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Strategy for Developing Four-Wheel Tractor Utilization at the Agricultural Agribusiness UPTD of Maros Regency

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ABSTRACT

Agricultural mechanization through four-wheel tractors (TR4) plays a critical role in improving rice farming efficiency and addressing persistent labor shortages in rural areas. However, research on the institutional development strategies of government-managed Alsintan service units (UPTD) at the district level remains limited in the Indonesian context. This study aims to (1) identify internal and external factors influencing TR4 utilization at the UPTD of Agricultural Agribusiness Management of Maros Regency, and (2) formulate strategic development recommendations. Data were collected through structured interviews and questionnaires involving 15 purposively selected respondents comprising UPTD managers, field extension officers, farmers, and representatives from related agencies. SWOT analysis was applied using Internal Factor Analysis Summary (IFAS) and External Factor Analysis Summary (EFAS) matrices with weighted scoring. Results indicated that the IFAS strength score (3.340) exceeded the weakness score (3.098), and the EFAS opportunity score (3.091) exceeded the threat score (2.856), positioning the UPTD in Quadrant I (Aggressive/SO Strategy). The identified priority strategies are: (1) socialization of TR4 services supported by relevant government agencies; (2) strengthening multi-stakeholder cooperation; (3) application of competitive rental rates; and (4) expansion of TR4 fleet availability through policy advocacy. These findings provide evidence-based recommendations for institutional development and agricultural mechanization policy in Maros Regency.

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1. INTRODUCTION

Agricultural mechanization is widely recognized as a key driver of productivity enhancement in developing country farming systems (Diao et al., 2014; Sulaiman et al., 2018). In Indonesia, the strategic use of Agricultural Equipment and Machinery (Alsintan), particularly four-wheel tractors (TR4), has been central to national efforts to increase rice production, reduce labor dependency, and improve farming efficiency (Aldillah, 2016; Saliem et al., 2015). The substitution of animal traction and manual labor with mechanized land preparation has demonstrated measurable impacts on farming cost reduction and harvest cycle intensification in various rice-producing regions (Handaka, 2012; Owombo et al., 2012).

Maros Regency, located in South Sulawesi, is one of the principal rice-producing districts in the region, where the majority of the population is engaged in agricultural activities. The availability of affordable and accessible Alsintan services is therefore critical to sustaining and improving local agricultural productivity (Department of Agriculture and Food Security Maros Regency, 2017). To address these needs, the Agribusiness Management Technical Implementation Unit (UPTD) of the Maros Regency Agriculture and Food Security Office was formally established in 2017 under Regent Regulation No. 133 of 2017 as a government-managed Alsintan

rental service provider. Since its establishment, the UPTD has contributed to increasing the farming cycle from twice to three harvests per year and reducing production costs by up to 30% (UPTD of Agricultural Agribusiness Management Maros Regency, 2022).

Previous studies on Alsintan service institutions in Indonesia have largely focused on farmer-owned or cooperative-based Alsintan Service Business Units (UPJA). Yeni and Dewi (2014) analyzed UPJA institutional performance in Pelalawan Regency and identified coordination and capital limitations as primary constraints. Galib (2010) found that institutional capacity and fleet management were key determinants of UPJA sustainability in South Kalimantan. Erniati et al. (2020) applied SWOT analysis to agricultural mechanization in Kapuas Hulu, West Kalimantan, and identified managerial competence and government support as critical success factors for SO-positioned institutions. Notably, however, research specifically examining government-owned UPTD entities at the district level,which operate under distinct institutional, regulatory, and budgetary frameworks from farmer-managed UPJA,remains scarce in the literature, particularly in the context of Sulawesi.

This study addresses that gap by applying a weighted SWOT analysis framework (IFAS-EFAS) to systematically identify the internal and external strategic factors affecting TR4 utilization at the UPTD of Maros Regency and to formulate context-appropriate development strategies. The novelty of this study lies in its focus on a government-managed UPTD as a distinct institutional type, providing findings that are directly applicable to local government policy for agricultural mechanization services in Maros Regency and potentially transferable to similar institutional settings across South Sulawesi.

