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Food Brigade Strategy to Increase Paddy Production in Aceh Province

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Abstract: The agricultural sector in Simeulue Regency faces challenges including low productivity, limited infrastructure, and high dependence on external funding. The Food Brigade Program (Program Brigade Pangan) was established as a strategic initiative to enhance production efficiency through the collective management of land areas of at least 200 hectares, supported by adaptive agricultural technology. This study aims to identify internal and external factors influencing rice production enhancement and to formulate development strategies for the Food Brigade Program in Simeulue Regency. The research method employed is a descriptive-quantitative survey using purposive sampling of seven Food Brigade groups, involving a total of 105 respondents. Data analysis was conducted by identifying internal and external environmental factors, evaluated using the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices, followed by strategy formulation through SWOT analysis. The results indicate that the program's primary strengths lie in the availability of extensive land, adequate water resources (pump irrigation), and high community interest in agricultural innovation. However, the program is constrained by unsustainable monitoring systems and low technology literacy among traditional farmers. The recommended strategy is an aggressive strategy (growth-oriented strategy) utilizing the Strengths-Opportunities (S-O) approach. The implementation of this strategy includes the Land Optimization Program (OPLA) to increase the Cropping Index (IP) from 2 to 2.5, and institutional strengthening through Farmer Field Schools (Sekolah Lapang) and partnerships with post-harvest processing industries. Additionally, diversification of water-saving irrigation systems ("Solar Drip Reservoir System") is required to mitigate climate change impacts, alongside the revitalization of local wisdom such as Kono Lada through Qanun regulations to protect sustainable agricultural land. The integration of technological modernization, cooperative financial independence, and strengthened digital coordination is expected to ensure food sovereignty and farmer welfare in Simeulue Regency.

Keywords*: Food Brigade; Rice Production; SWOT Analysis; Simeulue; Farmer Institutions.*

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I. INTRODUCTION

The agricultural sector plays a vital role in Indonesia's economy and food supply; however, it continues to face challenges regarding low productivity and import dependence. Consequently, strategic efforts through the application of modern technology are required to improve efficiency (1). Food self-sufficiency remains a primary target to reduce rice imports, which reached 2.1 million tons in 2023, and to strengthen national food security (2). Furthermore, this sector contributes significantly to the absorption of 29% of the national workforce (3). Support for irrigation infrastructure and agricultural machinery 4), as well as multi-stakeholder collaborative approaches (4), are key to facing climate change and market challenges.

At the regional level, Simeulue Regency demonstrates significant agrarian potential. In 2024, the harvested area for wetland paddy increased to 6,809.33 hectares, with production reaching 23,304.21 tons and a productivity rate of 3.42 tons/ha (6). This increase was supported by government programs such as New Rice Field Establishment and Expansion of Planting Areas (PAT). However, farmers in Simeulue still face structural constraints such as limited access to technology and capital, weak bargaining positions, and a lack of knowledge regarding sustainable agriculture and supporting infrastructure.

To address these issues comprehensively, the Food Brigade initiative was formed. Based on Regulation of the Minister of Agriculture No. 40 of 2020 and Law No. 19 of 2013, the Food Brigade is a farmer institution that manages a

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minimum of 200 hectares of land through partnership patterns and modernization. This program aims to create a structured, technology-based agricultural system to improve farmer productivity and welfare (7). Therefore, this research is urgent to formulate strategies for increasing rice production through the optimization of the Food Brigade Program in Simeulue Regency.

II. LITERATURE REVIEW

Production Enhancement Policy and Food Brigade Increasing rice production through land intensification and extensification is a government priority to ensure food security. (8) emphasize that the use of superior seeds, modern technology, and support for fertilizer subsidies and agricultural machinery (alsintan) are crucial factors in increasing productivity. In line with this, (8) initiated the Food Brigade as a strategic step to achieve food self-sufficiency. This initiative integrates land optimization, technological modernization, and farmer empowerment particularly of the younger generation within a corporate institutional framework. The program aims to create inclusive agribusiness through technical training, infrastructure provision, and cross-sector synergy (7). The involvement of a younger generation adaptive to technology is expected to drive innovation and sustainability in the agricultural sector (4).

