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Implementation Strategy for the Merah Putih Cooperative Program Based on a Needs Analysis of Panderman Forest Farmer Group Members

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Abstract
A government program to accelerate the establishment of the Merah Putih Cooperative presents a strategic opportunity for the economic development of Forest Farmer Groups or Kelompok Tani Hutan (KTH). Despite their potential, KTHs often face institutional and market access constraints. This study aims to formulate a development strategy for a cooperative within KTH through a quantitative Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis. This study involved 45 respondents from the Panderman Forest Farmer Group, selected through total sampling (census). Data collected via Likert scale questionnaires were analyzed using Internal Factor Evaluation (IFE), External Factor Evaluation (EFE), and Internal-External (IE) matrices to map the strategic position. The results indicate a very strong internal position (IFE score of 3.54) and a highly supportive external environment (EFE score of 3.49). This places the KTH in the 'Grow and Build' quadrant of the IE matrix, signalling the appropriateness of an aggressive growth strategy. The implementation of the Merah Putih Cooperative is highly feasible with significant potential for success. Therefore, it is suggested that KTH promptly adopt aggressive growth strategies, such as market penetration and vertical integration, to optimise its existing potential and become a driver of the local economy.

INTRODUCTION

The role of Forest Farmer Groups or Kelompok Tani Hutan (KTH) in sustainable resource management and local economic development is increasingly recognized as critical. The case of the Panderman KTH exemplifies how these groups can serve as a catalyst for economic vitality within communities rich in natural resources. This capacity, however, often remains underutilized due to structural weaknesses in the economic institutions that support them, resulting in challenges related to capital accumulation, product processing, and market accessibility (Firdaus & Nursakinah, 2023; Purnomo et al., 2022).

Strengthening social capital and enhancing collective action are recognized as fundamental strategies to overcome these challenges. Lee et al., (2017) assert that fostering social capital is essential in Indonesian community forest management, highlighting the role of internal and external factors in building effective cooperatives. In this context, the formation

of collective business entities like cooperatives is proposed as a means to boost market access, negotiate better prices, and subsequently increase incomes for members (Kubitza et al., 2018; Kurniawati & Mulyono, 2023). These collective structures not only enhance community ties but also enable groups to wield greater bargaining power in commercial exchanges. Furthermore, cooperative ventures are pivotal in facilitating the sharing of resources and knowledge, which can instigate a positive feedback loop for economic resilience (Kubitza et al., 2018).

Yet, these internal efforts must contend with a myriad of external challenges. Market participation is often hindered by logistical constraints, such as inadequate transport infrastructure and high transaction costs, leaving farmers vulnerable to exploitation by dominant trading entities (Limbong et al., 2023; Tridakusumah et al., 2021b). Tarlani & Sirajuddin, (2020) elucidate this power imbalance, noting how smallholder farmers face significant hurdles in negotiating fair trade terms. Despite the potential for Information and Communication Technologies (ICT) to improve transparency and market linkages, the integration of such tools remains inconsistent across regions (Yuliati & Utami, 2024). Suparyana et al., (2022) highlight that the lack of formal land title security disincentivizes farmers from engaging in sustainable practices, reflecting an urgent need for comprehensive policy frameworks that address both land tenure security and market access (Kurniawati & Mulyono, 2023).

The "Merah Putih Cooperative Program," aligned with Presidential Instruction Number 9 of 2025, aims to revitalize cooperative structures across Indonesia. This initiative presents a critical opportunity for amplifying the collective strength of KTHs like Panderman. However, a significant gap exists between this high-level policy mandate and the grassroots reality. Historical analyses indicate that past empowerment initiatives often faltered due to a "one-size-fits-all" approach that neglected local strategic nuances and lacked rigorous pre-assessment (Khonitan & Utami, 2018). While the benefits of cooperatives are well-theorized, there is a scarcity of empirical research that quantitatively measures the specific readiness of KTHs to transform into professional entities under this new regulatory framework.

Furthermore, existing studies on KTH development predominantly rely on qualitative descriptions, which often fail to provide precise, prioritized strategic steps. Without a measurable assessment of internal capabilities and external market fluctuations, the implementation of the Merah Putih Cooperative in Panderman risks repeating the failures of previous underdeveloped economic institutions. Therefore, there is an urgent need to bridge this gap by applying a rigorous Quantitative SWOT analysis. Unlike traditional descriptive approaches, integrating the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) frameworks offers a systematic, numerical basis for strategy formulation.

This study fills this void by mapping the precise strategic position of the Panderman KTH. By coupling the macro-policy context of 2025 with micro-level quantitative data, this research moves beyond general advocacy for cooperatives to provide a concrete, data-driven roadmap. This approach ensures that the "Merah Putih" initiative is not just adopted administratively, but is grounded in a robust understanding of local socio-economic strengths and market realities (Benos et al., 2015; Maloka et al., 2014).

Effective strategy formulation must incorporate environmental variables. Othman et al. highlight the impacts of urbanization on land use and economic dynamics, indicating that external factors are critical in understanding the operational environment of cooperatives (Othman et al., 2021). For the Merah Putih Cooperative, understanding local socio-economic conditions through EFE will help identify opportunities and mitigate risks from competitive

threats or regulatory changes, aligning with research that underscores community stakeholder engagement in local economic development (Vorodam et al., 2022).

Building on this framework, incorporating community engagement strategies, as discussed by Meigs et al., emphasizes centering local knowledge and involvement in transformative initiatives (Meigs et al., 2024). This approach aligns with Zhao et al.'s advocacy for leveraging social media within cooperative networks to enhance collaboration and information dissemination (Zhao et al., 2017). Consequently, the cooperative could foster a collective approach to economic transformation, promoting broader community engagement that supports local economic growth.

It is also important to recognize that cooperatives operate within a dynamic landscape that necessitates continuous evaluation of internal and external factors. Wu et al. discuss the interplay between trade, policy adaptation, and community resilience, which highlights the multifaceted nature of economic engagement (Wu et al., 2016). By integrating quantitative analyses with a holistic evaluation of these dynamics, the Merah Putih Cooperative can align its strategic objectives with sustainable development that resonates with both its mission and the local community's needs.

In conclusion, the strategic formulation embraced by the Merah Putih Cooperative, through structured quantitative SWOT analysis powered by IFE and EFE frameworks, will facilitate internal assessment and strategic clarity, positioning the cooperative as a pivotal player in local economic transformation efforts, driven by community engagement and stakeholder inclusivity.

