or interpreted as the exogenous variables that cannot explain the endogenous dependent variable. $Q^2 > 0$ is relevant for a specific dependent construct (Hair et al., 2021). In the inner/structural model, the significance of the relationship between the constructs/variables is assessed using a critical ratio (CR) > 1.96 or a probability ($p$) > 0.05. The f-square ($f^2$) indicates the effect of the size criterion on the structural level: $0.02 \leq f^2 \leq 0.15$ is small, $0.15 \leq f^2 \leq 0.35$ is moderate, and $f^2 \geq 0.35$ is a large effect. The outer loading factor indicates the estimated relationships or determines an item’s absolute contribution to its assigned construct (Hair et al., 2021).
RESULTS AND DISCUSSION

Smallholder characteristics

Smallholder characteristics include on-farm, off-farm, and non-farm income, education, age, and farm experience (Table 1).

As indicated in Table 1, most smallholders’ income is over 25.96–45.42 USD/month from on-farm and non-farm activities and over 97.34 USD/month from off-farm activities. Most have a senior high school level or 12 years of formal education, over 45–55 years of age, and over 20 years of farm experience. Moreover, the rubber price impacts smallholders. The fluctuating rubber prices affect the product type produced, working hours, type of input (Erlina et al., 2019), safety standards, use of toxic chemicals, discrimination, and child labor (Aidenvironment, 2016). The combination of biological and economic aspects of rubber production (Purnamasari et al., 2002) and institutional assistance (Wang et al., 2023) have been conceived to mitigate price fluctuations.

Cultivation, harvesting, and post-harvest management characteristics of natural rubber

The cultivation, harvesting, and post-harvest management characteristics of natural rubber are presented in Table 2.

Most used cultivation methods include sustainable farming, optimal growing conditions, optimal density, thinning for density control, pruning, and weeding. Most harvesting methods include tapping, and

<table>
<thead>
<tr>
<th>Income (USD/month):</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On-farm:</strong></td>
</tr>
</tbody>
</table>
| ≤5.84 | 1.11  
| >5.84-25.96 | 16.67  
| >25.96-45.42 | 36.67  
| >45.42-97.34 | 33.33  
| >97.34 | 12.22  
| **Off-farm:** |  
| ≤5.84 | 17.78  
| >5.84-25.96 | 17.78  
| >25.96-45.42 | 7.78  
| >45.42-97.34 | 20.00  
| >97.34 | 36.67  
| **Non-farm:** |  
| ≤5.84 | 3.33  
| >5.84-25.96 | 8.89  
| >25.96-45.42 | 40.00  
| >45.42-97.34 | 33.33  
| >97.34 | 14.44  
| **Education (year):** |  
| ≤6 | 1.11  
| >6-<9 | 24.44  
| 9 | 26.67  
| 12 | 42.22  
| >12 | 5.56  
| **Age (year):** |  
| <25 | 2.22  
| 25-35 | 4.44  
| >35-45 | 30.00  
| >45-55 | 52.22  
| >55 | 11.11  
| **Farm experience (year):** |  
| <5 | 2.22  
| 5-10 | 3.33  
| >10-15 | 28.89  
| >15-20 | 31.11  
| >20 | 34.44  

Table 1: Natural rubber smallholder characteristics (%)
most post-harvest methodologies include quality processing, air drying, maturation, and sales.

**Effect of income and smallholder characteristics on cultivation, harvesting, and post-harvest management**

In the reflective measurement model, the interrelationship model between the income/X1, smallholder characteristics/X2, cultivation/Y1, harvesting/Y2, and post-harvest/Y3 management displayed valid and consistent results (Table 3).

In formative measurement models, the content specification has proven related to the scope of the latent construct, and no multicollinearity data were observed (Table 4).

The accuracy of the prediction of the exogenous variables (i.e. income and smallholder characteristics) to explain the endogenous dependent variable (i.e. cultivation, harvesting, and post-harvest management) is indicated by the value of $R^2$ and $Q^2$ (Table 5).

As indicated in Table 5, income and smallholder characteristics are relevant in explaining cultivation, harvesting, and post-harvest management. In the structural/inner model, the significance of the relationship between the constructs/variables is assessed using CR value (Fig. 2).

Fig. 2 presents the non-significant effect of the relationship between income and smallholder characteristics on cultivation and income on post-harvest management.