Concepts and Dimensions of Food Security The definition of food security continues to evolve multidimensionally. (9) and (10) define food security as a condition where every individual has physical and economic access to safe and nutritious food. (1) expanded this concept by including aspects of supply stability and optimal food utilization. Furthermore (11) added the dimension of sustainability, where meeting current needs must not compromise the ability of future generations regarding availability, (12) and (13) explain that food availability encompasses domestic production, stock reserves, imports, and food aid accessible without risking the loss of basic rights.

Modernization and Precision Agriculture Transformation towards modern agriculture is key to farming efficiency. (14) notes that the application of advanced technologies such as mechanization, soil sensors, and drones can increase yields by up to 20%. This concept is closely related to precision agriculture, which, according to (15), is the combination of technology and efficient practices to optimize inputs (water, fertilizer) to minimize waste. In addition to physical technology, the use of superior plant varieties that are disease-resistant and resource-efficient has also proven to have a positive impact on food security (16).

Strategic Management and SWOT Analysis Strategy is a managerial tool to achieve long-term goals by optimizing resources amidst internal and external environmental dynamics (17) (18). Strategic management encompasses the process of formulation, implementation, and evaluation of cross-functional decisions (19). In analyzing industry competition, (20) introduced the five forces model to understand a company's bargaining position. However, to formulate specific development strategies, SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) is frequently used. (21) explains that the SWOT matrix functions to map internal organizational strengths and weaknesses, juxtaposing them with external opportunities and threats to generate effective and applicable strategic alternatives.

III. METHODOLOGY

Location and Object of Research This research was conducted in Simeulue Regency, Aceh Province. The location was selected purposively, considering the urgency of the region in the national food security map. This decision is based on the Decree of the Minister of Agriculture RI Number 647/KPTS/OT.050/M/11/2024 regarding the Food Self-Sufficiency Task Force. Additionally, Simeulue Regency has the largest allocation for the Swamp Land Optimization (OPLA) program in Indonesia in 2024 (5,000 ha) and possesses the highest number of Food Brigade groups in Aceh Province (15 groups). The research focuses on internal dynamics (HR capability, technology, management) and external dynamics (economy, regulations, market, environment) influencing the performance of the Food Brigade.

Population and Sample This study applies a survey method. The sampling technique used was purposive sampling, referring to sample representativeness guidelines (22). From the total population of existing groups, 7 (seven) Food Brigade groups were established as sample units. Given that each group consists of 15 members, the total number of respondents in this study is 105 people. Data collection was carried out comprehensively through interviews, questionnaires, and field observations.

Data Analysis Method The obtained data were analyzed using a combination of descriptive approaches and strategic analysis.

- *Descriptive Analysis:*

Used to address the first objective, which is to provide a systematic and factual description of the existing environmental conditions of the Food Brigade Program in Simeulue Regency (23).

- *SWOT Analysis:*

Used to address the second objective. This analysis identifies internal Strength and Weakness factors, as well as external Opportunity and Threat factors to formulate appropriate development strategies.

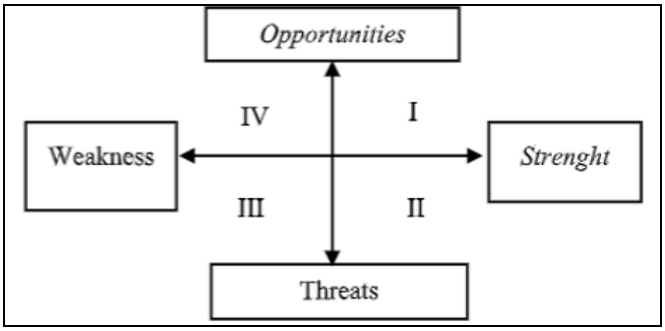

Fig 1 SWOT Analysis Diagram

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➢ Explanation of Each SWOT Analysis Diagram Quadrant:

Quadrant I	:	A very favorable strategy. The Food Brigade Program possesses opportunities and strengths, enabling it to capitalize on existing opportunities. The strategy to be applied in this situation is to support aggressive growth policies (growth-oriented strategy).
Quadrant II	:	The Food Brigade Program possesses internal strengths. The strategy to be applied is to use strengths to capitalize on long-term opportunities through diversification strategies (product or market).
Quadrant III	:	The Food Brigade Program has very large market opportunities, but on the other hand, the organization faces several internal constraints or weaknesses. The strategic focus in this quadrant is to minimize internal problems to better capture market opportunities.
Quadrant IV	:	A very unfavorable situation. In this condition, the Food Brigade Program faces various threats and internal weaknesses.

IV. RESULTS

➢ *Respondent Characteristics*

The demographic profile of respondents is a fundamental element in formulating strategies for the Food Brigade program in Simeulue Regency so that interventions are targeted and adaptive to conditions (24); (25). The following is an in-depth analysis of respondent characteristics in 2025:

Table 1 Respondent Characteristics by Gender

No	Description	Amount	Percen tage (%)
1	Male	100	95,24
2	Female	5	4,76
	Total	105	100,00

Source: Processed Primary Data, 2025

The membership structure is dominated by males (100 people, 95.24%), while females account for 5 people (4.76%). Based on findings by (26), this composition suggests the need for capacity building through community-based group approaches that have proven effective. Although dominated by men, training strategies still require the differentiation of technical roles in the field according to recommendations by (27), as well as the optimization of collaboration among members to achieve the rice productivity targets set in the Technical Guidelines (24).

Table 2 Respondent Characteristics by Age

No	Description	Amount	Percen tage (%)
1	Baby Boomers (1946-1964)	14	13,33
2	Gen X (1965-1980)	75	71,43
3	Millennial (1981-1996)	16	15,24
4	Gen Z (1997-2012)	0	0
	Total	105	100,00

Source: Processed Primary Data, 2025

The distribution shows a dominance of Generation X (1965-1980) at 71.43% (75 people), followed by Baby Boomers (13.33%) and Millennials (15.24%), with no involvement from Generation Z. The absence of the younger generation and the dominance of mature age groups have strategic implications. Generation X tends to be more receptive to practical field training compared to digital methods (26). However, the 45-60 age group is considered the backbone of archipelagic agriculture with high loyalty (8). (28) also highlights the advantage of this generation in mastering adaptive traditional cultivation techniques and strong social network stability for program sustainability.

Table 3 Respondent Characteristics by Education Level

No	Description	Amount	Percen tage (%)
1	Elementary School	0	-
2	Junior High School	2	1,90
3	Senior High School	78	74,29
4	Diploma	7	6,67
5	Bachelor's Degree	18	17,14
6	Master's Degree	0	-
	Total	105	100,00

Source: Processed Primary Data, 2025

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The majority of respondents have a High School (SMA) background (74.29%). This level of education is a positive modality for increasing the Rice Cropping Index (IP), as farmers with secondary education and above are more adaptive to technological innovation and farm management (24). (28) suggests that this group be given digital literacy and marketing training. However, a differentiation approach is still needed; Bachelor's (S1) graduates can be directed towards entrepreneurship and capital access, while high school graduates focus on practical cultivation technology. This is relevant to the opinion of (8) that the welfare of archipelagic farmers requires specific educational interventions according to their literacy levels.

➢ *Identification of Internal and External Factors*

Optimal and sustainable implementation of the Food Brigade Program depends on the integration of internal and external factors. Internally, key determinants include human resource capacity, availability of fertile land, and the effectiveness of farmer institutions; while externally, it is influenced by policy support, investment climate, and market dynamics. Comprehensive mapping of these two strategic dimensions is crucial to ensuring the program's success in improving farmer welfare.