RESEARCH METHODOLOGY

Time and Location

This study was conducted with the KTH, located on the slopes of Mount Panderman in Batu City, East Java. This site was selected purposively because the KTH is a primary target for the Merah Putih Cooperative Program and was considered highly representative for this study's needs analysis. The research took place from June to August 2025. Preparation and instrument development occurred in June, followed by primary data collection (questionnaires and interviews) in July. Data analysis and writing were completed in August 2025.

Population and Sample

The study population consisted of all 45 active members of the KTH. A total sampling method (census) was used, meaning all 45 members were included as respondents. This approach was chosen due to the small population size, allowing for a comprehensive examination of the needs of all members(Alleva et al., 2025; Zhao & Grafström, 2020). Using a census ensures that the findings accurately represent the entire group and minimizes the sampling bias common in small populations (Chadyšas & Krapavickaitė, 2016). The application of total sampling also significantly mitigates the potential for bias that can arise from other sampling techniques in small, heterogeneous populations, where certain elements might otherwise be overlooked. This is essential for ensuring the relevance of the analysis to the research objectives. Furthermore, this methodological choice aligns with the principles of sound research requiring precise and conclusive results, particularly for the development of evidence-based policy (Patrick & Osadebe, 2017).

Data Collection and Analysis

This study utilized a Concurrent Embedded Mixed-Methods design, placing primary emphasis on quantitative analysis (QUAN) supported by qualitative secondary data (qual). Primary data formed the core of the research, gathered from all 45 members of the KTH through a structured, closed-ended questionnaire. This instrument employed a Likert scale to systematically convert

members' perceptions into numerical data, serving as the foundation for the quantitative strategic analysis (Burhaniah & Krismayani, 2023).

Simultaneously, this quantitative dataset was enriched by a qualitative review of secondary data, including internal documents and organizational reports. This embedding of qualitative data provided crucial context regarding the KTH's operational history and socio-cultural environment, ensuring the statistical findings were grounded in reality (Rifa'i, 2023).
The analytical framework followed a rigorous quantitative strategic planning process. First, key internal and external factors identified from the preliminary assessment were evaluated using Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices. These matrices assigned numerical weights and ratings to calculate the organization's strategic standing (Ainurofiq, 2021). The resulting scores were mapped onto an Internal-External (IE) Matrix to visualize the strategic position—whether to pursue growth, stability, or retrenchment (Helms & Nixon, 2010). Finally, the Quantitative Strategic Planning Matrix (QSPM) was employed to objectively rank specific strategic alternatives, calculating the relative attractiveness of each option based on the integrated data (GÜREL, 2017).

RESULTS AND DISCUSSION

To understand the socio-demographic conditions and business profiles of the members of the Panderman Forest Farmer Group (KTH), an analysis was conducted on the 45 respondents who participated in this study. The respondents' characteristics, which include demographic aspects, business scale, land ownership, and market access, are presented in detail in Table 1. This data serves as the fundamental basis for identifying the needs, challenges, and potential of the KTH Panderman members.

Table 1. Characteristics of Panderman Forest Farmer Group Members

No.	Characteristic	Category	Number (people)	Percentage (%)
1.	Gender	Male	37	82.2%
		Female	8	17.8%
2.	Formal Education	Elementary School	15	30.0%
		Junior High School	13	26.0%
		Senior High School	18	36.0%
		Higher Education (Bachelor's)	4	8.0%
3.	Farmer's Age	15-64 years (Productive Age)	42	93.3%
		>65 years (Non-Productive Age)	3	6.7%
4.	Business Scale	Small Scale	35	77.8%
		Medium Scale	10	22.2%
		Large Scale	0	0.0%
5.	Land Ownership Status	Private Ownership	30	66.7%
		Borrowed/Communal Land	15	33.3%
6.	Land Size	Small (<0.5 ha)	25	55.6%
		Medium (0.5-1 ha)	16	35.5%
		Large (>1 ha)	4	8.9%
7.	Forest Farming Experience	<15 years	11	24.4%
		16-29 years	24	53.3%
		≥30 years	10	22.2%
8.	Cultivation Pattern	Intensive	5	11.1%
		Semi-Intensive	32	71.1%

		Extensive	8	17.8%
9.	Market Access	Direct to Consumer	4	8.9%
		Through Middlemen	41	91.1%
10.	Business Orientation	Side Income	9	20.0%
		Supplementary Income	15	33.3%
		Main Source of Income	21	46.7%
11.	Source of Capital	Personal Capital	40	88.9%
		External Capital (Loan, etc.)	5	11.1%

Gender Although the male dominance within the Panderman Forest Farmer Group (KTH) (82.2%) is a common phenomenon often associated with the physical demands of agriculture, the presence of female members (17.8%) indicates significant potential for empowerment programs in economic activities such as post-harvest processing and administration (Basnet, 2023; Habtewold, 2021). Increasing women's participation in decision-making processes has been proven to enhance their economic autonomy and social status (Diiro et al., 2018; Hordofa & Badore, 2023; Kandi et al., 2025) , while also contributing tangible improvements to agricultural productivity and food security (Malapit & Quisumbing, 2015; URHIBO & Orhero, 2023). To effectively facilitate this involvement, strategic interventions are required, including training programs, access to credit (Hordofa & Badore, 2023; Mursyidin et al., 2023) and the formation of women's cooperatives as a platform to access markets and develop skills. The success of such programs heavily relies on policies that integrate a gender perspective and involve all stakeholders to create an inclusive environment supportive of sustainable economic growth(Cherotich & Njoroge, 2022; Crookston et al., 2021; Ewerling et al., 2017; Makinde, 2021; Soemitra et al., 2022). Therefore, strategically empowering the potential of women in the KTH is not merely a matter of gender equity but an essential step toward strengthening the overall welfare of the community (Kasturi, 2019; Malapit & Quisumbing, 2015; Melesse, 2021; URHIBO & Orhero, 2023).