Specifically, this study aims to: (1) identify and analyze the internal and external factors influencing the development of TR4 utilization at the UPTD of Agricultural Agribusiness Management of Maros Regency; and (2) formulate strategic development options for TR4 utilization at the UPTD based on SWOT analysis results.

2. METHODS

2.1 Research Location and Period

This research was conducted from June to August 2024 at the UPTD of Agricultural Agribusiness Management of the Maros Regency Agriculture and Food Security Office. Maros Regency was selected as the research site due to its strategic importance as a rice-producing district in South Sulawesi and because the UPTD serves as the primary institutional provider of TR4 rental services in the regency.

2.2 Data Collection

Data collection combined primary and secondary sources. Primary data were obtained through structured interviews and questionnaires administered directly to respondents involved in the TR4 management and utilization system. Secondary data were sourced from official institutional documents, including the UPTD Annual Report (2022), the Maros Regent Regulation No. 50 of 2022, and the 2023 Alsintan inventory records (UPTD of Agricultural Agribusiness Management Maros Regency, 2023).

2.3 Sampling Method

Respondents were selected through purposive sampling, a technique appropriate for institutional case studies where the focus is on key informants who hold direct knowledge of the phenomena under investigation (Galib, 2010; Yeni and Dewi, 2014). A total of 15 respondents were selected across five stakeholder groups: (1) UPTD management comprising the Head of UPTD, Head of Administration, and Alsintan Manager (3 persons); (2) the Alsintan mechanic (1 person); (3) farmers/tenants from three sub-districts,Simbang, Bantimurung, and a third sub-district (3 persons); (4) Field Agricultural Extension Officers (PPL) from three sub-districts (3 persons); and (5) representatives from the District Agriculture Office, the Regional Finance Agency, and similar competitor UPTD entities (5 persons). While the total number of respondents is limited, this is consistent with the key informant approach employed in qualitative institutional assessments, where respondent expertise and positional authority are prioritized over sample size (Erniati et al., 2020).

2.4 Data Analysis

Data were analyzed using SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis through the Internal Factor Analysis Summary (IFAS) and External Factor Analysis Summary (EFAS) matrices. The SWOT framework is widely used to systematically evaluate institutional strategic positions and has been applied in previous agricultural mechanization studies in Indonesia (Erniati et al., 2020; Yeni and Dewi, 2014). Each factor was assigned a weight (reflecting relative importance) and a rating (reflecting performance level) by respondents, and a weighted score was calculated as the product of weight and rating. The total IFAS and EFAS scores determined the strategic quadrant position, from which strategic alternatives were formulated using a SWOT matrix crossover approach.

3. RESULTS AND DISCUSSION

3.1 Overview of the UPTD of Agricultural Agribusiness Management, Maros Regency

The UPTD of Agricultural Agribusiness Management was formally established in 2017 under Regent Regulation No. 133 of 2017, as a government-owned Alsintan leasing institution under the Maros Regency Agriculture and Food Security Office. Its operational mandate is to provide affordable and accessible TR4 rental services to farming communities across Maros Regency, as a mechanism for both increasing agricultural productivity and generating Regional Original Revenue (PAD).

As of 2024, the UPTD operates a fleet of 8 TR4 units (7 Iseki and 1 Yanmar brands) and employs 7 operational personnel, consisting of 2 tractor operators, 2 mechanics, 1 Alsintan manager, 1 Alsintan supervisor, and 1 warehouse guard. Each unit has a capacity of approximately 1 ha/day of land preparation, contingent on field conditions and weather. Since its establishment, the UPTD has contributed to the intensification of the rice farming cycle from twice to three harvests annually and has enabled production cost reductions of up to 30% for tenant farmers, consistent with national findings on the economic benefits of Alsintan utilization (Aldillah, 2016; Sulaiman et al., 2018). The UPTD's service users include organized farmer groups, individual tenant farmers, and other agricultural users across multiple sub-districts in Maros Regency.

3.2 Internal Factor Analysis (IFAS)

The IFAS matrix presents the weighted scores of internal strength and weakness factors identified through respondent assessments. Results are presented in Table 1.