Table 4 Internal Factors - Strengths

No	Internal Strength Factors
1	Availability of land area > 200 ha
2	Potential land and sufficient water resources (pump irrigation)
3	Trained agricultural extension workers
4	High community interest in farming
5	Access to modern agricultural technology
6	Partnerships and institutional support (Food Brigade and banking)

Source: Processed Primary Data, 2025

The Food Brigade Program in Simeulue Regency is supported by the integration of land legality, biophysical quality, and superior technical capacity. Land ownership of >200 ha with verified legal certainty is the main foundation driving productivity up to 25% (3). This is reinforced by S1/S2 class land quality with a cropping index (IP) >3 and adequate irrigation support, enabling year-round agricultural intensification and minimizing the risk of crop failure (24). Additionally, intensive assistance from academics and extension workers has accelerated technology adoption innovation by up to 40% (28), ensuring precision farming practices run effectively at the farmer level. The sustainability of this program also relies on strong social capital and cross-sector synergy from upstream to downstream. The culture of group farming not only increases farmers' economic resilience by 30% (29), but also optimizes the use of agricultural machinery capable of boosting production efficiency by 20%. This success is perfected through multi-stakeholder collaboration involving SOEs (BUMN), the Military (TNI), and local government, with active farmer group participation reaching more than 70% (30). This strategic combination creates a resilient agricultural ecosystem with the potential to become a national food self-sufficiency pilot model.

Table 5 Internal Factors - Weaknesses

No	Internal Weakness Factors
1	Dependence on external funding
2	Resistance from traditional farmers
3	Weak coordination among stakeholders
4	Lack of sustainable monitoring and evaluation
5	Insufficient experience among Food Brigade members
6	Food Brigade members lack full technological literacy

Source: Processed Primary Data, 2025

The Food Brigade Program faces crucial sustainability challenges due to high financial dependence on external funding (80-90%), with operational resilience of less than three months. This condition increases the risk of program failure by up to 40% (29), given that only 15% of farmer groups have independent business units. This problem is exacerbated by low technology adoption (<30%) and a productivity gap of 1.5 tons/Ha due to the dominance of older farmers (65% above 45 years) who tend to be resistant to digital innovation (28). Limited digital literacy, where only 35% of members are capable of operating agricultural applications, hinders potential farming efficiency that should be increasable by up to 25% (24).

On the managerial side, fragmented coordination among stakeholders triggers budget inefficiency of 25-30% due to overlapping programs (31). This weakness is compounded by inconsistent monitoring and evaluation systems, with recommendation implementation rates below 50% and minimal measurable performance indicators (32). From the human resources aspect, the low technical experience of members and the non-ideal extension worker ratio (1:150) cause a high frequency of technical errors in fertilization and pest control. Overall, limited technical competence and weak institutional governance are major obstacles in achieving resilient development program management standards.

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Table 6 External Factors - Opportunities

No	External Opportunity Factors
1	Strong government policy support
2	Partnerships with processing and export industries
3	Affordable agricultural technology
4	Sustainable consumer movement
5	Improving logistics infrastructure
6	Collaboration with academia and agricultural research

Source: Processed Primary Data, 2025

The Food Brigade Program in Simeulue Regency is driven by strong national policy support and strategic partnerships with the industrial sector. An annual budget allocation of IDR 15 billion through equipment assistance schemes and Agricultural People's Business Credit (KUR) serves as a main stimulus in realizing Simeulue as a national food barn (33). This acceleration is supported by downstream policies guaranteeing markets through Memorandum of Understanding (offtake) agreements of 500 tons per year, significantly reducing price fluctuation risks for farmers. Furthermore, access to modern technology is increasing alongside a 25% decrease in agricultural machinery prices and the availability of low-interest credit, allowing 45% of farmers to adopt mechanization to improve production efficiency (29). Program sustainability opportunities are also strengthened by a market trend shift towards sustainable food products and improved logistics infrastructure. The potential selling value of organic and premium rice, which is 20–30% higher than conventional rice, offers farmers opportunities to reach upper-class market segments (28). Technically, the development of Rice Milling Units (RMU) and cold storage facilities has successfully reduced post-harvest losses from 15% to 7% (37). This integration is further optimized through collaboration with research institutions and universities producing tidal land-adaptive rice varieties, proven to increase productivity by 1.2 tons per hectare (34).