Education The educational level of KTH Panderman members, dominated by elementary (40.0%) and junior high school (35.6%) graduates, presents a significant challenge for capacity development. The low number of members with higher education only 15.5% having graduated from high school and 2.2% from university indicates the need for more contextual and practical mentoring and training programs (Onyemauwa, 2012; Sukmayanto et al., 2022). This prevalence of limited formal education among farmers can contribute to restricted access to new technologies, and overly theoretical training materials may be ineffective in this context (Muddassir et al., 2024). Accordingly, learning approaches that prioritize visual methods and hands-on practice can enhance members' understanding and skills, enabling them to be better prepared for field challenges (Berge et al., 2021; Muddassir et al., 2024) It is therefore crucial to design training programs that not only consider formal educational backgrounds but also build practical skills directly applicable to daily farming activities (Sukmayanto et al., 2022).

Age A vast majority of KTH Panderman members (93.3%) are within the productive age range of 15-64 years. This demographic is a valuable asset for the KTH and the prospective cooperative, indicating a strong human resource base ready to contribute to business development(Everest, 2021). The presence of members in their productive years promises sustainability and regeneration for the group in the medium to long term (Golovina et al., 2021). Research shows that youth and adults within such groups can significantly contribute to productivity improvements and the adoption of new agricultural technologies, which in turn

enhances member welfare(Teng et al., 2022). Thus, the cooperative must leverage this potential by designing programs that engage and empower members to develop skills and knowledge relevant to business success (Li et al., 2022).

Business Scale The majority of KTH Panderman members (77.8%) operate on a small scale, reflecting farming practices that are more subsistence-based or semi-commercial rather than fully profit-oriented. This condition underscores the need for establishing a cooperative as a strategic solution to consolidate harvests, thereby increasing the collective business scale and effectively enhancing bargaining power in the market (Ma & Abdulai, 2018; Zhang & Wu, 2023). Research indicates that through cooperatives, farmers can access better resources, including production and marketing services that significantly reduce costs and increase income, allowing them to compete more effectively(Liu & Wu, 2021; Zhang & Wu, 2023). Through this consolidation, the KTH can maximize its profits and provide the necessary impetus for the economic growth of its members (Deng et al., 2021; Giagnocavo et al., 2018).

Land Ownership Status Two-thirds (66.7%) of KTH Panderman members manage privately owned land, while the remaining third (33.3%) cultivate on borrowed or communal land. The predominance of private land ownership provides a sense of security and an incentive for members to make long-term investments in their farms, both in terms of productivity and infrastructure improvements. Studies show that land tenure security positively influences farmers' decisions to invest and adopt new technologies (Nakayama et al., 2024) However, the presence of farmers on non-private land requires special attention from the cooperative to ensure they receive equitable rights, security, and support, creating equal access to resources and opportunities for improved welfare (Prabawani et al., 2024). By including these farmers, the cooperative can strengthen its base and expand its support network, ultimately enhancing the group's collective economic potential (Ma et al., 2023).

Land Size The majority of KTH Panderman members operate on small plots, with 55.6% managing less than 0.5 hectares. This limited land size constrains individual production volume, increasing the risk of agricultural insufficiency for members (Nakayama et al., 2024). This situation further emphasizes the importance of a cooperative to act as an aggregator, where harvests from these small plots can be collected and managed collectively. By consolidating produce, the cooperative can create a significant sales volume, enabling members to compete in broader markets and achieve better returns(Ade Intan Christian & Subejo, 2018). Research demonstrates that through cooperative collaboration, smallholder farmers not only gain better market access but also have the opportunity to obtain additional services that can improve their productivity and efficiency (Slameto et al., 2015).Thus, the cooperative model is crucial for improving the welfare of smallholder farmers in the context of sustainable agriculture.

Market Access Nearly all KTH Panderman members (91.1%) sell their produce through middlemen or intermediaries, creating high dependency and weakening their bargaining power. Consequently, they often receive unfair prices for their agricultural products, which is the most critical issue the cooperative must address (Ma et al., 2023). By shortening the supply chain and seeking direct market access, the cooperative has significant potential to increase member incomes (Tridakusumah et al., 2021a). Participation in a cooperative structure can strengthen farmers' bargaining position by enabling them to sell directly to the market, thereby securing better prices and higher profits (Purnawan et al., 2022) Furthermore, the cooperative can serve as a provider of transparent market information and offer necessary training for members to

understand market dynamics and consumer needs, ultimately enhancing the sustainability of their farming enterprises (Suparyana et al., 2022).

Source of Capital A large majority of KTH Panderman members (88.9%) rely on personal capital to finance their operations, indicating limited access to external capital, such as formal loans, which is a major impediment to their business development. As a legal entity, a cooperative can potentially bridge this gap by facilitating members' access to formal financing institutions like banks, Revolving Fund Management Institutions (LPDB), or other government credit programs (Pambudi, 2020). Studies show that improved access to formal financing can enhance the sustainability of micro, small, and medium enterprises (MSMEs) and support local economic growth (Tavares et al., 2024). Therefore, strengthening the cooperative's role in providing members access to these capital sources will not only help increase business productivity but also enhance their bargaining power in the broader market (Ade Intan Christian & Subejo, 2018).

Table 2. Key Internal Factors

Key Internal Factors	Weight	Rating	Weighted Score
Strengths			
S1: Group Solidarity & Cohesion	0.08	4	0.32
S2: Business Management Experience	0.06	4	0.24
S3: Availability of Internal Cadres	0.07	4	0.28
S4: Availability of Initial Assets	0.05	4	0.20
S5: Product Superiority	0.07	4	0.28
S6: Administrative Skills	0.04	3	0.12
S7: Initial Marketing Network	0.05	4	0.20
S8: Local Knowledge & Product Uniqueness	0.06	4	0.24
S9: Technology Adoption	0.04	4	0.16
S10: Partnership Experience	0.03	4	0.12
Weaknesses			
W1: Difficulty in Accessing Capital	0.08	3	0.24
W2: Need for Management Training	0.07	3	0.21
W3: Availability of Facilities & Infrastructure	0.06	3	0.18
W4: Bookkeeping Difficulties	0.05	3	0.15
W5: Potential for Internal Conflict	0.04	3	0.12
W6: Bargaining Power in Marketing	0.05	3	0.15
W7: Dependence on Middlemen	0.03	4	0.12
W8: Access to Info on Government Programs	0.03	3	0.09
W9: Regeneration Difficulties	0.02	3	0.06
W10: Barriers to Technology Use	0.02	3	0.06
TOTAL	1.00		3.54