The effect of the others relationships is significant based on $f^2$ values for the effect of size on the structural level (Table 6).

The size effect of the significant relationship between income and smallholder characteristics on harvesting and of smallholder characteristics on post-harvest management is small. Income is a key characteristic of the success potential of smallholders to cultivate and manage rubber plantations in the selected study area and other areas (Dissanayake *et al.*, 2013). Mentoring and introducing site-specific technology help smallholders overcome the limitations of their income and resources in rubber cultivation and management (Yardha *et al.*, 2022). The outer loading factor that indicates the estimated relationships or determines an item’s absolute contribution to its assigned construct is presented in Fig. 3.
### Table 4: Formative measurement model

<table>
<thead>
<tr>
<th>The content specification</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Income/X1:</strong></td>
<td></td>
</tr>
<tr>
<td>On-farm/X11</td>
<td>1.545</td>
</tr>
<tr>
<td>Off-farm/X12</td>
<td>1.471</td>
</tr>
<tr>
<td>Non-farm/X13</td>
<td>1.321</td>
</tr>
<tr>
<td>Smallholder characteristics/X2:</td>
<td></td>
</tr>
<tr>
<td>Education/X21</td>
<td>1.160</td>
</tr>
<tr>
<td>Age/X22</td>
<td>1.305</td>
</tr>
<tr>
<td>Farm experience/X23</td>
<td>1.421</td>
</tr>
<tr>
<td><strong>Cultivation/Y1:</strong></td>
<td></td>
</tr>
<tr>
<td>Pesticide usage, integrated pest management and diseases, and usage of chemical pesticides (Pets and Diseases/Y11)</td>
<td>2.721</td>
</tr>
<tr>
<td>Organic material, soil organisms, fertilizer, the roles of forests, healthy soil, soil erosion control, and terracing (Land/Y12)</td>
<td>3.211</td>
</tr>
<tr>
<td>Costs and benefits of farming, cider cone, trees layers, products and services, the use of local tree, and waste management (Processed products/Y13)</td>
<td>2.116</td>
</tr>
<tr>
<td>Sustainable farming, optimal growing conditions, optimal density, thinning for density control, pruning, and weeding (Cultivation/Y14)</td>
<td>2.836</td>
</tr>
<tr>
<td>Child labor and their safety, workers' rights, and community relations (Labor/Y15)</td>
<td>1.687</td>
</tr>
<tr>
<td><strong>Harvesting/Y2:</strong></td>
<td></td>
</tr>
<tr>
<td>Tapping time, and frequency (Time/Y21)</td>
<td>1.566</td>
</tr>
<tr>
<td>Tapping technique (Step/Y22)</td>
<td>1.754</td>
</tr>
<tr>
<td>Tapping knife, bamboo latex collector, clean latex collection, and latex stimulus risk (Tools and Materials/Y23)</td>
<td>1.779</td>
</tr>
<tr>
<td><strong>Post-Harvest/Y3:</strong></td>
<td></td>
</tr>
<tr>
<td>Quality processing, air drying, maturation, and sales (Results and Sales/Y31)</td>
<td>1.747</td>
</tr>
<tr>
<td>Risks of acid for coagulation, and storage (Risk/Y32)</td>
<td>1.747</td>
</tr>
</tbody>
</table>

### Table 5: $R^2$ and $Q^2$ values

<table>
<thead>
<tr>
<th>Endogenous dependent variable</th>
<th>$R^2$</th>
<th>Adj. $R^2$*</th>
<th>$Q^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivation (Skillfarm/Y1)</td>
<td>0.188</td>
<td>0.167</td>
<td>0.149</td>
</tr>
<tr>
<td>Harvesting (Skillharv/Y2)</td>
<td>0.283</td>
<td>0.264</td>
<td>0.194</td>
</tr>
<tr>
<td>Post-harvest (Skillphar/Y3)</td>
<td>0.237</td>
<td>0.217</td>
<td>0.124</td>
</tr>
<tr>
<td>Mean</td>
<td>0.236</td>
<td>0.216</td>
<td>0.155</td>
</tr>
</tbody>
</table>