Table 1. Internal Factor Analysis Summary (IFAS) of TR4 Utilization at the UPTD of Agricultural Agribusiness Management, Maros Regency

IFAS FACTOR	Weight	Rating	Score	Note
STRENGTHS				
Managerial Skills	0.205	3.533	0.724	
Total TR4 Fleet	0.196	3.000	0.587	
Operator and Mechanical Skills	0.224	3.867	0.865	Highest
Budget Availability	0.189	3.000	0.568	
TR4 Quality/Technology	0.186	3.200	0.596	
Subtotal Strengths	1.000		**3.340**	
WEAKNESSES				
Limited TR4 Fleet	0.215	3.133	0.672	
Customer Service Quality	0.204	3.267	0.665	
Inter-Agency Coordination	0.193	3.467	0.668	
UPTD Management Discipline	0.236	3.200	0.756	Highest
Lack of Socialization	0.153	2.200	0.336	Lowest
Subtotal Weaknesses	1.000		**3.098**	

Table 1 shows that among the strength factors, **Operator and Mechanical Skills** recorded the highest weighted score (0.865), followed by Managerial Skills (0.724). The centrality of skilled operators and institutional management in Alsintan service delivery aligns with national-level findings by Aldillah (2016), who identified operator competence as a key determinant of successful mechanization adoption, and with Sulaiman et al. (2018), who emphasized that qualified human resources are fundamental to the sustainability of Indonesia's agricultural mechanization institutions. Erniati et al. (2020) similarly found that managerial competence was the primary

strength factor in their SWOT analysis of agricultural mechanization institutions in West Kalimantan, reinforcing the cross-regional significance of this factor.

Among the weaknesses, **UPTD Management Discipline** recorded the highest score (0.756), indicating that internal governance and personnel commitment are areas requiring priority attention. Galib (2010) similarly identified internal management discipline as a recurring constraint in UPJA institutional performance assessments in South Kalimantan, noting that lapses in operational protocols frequently led to underutilization of machinery assets. Yeni and Dewi (2014) found analogous coordination failures in UPJA management in Riau, where inadequate inter-member commitment undermined service continuity. The **Lack of Socialization** recorded the lowest score (0.336) among weaknesses, reflecting insufficient community outreach activities,a factor that, if unaddressed, limits the institution's ability to expand its service user base (Indraningsih et al., 2017).

3.3 External Factor Analysis (EFAS)

The EFAS matrix presents the weighted scores of external opportunity and threat factors. Results are presented in Table 2.

Table 2. External Factor Analysis Summary (EFAS) of TR4 Utilization at the UPTD of Agricultural Agribusiness Management, Maros Regency

EFAS FACTOR	Weight	Rating	Score	Note
OPPORTUNITIES				
Government Support and Assistance	0.199	3.000	0.596	
Budget Availability	0.185	2.933	0.542	
TR4 Spare Parts Availability	0.188	2.800	0.527	
Competitive TR4 Rental Rates	0.240	3.533	0.849	Highest
Economic Advantages for Farmers	0.188	3.067	0.577	
Subtotal Opportunities	1.000		**3.091**	
THREATS				
Competitors of UPTD Services	0.205	3.133	0.644	
Aging TR4 Fleet	0.212	2.800	0.595	
Strong Social Networks Among Farmers	0.199	3.267	0.649	
Low Farmer Rental Interest/Demand	0.168	2.000	0.336	Lowest
Farmer Knowledge of TR4 Technology	0.216	2.933	0.633	
Subtotal Threats	1.000		**2.856**	

The EFAS results indicate that among opportunity factors, **Competitive TR4 Rental Rates** recorded the highest score (0.849). This finding is consistent with the broader mechanization literature: Diao et al. (2014), in a study of agricultural mechanization in Ghana, identified affordable and transparent rental pricing as the most critical determinant of machinery adoption by smallholder farmers, particularly in contexts of limited farmer capital. Similarly, Murti et al. (2018) found that cost-effective tractor operations are fundamental to the viability of Alsintan rental services in Indonesian rice farming contexts. The competitive rental rates established by Maros Regent Regulation No. 50 of 2022 (Maros Regency Government, 2022) therefore represent a significant institutional asset that should be actively leveraged in UPTD's development strategy.