Table 3. Key External Factors

Key External Factors	Weight	Rating	Weighted Score
Opportunities			
O1: Benefit of Assistance from Ministries/Institutions	0.07	4	0.28
O2: Optimism in Obtaining Initial Capital	0.09	4	0.36
O3: Potential for Partnership with SOEs	0.08	4	0.32
O4: Product Potential for Food Programs	0.06	4	0.24
O5: Benefit of Digital Training	0.06	4	0.24
O6: Confidence in Local Government Support	0.05	4	0.20
O7: Benefit of Ease of Permitting	0.04	4	0.16
O8: Potential for Village Fund Support	0.05	4	0.20
O9: Potential for Health Business Unit	0.03	3	0.09
O10: Potential for Membership Expansion	0.02	4	0.08
Threats			
T1: Risk of Bureaucracy & Coordination	0.07	3	0.21
T2: Risk of Negative Reaction from Competitors	0.06	4	0.24
T3: Risk of Dependence on Aid	0.05	3	0.15
T4: Risk of Policy Changes	0.04	3	0.12
T5: Concerns Regarding Supervision	0.04	3	0.12
T6: Risk of Business Model Mismatch	0.03	3	0.09
T7: Risk of Social Conflict	0.03	4	0.12
T8: Risk of Loan Default	0.05	3	0.15
T9: Risk of Market Uncertainty	0.02	3	0.06
T10: Risk of Ineffective Mentoring	0.02	3	0.06
TOTAL	1.00		3.49

Based on the total IFE and EFE scores calculated in the previous stage, the strategic position of the Forest Farmer Group (KTH) can be mapped onto the Internal-External (IE) Matrix. Calculation Results that total IFE Score (Internal): 3.54 → Falls within the Strong category (3.0 - 4.0). and The total EFE Score (External): 3.49 → Falls within the High category (3.0 - 4.0).

Table 4. IFE and EFE Matrix Analysis

	Total IFE Score (Internal)		
Total EFE Score (External)	Strong (3.0 - 4.0)	Average (2.0 - 2.99)	Weak (1.0 - 1.99)
High (3.0 - 4.0)	I. Grow and Build (X) Merah Putih Cooperative	II. Grow and Build	III. Hold and Maintain
Medium (2.0 - 2.99)	IV. Grow and Build	V. Hold and Maintain	VI. Harvest and Divest
Low (1.0 - 1.99)	VII. Hold and Maintain	VIII. Harvest or Divest	IX. Harvest or Divest

Formulation of Strategic Alternatives

Based on the strategic position analysis, which places the group in Quadrant I (Grow and Build), the formulated strategies are aggressive in nature. This approach focuses on maximally leveraging internal strengths to capitalize on existing external opportunities. The detailed strategic formulation is organized into three main pillars:

1. Institutional and Capital Acceleration Pillar (S-O & W-O Strategies) This pillar focuses on establishing a robust cooperative and utilizing external support to overcome internal weaknesses, particularly in capacity and capitalization.

a) Acceleration of Cooperative Formation & Capital Access: The primary strategy is to promptly establish a legal cooperative entity to formally leverage the group's solidarity (S1) and members' experience (S2). With legal status, the cooperative can aggressively access external funding sources, such as initial capital support from Presidential Instruction No. 9/2025 (O1) and government microcredits (KUR) (O2). This directly addresses the weakness of limited access to capital (W1).
b) Management Capacity Building Program: To overcome the lack of management knowledge (W2), the cooperative will actively participate in government-facilitated mentoring and digital training programs (O4). This training will focus on professional financial management, marketing, and cooperative governance.
c) Business Modernization and Strengthening Bargaining Power: The cooperative will utilize available funding schemes (O2) to address the limitation of post-harvest facilities (W3). This modernization also aims to improve bargaining power (W4) by enhancing product quality and value addition.

Table 5. Mapping on IE Matrix

INTERNAL / EKSTERNAL	**STRENGTHS** *Positive Internal Factors*	**WEAKNESSES (W)** *Negative Internal Factors*
	1. High group solidarity & cohesion. 2. Basic experience in business management. 3. Availability of potential internal cadres/human resources. 4. Possesses unique and superior forest products. 5. Strong local knowledge	1. Limited access to formal capital. 2. Lack of professional management & financial knowledge. 3. Limited post-harvest facilities & infrastructure. 4. Weak bargaining position with middlemen/the market.
OPPORTUNITIES (O) *Positive External Factors*	**S-O STRATEGIES** ***(Using Strengths to Leverage Opportunities)***	**W-O STRATEGIES** ***(Overcoming Weaknesses by Leveraging Opportunities)***
1. Presence of Presidential Instruction No. 9/2025. 2. Support for initial capital, special government microcredits (KUR). 3. Potential for strategic partnerships with SOEs.	1. **Accelerate Cooperative Formation & Capital Access:** Leverage group solidarity (S1) and experience (S2) to immediately establish a legal entity to access initial capital support and special microcredits (KUR) (O2, O5).	.1. **Capacity Building Program:** Enhance management and financial knowledge (W2) through government-facilitated mentoring and training programs (O4).

4. Availability of mentoring and digital training programs. 5. Ease of permitting and support from local government	2. **Become a Strategic Supplier:** Optimize product advantages (S4) and local knowledge (S5) to establish partnerships with SOEs as a supplier for national food programs (O3).	2. **Business Modernization:** Overcome limited access to capital (W1) and facilities (W3) by utilizing funding schemes provided by the Presidential Instruction (O2) to strengthen bargaining power (W4).
THREATS (T) ***Negative External Factors***	**S-T STRATEGIES** ***(Using Strengths to Mitigate Threats)***	**W-T STRATEGIES** ***(Minimizing Weaknesses and Avoiding Threats)***
1. Potential for complex bureaucracy. 2. Negative reactions from competitors/middlemen. 3. Risk of dependency on government aid. 4. Potential for policy instability. 5. Risk of default due to market/harvest uncertainty.	1. **Build Self-Reliance & Brand:** Strengthen group cohesion (S1) and build a brand from product advantages (S4) to create market loyalty and counter negative reactions from middlemen (T2). 2. **Professional Governance:** Utilize internal cadres (S3) to build a self-reliant system to reduce the risk of dependency (T3) and prepare for policy changes (T4).	1. **Financial Risk Management:** Implement strict and transparent financial management (addressing W2) to minimize the risk of loan default (T5). 2. **Business Diversification:** Gradually build business diversification to reduce dependency on a single market in anticipation of reactions from middlemen (T2) and market uncertainty (T5)