Table 7 External Factors - Threats

No	External Threat Factors
1	Extreme climate change
2	Competition with rice from other islands
3	Dependence on government subsidies
4	Agricultural land conversion
5	Social resistance and farmer group dynamics

Source: Processed Primary Data, 2025

The agricultural sector in Simeulue Regency faces ecological and market pressures threatening productivity stability. The frequency of extreme climate change (35 times per year) has caused an average yield decrease of 1.2 tons/ha, yet only 35% of farmers apply mitigation techniques (35); (3). This threat is aggravated by market pressure due to the price disparity of imported rice, which is IDR 2,000–3,000/kg cheaper than local rice, eroding the domestic market share by up to 45% (36). Additionally, structural dependence on government subsidies covering 60% of production costs creates systemic vulnerability; a 20% subsidy reduction is predicted to slash farmer income by up to 50% due to low access to formal financing (33). Regarding land fundamentals and institutions, the conversion of productive land reaches 15 hectares per year for tourism and settlements, with land protection regulation enforcement effectiveness reaching only 40% (37). This trend is projected to reduce productive land by 20% in the next decade. The situation is complicated by internal social dynamics such as inter-group conflicts and a member turnover rate of 15% per year due to minimal economic incentives for young farmers (31). Weak institutional stability and land asset protection are critical obstacles to the sustainability of the Food Brigade Program in the region.

- *IFE Matrix Analysis Results*

The Internal Factor Evaluation (IFE) matrix is a strategic instrument for evaluating organizational strengths and weaknesses through the integration of qualitative and quantitative data. Assert that the use of weights and ratings in this matrix produces a composite score capable of objectively describing internal capacity (38).

Table 8 IFE Matrix Analysis Results

Strategic Factors	Bobot	Rating	Score
Strengths			
Availability of land area > 200 ha	0,090	4,000	0,360
Potential land and sufficient water resources (pump irrigation)	0,094	4,000	0,374
Trained agricultural extension workers	0,092	4,000	0,367
High community interest in farming	0,093	4,000	0,373
Access to modern agricultural technology	0,093	4,000	0,372
Partnerships and institutional support (Food Brigade and banking)	0,091	4,000	0,365
Sub Total Strenght			**2,210**
Weakness			

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Dependence on external funding	0,066	3,000	0,198
Resistance from traditional farmers	0,075	3,000	0,226
Weak coordination among stakeholders	0,080	3,000	0,240
Lack of sustainable monitoring and evaluation	0,081	3,000	0,243
Insufficient experience among Food Brigade members	0,081	3,000	0,242
Food Brigade members lack full technological literacy	0,065	3,000	0,194
Sub Total Weakness			**1,342**

Source: Processed Primary Data, 2025

The sustainable success of the Food Brigade Program is determined by the synergy between internal determinants and external factors. Internally, human resource capacity, availability of productive land >200 ha with clear legal status, and farmer institutional effectiveness are the main pillars (3). Analysis of these factors provides an objective picture of technical and managerial readiness in optimizing S1/S2 class land potential to achieve national productivity targets (24). Externally, program dynamics are influenced by government policy support through KUR allocation and market stability (29).

However, the program also faces macro challenges such as price fluctuations and extreme climate change requiring comprehensive mitigation strategies (35). Comprehensive mapping of industrial partnership opportunities and land conversion threats is highly necessary to build relevant adaptation strategies (37); (30). Integrating these two strategic dimensions is a crucial step in formulating an optimal policy model for farmer welfare. Through in-depth evaluation of internal strengths and weaknesses as well as external opportunities and threats, the program can be implemented efficiently to reduce post-harvest loss and subsidy dependence (28). This approach is expected to strengthen food security in Simeulue Regency sustainably.