On the threat side, **Strong Social Networks Among Farmers** (0.649) and **UPTD Competitors** (0.644) were identified as the most pressing threats. These social networks can divert rental demand toward informal or competitor service providers. Galib (2010) noted a similar dynamic in South Kalimantan, where farmer loyalty to

informal rental arrangements,often based on personal relationships,posed a persistent challenge for formal UPJA institutions. Notably, **Low Farmer Rental Interest** recorded the lowest threat score (0.336), which may reflect the adequacy of existing demand rather than its absence, particularly since tenants reported high satisfaction with current rental terms and service quality.

The **Aging TR4 Fleet** (0.595) also represents a structural threat that requires anticipatory policy responses. As documented by Sulaiman et al. (2018), aging machinery diminishes service reliability and increases maintenance costs, which progressively erodes the competitive position of public mechanization institutions. The current policy constraint imposed by Ministerial of Home Affairs regulations on regional capital expenditure (Permendagri) further complicates fleet renewal efforts, highlighting the need for advocacy-based strategies to enable TR4 procurement.

3.4 SWOT Matrix and Strategic Formulation

The SWOT quadrant position of the UPTD is determined by comparing the subtotal scores of strengths versus weaknesses (S − W = 3.340 − 3.098 = +0.242) and opportunities versus threats (O − T = 3.091 − 2.856 = +0.235). Both values are positive, placing the UPTD in **Quadrant I (Aggressive/SO Strategy)**, indicating that the institution currently operates from a position of internal strength and in a favorable external environment. This position implies that the UPTD should pursue growth-oriented strategies that leverage its strengths to capitalize on existing opportunities (Erniati et al., 2020).

The resulting SWOT strategy matrix is presented in Table 3.

Table 3. SWOT Strategy Matrix for TR4 Utilization at the UPTD of Agricultural Agribusiness Management, Maros Regency

IFAS / EFAS	**STRENGTHS (S) • Managerial Skills • TR4 Fleet • Operator/Mechanical Skills • Budget • TR4 Technology**	**WEAKNESSES (W) • Limited TR4 • Customer Service • Inter-Agency Coordination • Management Discipline • Lack of Socialization**
OPPORTUNITIES (O) • Gov. Support • Budget Availability • Spare Parts • Rental Rates • Economic Benefits	**S–O (Aggressive) Strategies** SO1: Utilize managerial skills to conduct socialization with support from government agencies (S1, O1) SO2: Leverage budget capacity to propose TR4 fleet expansion and maintenance programs (S4, O2) SO3: Expand service coverage using TR4 technology advantage and spare parts availability (S5, O3) SO4: Strengthen institutional cooperation to maximize economic benefits for farmers (S1, O5)	**W–O Strategies** WO1: Conduct government-supported socialization to address the lack of outreach (W5, O1) WO2: Use available budget to supplement TR4 fleet and reduce current limitation (W1, O2) WO3: Improve management discipline to strengthen institutional sustainability and economic performance (W4, O5) WO4: Coordinate with relevant agencies to set competitive rental rates (W3, O4)
THREATS (T) • Competitors • Aging TR4 • Social Networks • Low Demand • Low Knowledge	**S–T Strategies** ST1: Apply managerial skills to review rental tariffs and counter competitor pressure (S1, T1) ST2: Use operator skills for intensive TR4 maintenance to address aging fleet concerns (S3, T2) ST3: Build close relationships with farmer groups to compete with informal social rental networks (S1, T3) ST4: Provide operator training to demonstrate TR4 technology advantages and stimulate demand (S5, T5)	**W–T Strategies** WT1: Review rental rates and improve service standards to counter competitors and social networks (W1, T1, T3) WT2: Improve communication and provide TR4 technology information to increase farmer knowledge and demand (W5, T4, T5) WT3: Strengthen internal discipline to ensure TR4 readiness and minimize operational disruptions (W4, T2)

3.5 Priority Development Strategies

Based on the SWOT matrix analysis and the Quadrant I positioning, the following four priority strategies are recommended for the UPTD of Agricultural Agribusiness Management of Maros Regency:

Strategy 1: Government-Supported Socialization of TR4 Services

The UPTD should conduct systematic outreach to farming communities across Maros Regency, leveraging its partnership with the Maros Regency Agriculture and Food Security Office and Field Agricultural Extension Officers (PPL). Socialization activities should communicate the availability, affordability, and application procedures of TR4 rental services. Indraningsih et al. (2017) emphasize that extension-based institutional socialization is a critical mechanism for closing the information gap between Alsintan service providers and potential user communities, particularly in rural areas with limited access to formal communication channels. This strategy directly addresses the lowest-scoring weakness (Lack of Socialization, 0.336) while capitalizing on the highest-scoring opportunity (Competitive Rental Rates, 0.849).