1. Business and Marketing Development Pillar (S-O & S-T Strategies) This pillar aims to strengthen the cooperative's market position by leveraging product advantages and building business self-reliance.
   a) Becoming a Strategic Supplier for SOEs: Leveraging its product advantages (S4) and local knowledge (S5), the cooperative will position itself as a strategic supplier. The objective is to establish direct partnerships with State-Owned Enterprises (SOEs) or national food programs (O3), thereby securing a stable market and bypassing middlemen.
   b) Building Self-Reliance & Branding: To counter negative reactions from competitors/middlemen (T2), the cooperative will leverage member cohesion (S1) to build its own product brand. Creating a strong brand will enhance market loyalty and improve the image of KTH Panderman's products.
   c) Professional Governance for Self-Reliance: By optimizing potential internal cadres (S3), the cooperative will build an independent management system. This aims to reduce the risk of dependency on government aid (T3) and be better prepared for potential policy instability (T4) in the future.
2. Risk Management and Diversification Pillar (W-T Strategies) This pillar is designed to minimize internal weaknesses to build resilience against external threats, particularly those related to financial and market risks.
   a) Financial Risk Management: To address management weaknesses (W2) and confront the risk of loan default (T5), the cooperative will implement strict, transparent, and accountable financial management practices.
   b) Business Diversification: As a long-term strategy, the cooperative will gradually establish new

Table 6. Analysis Quantitative Strategic Planning Matrix (QSPM)

Key Factors	Weight	Strategy 1 (Aggressive) AS	Strategy 2 (Internal Strengthening) TAS	Strategy 3 (Defensive) AS	Strategy 4 (Diversification) TAS
Internal Factors					
S1: Group Solidarity	0.15	4	0.60	3	0.45
S2: Member Experience	0.10	3	0.30	3	0.30
S3: Internal Cadres	0.05	2	0.10	3	0.15
S4: Product Advantage	0.10	4	0.40	3	0.30
S5: Local Knowledge	0.05	3	0.15	2	0.10
W1: Capital Limitation	0.20	4	0.80	3	0.60
W2: Lack of Management	0.15	2	0.30	4	0.60
W3: Post-harvest Facilities	0.10	3	0.30	4	0.40
W4: Weak Bargaining Position	0.10	4	0.40	3	0.30
Internal Subtotal	1.00		3.35		3.20
External Factors					
O1: Capital Support (Presidential Instruction)	0.15	4	0.60	2	0.30
O2: Access to Microcredits (KUR)	0.15	4	0.60	3	0.45
O3: Partnership with SOEs	0.20	4	0.80	2	0.40
O4: Training & Mentoring	0.10	2	0.20	4	0.40
T1: Competitor Reaction	0.15	2	0.30	3	0.45
T2: Dependency on Aid	0.10	1	0.10	3	0.30
T3: Policy Instability	0.05	1	0.05	2	0.10
T4: Risk of Default	0.10	2	0.20	3	0.30
External Subtotal	1.00		2.85		2.70
TOTAL SCORE (TAS)			6.20		5.90

Based on the Total Attractiveness Score (TAS), the strategic priorities are ranked as follows:

1. Strategy 1: Acceleration & Strategic Partnership (Score: 6.20)
   This strategy is the highest priority because it directly addresses the most critical weakness (W1: Capital Limitation) by capitalizing on the most significant opportunities (O1, O2, O3: Access to Funding and Partnerships). It is the most effective approach for leveraging key strengths, such as group solidarity (S1) and product advantage (S4), to improve the group's bargaining position (W4) and penetrate more stable markets (i.e., partnerships with SOEs).
2. Strategy 2: Internal Strengthening & Modernization (Score: 5.90)
   This second-ranked priority is critical and nearly as important as the first. This strategy focuses on strengthening the cooperative's internal foundation, particularly by addressing weaknesses in management (W2) and facilities (W3) by leveraging training opportunities

(O4). Although it may not generate revenue as quickly as the first strategy, it builds vital long-term capabilities.

3. Strategy 3: Brand Independence & Governance (Score: 5.00)
   This strategy is defensive yet essential. Its focus is on mitigating the threats of dependency (T2) and competitor reactions (T1) by building a strong brand identity. This is a logical subsequent step once the cooperative has secured better capital and management.
4. Strategy 4: Risk Management & Diversification (Score: 4.70)
   This strategy is ranked last not because it is unimportant, but because it is more long-term in nature and requires an already solid foundation. Business diversification and rigorous financial risk management are most effective when core operations are stable and profitable.

Strategies 1 and 2 should be implemented in parallel. The cooperative should immediately establish a legal entity to access capital and partnerships (Strategy 1), while simultaneously participating in training programs to enhance management capacity and plan for facility modernization (Strategy 2). Once this foundation is secure, the cooperative can then focus on brand development (Strategy 3) and business diversification (Strategy 4) for long-term sustainability.

CONCLUSIONS AND SUGGESTION

Conclusion

Positioned strongly in the "Grow and Build" quadrant (IFE 3.54; EFE 3.49), KTH Panderman's implementation of the Merah Putih Cooperative is highly feasible. An aggressive growth strategy, guided by the QSPM, is recommended. This involves a synergistic dual approach simultaneously pursuing external acceleration by forming a legal entity to access capital and partnerships, alongside internal strengthening through management training and modernization. This parallel strategy is the most effective way for KTH to optimize its potential and become a driver of the local economy.

REFERENCES

Ade Intan Christian & Subejo. (2018). Akses, Fungsi, Dan Pola Penggunaan Teknologi Informasi Dan Komunikasi (Tik) Oleh Petani Pada Kawasan Pertanian Komersial Di Kabupaten Bantul Access, Functions, and Use Pattern of Information and Communication Technology (Ict) in Commercial Area in Ba. *Jsep* , *11*(2), 25–30.