*Adjusted r-squared

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**Fig. 2:** CR value
As indicated in Fig. 3, increased harvesting is more likely to depend on increasing income than smallholder characteristics, and increased income is more likely to depend on off-farm activities, followed by on-farm and non-farm activities. Increased post-harvest management depends on increased smallholder characteristics, while increased smallholder characteristics depend more on increased age than education. Increased harvesting depends more likely on increasing tapping knife, bamboo latex collector, clean latex collection, and latex stimulus risk. Finally, increased post-harvest management is likely due to increasing risks of acid coagulation and storage. Organic material, soil organisms, fertilizer, the role of forests, soil erosion control, and terracing can enhance biodiversity and soil ecology (Ogunsola et al., 2020). The tapping technique, a costly activity, can be improved by tapping from high left to low right (Rodrigo, 2007). Natural coagulation, formic acid coagulation, and air-drying methods are the key drivers of structuration (Noinart et al., 2022) for resin quality, limiting post-harvest latex losses, and increasing the time interval between harvesting and processing (Coffelt et al., 2009). A smallholder identity factor that is contrary to their productivity attitude can lead to non-pros-farm management behavior (Shen et al., 2022), the perception of which (Dixon et al., 2022) might mean more regulation (McGuire et al., 2015), fear of losing non-pecuniary benefits (Howley et al., 2015), place attachment (Maricchiolo et al., 2021), and underestimating the importance of environmental benefits (Shen et al., 2022; Gosling and Williams, 2010). The support of supply chain dialogue and emotional valuing of nature to target particular groups of smallholders (Barnes et al., 2022; Gosling and Williams, 2010) and engage in long-term supply chain relationships and co-investment with the rubber industry can create awareness and commitment while solving sustainability issues (Aidenvironment, 2016). Income changes do not necessarily reflect changes confronted by farm households (Mishra et al., 2002) since economic incentives alone are unlikely to encourage specific cohorts of smallholders (Howley et al., 2015).

CONCLUSION

Most smallholders’ income is over 25.96–45.43 USD/month from on-farm and non-farm activities and over 97.36 USD/month from off-farm activities. Most have a senior high school level or 12 years of formal
education, over 45–55 years of age, and over 20 years of farm experience. Most cultivation methods include sustainable farming, optimal growing conditions, optimal density, thinning for density control, pruning, and weeding. The most used harvesting technique is tapping, and the most used post-harvest management method includes quality processing, air drying, maturation, and sales. The results indicate that the effect of the relationship between income and smallholder characteristics on cultivation and income on post-harvest management is not significant. However, the effect of the relationship between income and smallholder characteristics on harvesting and of smallholder characteristics on post-harvest management is significant. Most harvesting increases are due to increased income rather than smallholder characteristics, and most income increases are due to increased off-farm activities, followed by on-farm and non-farm. Most post-harvest increases are due to increased smallholder characteristics, and most smallholder characteristics increases are due to increased age rather than education. Increasing tapping knives, bamboo latex collectors, clean latex collection, and latex stimulus risk present challenges in managing the harvesting step, while increasing risks of acid coagulation and storage present challenges in managing the post-harvest processing and marketing of natural rubber. Using organic materials, soil organisms, and fertilizers by considering healthy soil, tapping techniques, coagulation and drying methods with the support of supply chain dialogue and emotional value of nature to target particular groups of smallholders, and engaging in long-term supply chain relationships and co-investment with the rubber industry can promote pro-sustainable farm management behavior. Thus, the adoption of rubber cultivation and management methods depends on whether smallholders can provide measurable outcomes, such as a higher level of technical efficiency to enhance productivity and welfare, building partnerships in the planning and implementation of cultivation, and management with key stakeholders.

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CONFLICT OF INTEREST

The author declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy have been completely observed by the authors.

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ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>%</td>
<td>Percent</td>
</tr>
<tr>
<td>AVE</td>
<td>Average variance extracted</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>Adjusted r-squared</td>
</tr>
<tr>
<td>α</td>
<td>Cronbach’s alpha</td>
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<tr>
<td>CR-value</td>
<td>Critical ratio</td>
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<tr>
<td>CR</td>
<td>Composite reliability</td>
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<tr>
<td>F²</td>
<td>F-square</td>
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<tr>
<td>GAP</td>
<td>Good agricultural practices</td>
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<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse gas</td>
</tr>
<tr>
<td>p</td>
<td>Probability</td>
</tr>
<tr>
<td>PLS</td>
<td>Partial least squares</td>
</tr>
<tr>
<td>Q²</td>
<td>Q-squared</td>
</tr>
</tbody>
</table>
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