Strategy 2: Multi-Stakeholder Cooperation and Internal Governance Improvement

The UPTD should formalize and strengthen cooperation frameworks with related government agencies (Agriculture Office, Finance Agency), farmer groups, and PPL networks. Internally, management discipline should be addressed through clear performance standards and regular evaluations. Galib (2010) identified institutional cooperation as a decisive factor in UPJA development in South Kalimantan, while Yeni and Dewi (2014) found that governance reforms within Alsintan service institutions significantly improved operational continuity. The establishment of Standard Operating Procedures (SOPs), already partially implemented by the UPTD, should be reinforced through periodic monitoring and accountability mechanisms.

Strategy 3: Competitive and Responsive Rental Rate Policy

The UPTD should work with relevant authorities to maintain and periodically review TR4 rental tariffs in accordance with current equipment conditions and market dynamics. The existing regulatory framework (Regent Regulation No. 50/2022) provides a strong foundation, but rate flexibility,particularly for aging equipment,should be considered to sustain farmer interest and retain a competitive edge over informal rental providers. Diao et al. (2014) demonstrate that pricing sensitivity is acute among smallholder farmers, and that even modest rental rate differentials can significantly influence mechanization adoption decisions. Murti et al. (2018) similarly found that cost-per-hectare analysis is a critical factor in farmer rental decision-making for four-wheel tractors in Indonesian contexts.

Strategy 4: TR4 Fleet Expansion through Policy Advocacy

The current constraint on regional capital expenditure under Permendagri regulations limits the UPTD's ability to procure new TR4 units or replace aging ones. The UPTD management, through the Agriculture and Food Security Office, should actively advocate for regulatory flexibility or alternative financing mechanisms to enable fleet renewal. Sulaiman et al. (2018) note that fleet adequacy is a fundamental prerequisite for expanding mechanization service coverage in Indonesia, and that government investment in public Alsintan institutions remains indispensable given the high capital costs of agricultural machinery procurement at the farm level. In the interim, intensive TR4 maintenance programs,supported by the UPTD's skilled mechanic team,can extend the operational lifespan of existing units and reduce downtime.

Taken together, these four strategies constitute a coherent Aggressive (SO) development agenda that is grounded in the UPTD's demonstrated strengths and positioned to exploit the favorable external environment. This finding parallels Erniati et al. (2020), who identified a similar SO-dominant strategy for agricultural mechanization institutions in West Kalimantan, underscoring that government-backed Alsintan service providers with adequate human capital and competitive pricing are well-positioned for institutional growth when supported by focused strategic programming.

4. CONCLUSION

This study analyzed the strategic position of the UPTD of Agricultural Agribusiness Management of Maros Regency using a weighted SWOT framework (IFAS-EFAS) based on primary data from 15 key informants across relevant stakeholder groups. The key conclusions are:

1. The dominant internal strength of the UPTD lies in the skills of its operators and mechanics (IFAS score: 0.865), along with sound institutional management capability (0.724). The primary internal weakness is management discipline (0.756), followed by fleet limitation and insufficient outreach socialization (0.336).
2. The leading external opportunity is the competitive TR4 rental rate structure (EFAS score: 0.849), supported by government policy and budget availability. The principal external threats are service competition from informal providers (0.644) and limited farmer knowledge of TR4 technology (0.633).

3. SWOT matrix positioning in Quadrant I (S − W = +0.242; O − T = +0.235) indicates an Aggressive/SO strategic posture. The four priority development strategies recommended are: (a) government-supported socialization of TR4 services; (b) multi-stakeholder cooperation and internal governance improvement; (c) competitive and responsive rental rate policy; and (d) TR4 fleet expansion through policy advocacy. These strategies are directly actionable by the UPTD and can serve as evidence-based inputs for agricultural mechanization policy in Maros Regency.

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