Ainurofiq, A. (2021). Evaluation and Challenges of Research Groups in Higher Education: A Study in Faculty of Mathematics and Natural Sciences, Sebelas Maret University. *Journal of Higher Education Theory and Practice*, *21*(15). https://doi.org/10.33423/jhetp.v21i15.4903

Alleva, G., Falorsi, P. D., Falorsi, S., Fasulo, A., & Righi, P. (2025). Building Estimates for Totals in Respondent Driven Sampling. *Statistical Journal of the Iaos*, *41*(1), 50–61. https://doi.org/10.1177/18747655251325424

Basnet, R. K. (2023). Role of Cooperatives in Women Empowerment in the Nepalese Context. *Cognition*, *5*(1), 99–105. https://doi.org/10.3126/cognition.v5i1.55417

Benos, T., Kalogeras, N., Verhees, F., Sergaki, P., & Pennings, J. (2015). Cooperatives' organizational restructuring, strategic attributes, and performance: the case of agribusiness cooperatives in greece. Agribusiness, 32(1), 127-150. https://doi.org/10.1002/agr.21429

Berge, S., Bokoumbo, K., Johnson, K. A., Yabi, J. A., & Yegbemey, R. N. (2021). Cooperative Development: Sustainability Agricultural Planning Viewed Through Cooperative Equilibrium Management Theory in Togo, Africa. *Frontiers in Sustainable Food Systems*, *5*. https://doi.org/10.3389/fsufs.2021.758363

Burhaniah, E. N. I., & Krismayani, I. (2023). Perilaku Pencarian Informasi Sebagai Sumber Gagasan Penulisan Berita Di Era Pandemi Covid-19: Studi Kasus "Lembaga Pers Mahasiswa Hayamwuruk" Fakultas Ilmu Budaya Universitas Diponegoro. *Anuva Jurnal Kajian Budaya Perpustakaan Dan Informasi*, *7*(1), 162–174. https://doi.org/10.14710/anuva.7.1.162-174

Chadyšas, V., & Krapavickaitė, D. (2016). Estimation of the Current Population Total for a Four-Phase Sampling Design. *Nonlinear Analysis Modelling and Control*, *21*(2), 241–260. https://doi.org/10.15388/na.2016.2.7

Cherotich, B. C., & Njoroge, J. (2022). Women Leadership and Economic Empowerment inKajiado County, Kenya. *International Journal of Advances in Scientific Research and Engineering*, *08*(06), 25–42. https://doi.org/10.31695/ijasre.2022.8.6.4

Crookston, B. T., West, J., Davis, S. F., Hall, C., Seymour, G., & Gray, B. (2021). Understanding Female and Male Empowerment in Burkina Faso Using the Project-Level Women's Empowerment in Agriculture Index (Pro-Weai): A Longitudinal Study. *BMC Women S Health*, *21*(1). https://doi.org/10.1186/s12905-021-01371-9

Deng, L., Chen, L., Zhao, J., & Wang, R. (2021). Comparative Analysis on Environmental and Economic Performance of Agricultural Cooperatives and Smallholder Farmers: The Case of Grape Production in Hebei, China. *Plos One*, *16*(1), e0245981. https://doi.org/10.1371/journal.pone.0245981

Diiro, G., Seymour, G., Kassie, M., Muricho, G., & Muriithi, B. (2018). Women's Empowerment in Agriculture and Agricultural Productivity: Evidence From Rural Maize Farmer Households in Western Kenya. *Plos One*, *13*(5), e0197995. https://doi.org/10.1371/journal.pone.0197995

Everest, B. (2021). Willingness of Farmers to Establish a Renewable Energy (Solar and Wind) Cooperative in NW Turkey. *Arabian Journal of Geosciences*, *14*(6). https://doi.org/10.1007/s12517-021-06931-9

Ewerling, F., Lynch, J., Victora, C. G., Eerdewijk, A. v., Tyszler, M., & Barros, A. J. D. (2017). The SWPER Index for Women's Empowerment in Africa: Development and Validation of an Index Based on Survey Data. *The Lancet Global Health*, *5*(9), e916–e923. https://doi.org/10.1016/s2214-109x(17)30292-9

Firdaus, F., & Nursakinah. (2023). Management of the Lati Petangis Grand Forest Park (TAHURA): Roles and Perceptions of Forest Farmer Groups. *Iop Conference Series Earth and Environmental Science*, *1282*(1), 12009. https://doi.org/10.1088/1755-1315/1282/1/012009

García-Salgado, S., Quijano, M. Á., & Torres, M. S. (2008). Assessment of Total Arsenic and Arsenic Species Stability in Alga Samples and Their Aqueous Extracts. *Talanta*, *75*(4), 897–903. https://doi.org/10.1016/j.talanta.2007.12.031

Giagnocavo, C., Gómez, E. G., & Mesa, J. C. P. (2018). Cooperative Longevity and Sustainable Development in a Family Farming System. *Sustainability*, *10*(7), 2198. https://doi.org/10.3390/su10072198

Golovina, S., Mikolaychik, I. N., Poltarykhin, A. L., & Zhuravlev, P. (2021). The Impact of Human Capital on the Success of an Agricultural Cooperative (Example of 'Arla Foods'). *Siberian Journal of Life Sciences and Agriculture*, *13*(2), 262–283. https://doi.org/10.12731/2658-6649-2021-13-2-262-283

GÜREL, E. (2017). Swot Analysis: A Theoretical Review. *Journal of International Social Research*, *10*(51), 994–1006. https://doi.org/10.17719/jisr.2017.1832

Habtewold, T. M. (2021). Improved Agricultural Innovations and Women's Empowerment: Multidimensionality of Empowerment and Program Evaluation Approach. *Modern Concepts & Developments in Agronomy*, *9*(1). https://doi.org/10.31031/mcda.2021.09.000701

Helms, M. M., & Nixon, J. (2010). Exploring SWOT Analysis – Where Are We Now? *Journal of Strategy and Management*, *3*(3), 215–251. https://doi.org/10.1108/17554251011064837

Hordofa, D. F., & Badore, M. A. (2023). *Assessing the Impact of Social, Demographic, and Economic Factors on the Economic Empowerment of Rural Women in Agricultural Activitie : A Partial Proportional Odds Model Analysis in Dire Dawa Administration, Ethiopia*. https://doi.org/10.21203/rs.3.rs-2687187/v1

Kandi, L. P., Ma, S., Xu, Z., & Dooley, K. E. (2025). Women in Agricultural Marketing: A Systematic Review of Motivations, Opportunities, and Challenges. *Outlook on Agriculture*, *54*(1), 3–15. https://doi.org/10.1177/00307270241305644