Tabel 9 External Factor Evaluation

Strategic Factors	Bobot	Rating	Score
Opportunities			
Strong government policy support	0,112	4,000	0,447
Partnerships with processing and export industries	0,110	4,000	0,440
Affordable agricultural technology	0,104	3,000	0,311
Sustainable consumer movement	0,108	3,000	0,324
Improving logistics infrastructure	0,107	4,000	0,429
Collaboration with academia and agricultural research	0,108	3,000	0,325
Sub Total Opportunities			**2,276**
Threats			
Extreme climate change	0,081	2,000	0,161
Competition with rice from other islands	0,066	1,000	0,066
Dependence on government subsidies	0,071	1,000	0,071
Agricultural land conversion	0,067	2,000	0,135
Social resistance and farmer group dynamics	0,066	2,000	0,132
Sub Total Threats			**0,565**
Total Eksternal	**1,000**		**1,711**

Source: Processed Primary Data, 2025

The external factor analysis demonstrates that the Food Brigade Program in Simeulue Regency holds a strong strategic position, characterized by a total opportunity score (2.276) that significantly outweighs the total threat score (0.565). This indicates the program's capacity to capitalize on external momentum to mitigate obstacles (17).

The most dominant opportunity factor is strong government policy support (score 0.447). The implementation of Presidential Regulation No. 66 of 2021 and the 32% increase in Village Fund allocation for agriculture (3) have created a conducive ecosystem through budgetary support and fiscal incentives (39). This synergy is further strengthened by industrial partnerships (score 0.440), where the vertical integration model (40) with PT Beras Sejahtera has proven to increase the value-added of "Padi Lestari" products by 25% (25). Furthermore, improvements in logistics infrastructure (score 0.429) have successfully reduced post-harvest losses to 9% and distribution costs by 18% (37), although last-mile connectivity still requires attention (41). Technology adoption (score 0.311) also shows a potential ROI of 1.8; however, it necessitates a hybrid approach (42) to bridge the digital literacy and infrastructure gaps in the region (43).

Conversely, the primary threat stems from extreme climate change (score 0.161), which has decreased productivity by up to 20% due to droughts (35); (25). Adaptation strategies utilizing drought-resistant varieties (Inpago 12), the System of Rice Intensification (SRI), and agricultural insurance have become imperative (44). The threat of land conversion (score 0.135), reaching 45 ha/year, necessitates the establishment of Sustainable Food Agricultural Land regulations (45). Meanwhile, competition from imported rice (score 0.066) and subsidy dependence (score 0.071) can be mitigated through product

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differentiation based on low-carbon local varieties (46) and institutional transformation towards cooperative independence (47).

Overall, the positive gap between opportunities and threats underscores that the external environment strongly supports the accelerated development of the Food Brigade Program in Simeulue.

➢ *SWOT Quadrant Matrix*

The Internal Factor Evaluation (IFE) analysis results show solid internal capacity with a score of > 2.5, driven by institutional strength, local resource availability, and proactive community participation. These internal modalities significantly compensate for primary infrastructure and technology access limitations. This aligns with findings by (48) that collective participation-based food security programs can increase cropping intensity by up to 25% through strategic collaboration between the government and local institutions. Based on the IE and SWOT matrices, the Food Brigade occupies the Aggressive position (3.55; 1.71). This position demands the utilization of internal strengths to capture policy opportunities through market penetration strategies (49). Modern technology implementation is key to the S-O strategy, where Smart Farming use can compensate for member experience limitations (44). Furthermore, sustainable land expansion must be supported by downstreaming and contract farming schemes to ensure price stability and market certainty (50).