Kasturi, K. (2019). Factors Influencing Women Empowerment Among Kurumba Tribes in Niligiris District. *Huss International Journal of Research in Humanities and Social Sciences*, *6*(2), 60. https://doi.org/10.15613/hijrh/2019/v6i2/190582

Khonitan, D., & Utami, B. N. (2018). Motivasi Generasi Muda Dalam Menyongsong Revolusi Industri 4.0 Melalui Pendidikan Bidang Pertanian Di Sekolah Tinggi Penyuluhan Pertanian Malang. *Jurnal Sains Psikologi*, *8*(1), 162–170. https://doi.org/10.17977/um023v8i12019p162

Kubitza, C., Krishna, V. V, Urban, K., Alamsyah, Z., & Qaim, M. (2018). Land Property Rights, Agricultural Intensification, and Deforestation in Indonesia. *Ecological Economics*, *147*, 312–321. https://doi.org/10.1016/j.ecolecon.2018.01.021

Kurniawati, K., & Mulyono, K. T. B. (2023). Asset Analysis and Sustainable Strategies for Forest Management: A Case Study of the Organic Forest Farmer Group and the Citarum Watershed Upstream Farmer Group. *Journal of Social Research*, *2*(3), 818–825. https://doi.org/10.55324/josr.v2i3.731

Lee, Y., Rianti, I. P., & Park, M. S. (2017). Measuring Social Capital in Indonesian Community Forest Management. *Forest Science and Technology*, *13*(3), 133–141. https://doi.org/10.1080/21580103.2017.1355335

Limbong, C., Samsuri, S., & Ahmad, A. G. (2023). Strategy to Strengthening Forest Farming for Sustainable Mangrove Forest Management in the Coastal Area, Deli Serdang, Indonesia. *Journal of Sylva Indonesiana*, *6*(01), 29–43. https://doi.org/10.32734/jsi.v6i01.9154

Liu, T., & Wu, G. (2021). Does Agricultural Cooperative Membership Help Reduce the Overuse of Chemical Fertilizers and Pesticides? Evidence From Rural China. *Environmental Science and Pollution Research*, *29*(5), 7972–7983. https://doi.org/10.1007/s11356-021-16277-0

Ma, W., & Abdulai, A. (2018). IPM Adoption, Cooperative Membership and Farm Economic Performance. *China Agricultural Economic Review*, *11*(2), 218–236. https://doi.org/10.1108/caer-12-2017-0251

Ma, W., Marini, M. A., & Rahut, D. B. (2023). Farmers' organizations and sustainable development: An introduction. *Annals of Public and Cooperative Economics*, *94*(3), 683–700. https://doi.org/10.1111/apce.12449

Makinde, C. O. B. (2021). The Interactive Impact Between Empowerment and Women Empowerment Programs in Selected Local Government Areas in Ekiti State. *Texila International Journal of Management*, *7*(2), 38–45. https://doi.org/10.21522/tijmg.2015.07.02.art005

Malapit, H., & Quisumbing, A. (2015). What Dimensions of Women's Empowerment in Agriculture Matter for Nutrition in Ghana? *Food Policy*, *52*, 54–63. https://doi.org/10.1016/j.foodpol.2015.02.003

Maloka, C., Mashamaite, K., & Ledwaba, M. (2014). Local economic development: linking theory and practice in south africa's local municipalities. Mediterranean Journal of Social Sciences. https://doi.org/10.5901/mjss.2014.v5n20p218

Maryudi, A., Citraningtyas, E. R., Purwanto, R. H., Sadono, R., Suryanto, P., Riyanto, S., & Siswoko, B. D. (2016). The Emerging Power of Peasant Farmers in the Tenurial Conflicts Over the Uses of State Forestland in Central Java, Indonesia. *Forest Policy and Economics*, *67*, 70–75. https://doi.org/10.1016/j.forpol.2015.09.005

Meigs, R., Mohamed, A., Bearse, A., Vicente, S., Dang, N., Deiranieh, A., … & Meléndrez, B. (2024). Community-led transformation principles: transforming public health learning systems by centering authentic collaboration with community-based organizations. Learning Health Systems, 8(4). https://doi.org/10.1002/lrh2.10451

Melesse, M. B. (2021). The Effect of Women's Nutrition Knowledge and Empowerment on Child Nutrition Outcomes in Rural Ethiopia. *Agricultural Economics*, *52*(6), 883–899. https://doi.org/10.1111/agec.12668

Muddassir, M., Alotaibi, B. A., & Azeem, M. I. (2024). Willingness to Adopt Biodegradable Mulch Among Farmers in Saudi Arabia: Implications for Agricultural Extension. *Frontiers in Sustainable Food Systems*, *8*. https://doi.org/10.3389/fsufs.2024.1423136

Mursyidin, M., Darmansyah, D., & Yulianda, R. (2023). The Role of a Women's Cooperative to Improve the Welfare of Women Coffee Farmers in Bener Meriah Regency, Indonesia. *Journal of Madani Society*, *2*(3), 195–202. https://doi.org/10.56225/jmsc.v2i3.268

Nakayama, H., Rustiadi, E., & Fauzi, A. (2024). Does Social Forestry Contribute to Farmers' Income?: A Case Study of Two Mountainous Villages on Java Island, Indonesia. *Journal of Regional and Rural Development Planning*, *8*(1), 1–10. https://doi.org/10.29244/jp2wd.2024.8.1.1-10

Onyemauwa, C. S. (2012). Analysis of Women Participation in Cassava Production and Processing in Imo State, Southeast Nigeria. *Agricultura Tropica Et Subtropica*, *45*(2). https://doi.org/10.2478/v10295-012-0012-9

Othman, A., Ali, K., Yin, I., Tan, M., & Jizan, N. (2021). Urbanization and land use changes in rural town: guar cempedak, kedah. Planning Malaysia, 19. https://doi.org/10.21837/pm.v19i19.1055

Pambudi, A. S. (2020). The Development of Social Forestry in Indonesia: *The Journal of Indonesia Sustainable Development Planning*, *1*(1), 57–66. https://doi.org/10.46456/jisdep.v1i1.11

Patrick, P., & Osadebe, U. (2017). Evaluation of Undergraduate Students' Performance in Test and Measurement Achievement Test With Samples From Probabilistic and Non-Probabilistic Sampling Procedures. *Asian Journal of Assessment in Teaching and Learning*, *7*, 26–31. https://doi.org/10.37134/ajatel.vol7.3.2017

Prabawani, B., Hadi, S. P., Fisher, M. R., Warsono, H., Dewi, R. S., & Ainuddin, I. (2024). Socioeconomic perspective of agroforestry development in Central Java. *Environmental and Sustainability Indicators*, *22*(May 2023), 100354. https://doi.org/10.1016/j.indic.2024.100354

Purnawan, E., Brunori, G., & Prosperi, P. (2022). Small Family Farms, A Review in Indonesian Context. *International Journal of Multidisciplinary: Applied Business and Education Research*, *3*(12), 2708–2725. https://doi.org/10.11594/ijmaber.03.12.23

Purnomo, M., Hadiwiyono, E., Andriatmoko, N. D., Pariasa, I. I., Kustanti, A., & Faust, H. (2022). Transformation Role of Forest Farmer Group's (FFGs) in Indonesia From Development Agent to Brokering Project. *Sage Open*, *12*(1). https://doi.org/10.1177/21582440221082144

Rahman, S. A., Jacobsen, J. B., Healey, J. R., Roshetko, J. M., & Sunderland, T. (2016). Finding Alternatives to Swidden Agriculture: Does Agroforestry Improve Livelihood Options and Reduce Pressure on Existing Forest? *Agroforestry Systems*, *91*(1), 185–199. https://doi.org/10.1007/s10457-016-9912-4

Rifa'i, Y. (2023). Analisis Metodologi Penelitian Kulitatif Dalam Pengumpulan Data Di Penelitian Ilmiah Pada Penyusunan Mini Riset. *Cendib*, *1*(1), 31–37. https://doi.org/10.59996/cendib.v1i1.155

Slameto, S., Haryadi, F. T., & Subejo, S. (2015). Perbedaan Tahapan Pembelajaran Sekolah Lapang Pengelolaan Tanaman Terpadu Padi Sawah antar Komunitas Petani di Lampung. *Jurnal Penyuluhan*, *11*(1). https://doi.org/10.25015/penyuluhan.v11i1.9934

Soemitra, A., Kusmilawaty, K., & Rahma, T. I. F. (2022). The Role of Micro Waqf Bank in Women's Micro-Business Empowerment Through Islamic Social Finance: Mixed-Method Evidence From Mawaridussalam Indonesia. *Economies*, *10*(7), 157. https://doi.org/10.3390/economies10070157

Sukmayanto, M., Hasanuddin, T., & Listiana, I. (2022). The Capacity of Farmers in Rice Farming in Kabupaten Lampung Tengah. *Agriecobis Journal of Agricultural Socioeconomics and Business*, *5*(1), 1–11. https://doi.org/10.22219/agriecobis.v5i1.16280

Suparyana, P. K., Sukardi, L., Yakin, A., Amiruddin, A., & Sa'diyah, H. (2022). The Potential of Forest Resource Management at Farmer Groups in the Rarung Forest Area. *Iop Conference Series Earth and Environmental Science*, *1107*(1), 12028. https://doi.org/10.1088/1755-1315/1107/1/012028

Tarlani, & Sirajuddin, T. (2020). Rural development strategies in Indonesia: Managing villages to achieve sustainable development. *IOP Conference Series: Earth and Environmental Science*, *447*(1). https://doi.org/10.1088/1755-1315/447/1/012066

Tavares, M. F., Gallo, P., Nascimento, N., Bauhus, J., Brancalion, P. H. S., & Feurer, M. (2024). Smallholders' perspectives, motivations, and incentives for restoring the Brazilian Atlantic Forest. *Restoration Ecology*, *32*(8), 1–12. https://doi.org/10.1111/rec.14270

Teng, Y., Pang, B., Wei, J., Li, M., Yang, H., & Tian, Z. (2022). Behavioral Decision-Making of the Government, Farmer-Specialized Cooperatives, and Farmers Regarding the Quality and Safety of Agricultural Products. *Frontiers in Public Health*, *10*. https://doi.org/10.3389/fpubh.2022.920936

Tridakusumah, A. C., Supyandi, D., Arari, M., Kurnia, G., & Sukayat, Y. (2021a). The analysis of farmers' access mechanism and social network in community-based forest management programs in Garut Regency, West Java Province Indonesia. *E3S Web of Conferences*, *316*. https://doi.org/10.1051/e3sconf/202131604007

Tridakusumah, A. C., Supyandi, D., Arari, M., Kurnia, G., & Sukayat, Y. (2021b). The Analysis of Farmers' Access Mechanism and Social Network in Community-Based Forest Management Programs in Garut Regency, West Java Province Indonesia. *E3s Web of Conferences*, *316*, 4007. https://doi.org/10.1051/e3sconf/202131604007

URHIBO, B. O., & Orhero, A. E. (2023). Rural Women Empowerment and Development in Nigeria. *Journal of Public Administration Finance and Law*, *27*, 499–513. https://doi.org/10.47743/jopafl-2023-27-39

Vorodam, J., Rashid, M., & Misnan, S. (2022). Settlement as a determinant for community's resilience to local economic development in ghana. Iop Conference Series Earth and Environmental Science, 1082(1), 012005. https://doi.org/10.1088/1755-1315/1082/1/012005

Wu, Y., Lupi, F., Dietz, T., & Liu, J. (2016). Dynamics of economic transformation., 109-119. https://doi.org/10.1093/acprof:oso/9780198703549.003.0009

Yuliati, Y., & Utami, B. N. (2024). Community participation in the management of land conservation areas and educational tourism at forest farmer groups, Panderman District Batu, Batu City, Indonesia. *Caspian Journal of Environmental Sciences*, *22*(1), 111–127. https://doi.org/10.22124/cjes.2024.7446

Zhang, H., & Wu, D. (2023). The Impact of Agricultural Factor Inputs, Cooperative-Driven on Grain Production Costs. *Agriculture*, *13*(10), 1952. https://doi.org/10.3390/agriculture13101952

Zhao, X., & Grafström, A. (2020). A Sample Coordination Method to Monitor Totals of Environmental Variables. *Environmetrics*, *31*(6). https://doi.org/10.1002/env.2625

Zhao, M., Lin, Y., & Derudder, B. (2017). Demonstration of public participation and communication through social media in the network society within shanghai. Environment and Planning B Urban Analytics and City Science, 45(3), 529-547. https://doi.org/10.1177/2399808317690154