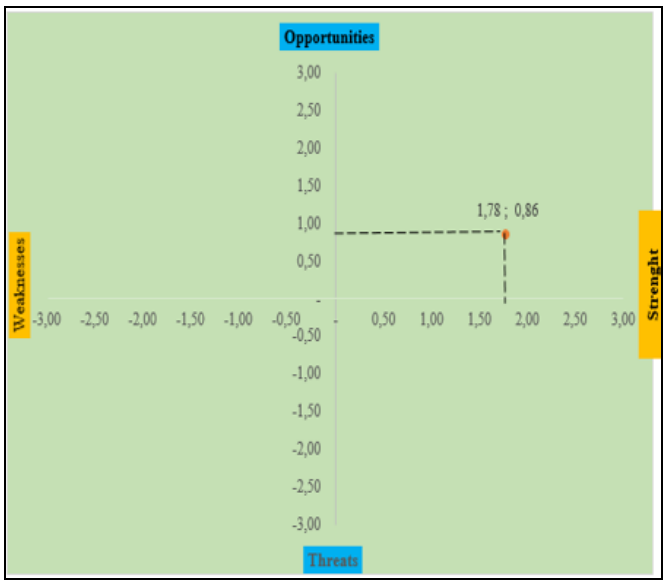

Fig 2 SWOT Quadrant Matrix

Figure 2. SWOT Quadrant Matrix Results Based on the integration of these two matrices, the Food Brigade Program in Simeulue is recommended to apply an aggressive strategy (growth-oriented strategy) through the Strengths-Opportunities (SO) approach. Strategy implementation focuses on using internal strengths to maximize market and policy opportunities. Empirical support from (51) reinforces that policy interventions integrated with local resource empowerment effectively increase the Rice Cropping Index (IP), even in regions with infrastructure limitations.

Results Based on the integration of these two matrices, the Food Brigade Program in Simeulue is recommended to apply an aggressive strategy (growth-oriented strategy) through the Strengths-Opportunities (SO) approach. Strategy implementation focuses on using internal strengths to maximize market and policy opportunities. Empirical support from (51) reinforces that policy interventions integrated with local resource empowerment effectively increase the Rice Cropping Index (IP), even in regions with infrastructure limitations.

V. DISCUSSION

The Food Brigade Program in Simeulue Regency integrates rice production enhancement with food security strengthening based on local wisdom and participatory approaches. This strategy, as supported by (52), utilizes organic systems and local resources capable of boosting farmer income by up to 30%. Program implementation is optimized through multi-party collaboration to accelerate adaptive technology adoption, such as solar-powered irrigation on dry land (53). Using SWOT analysis, this research formulates an integrated strategy synergizing farmer group institutional strengths with strategic policy opportunities, such as the Food Estate and village fund allocations, to ensure sustainable national productivity enhancement.

The SO Strategy (Strengths-Opportunities) focuses on productivity acceleration through technological transformation and upstream-downstream integration on potential lands >200 hectares. Implementation of smart farming utilizing IoT sensors and modern mechanization (TR4 and combine harvesters) is projected to boost land efficiency by 35% and minimize post-harvest losses significantly (54). Increasing the Cropping Index (IP) from 2.0 to 2.5 is supported by irrigation infrastructure modernization and farmer capacity building through academically curriculated "Field Schools" (Sekolah Lapang) (55). This synergy is perfected by industrial off-taker partnership schemes guaranteeing harvest absorption at stable prices, thereby creating business certainty for farmers (56).

The ST Strategy (Strengths-Threats) is directed at strengthening economic resilience and local market sovereignty to mitigate dependence on government subsidies, which reach 60% of production costs. Through cooperative revitalization and KUR access facilitation, this program builds solid financial independence, proven to increase productive household investment (57). Facing imported rice penetration, this strategy emphasizes product differentiation through premium organic rice certification based on local wisdom. This step not only increases bargaining power in the premium market but also builds consumer loyalty through strong sustainability narratives, thereby reducing the impact of commodity price fluctuations (58).

The WO Strategy (Weaknesses-Opportunities) integrates adaptive technological innovation to overcome biophysical barriers and extreme climate change threats in the archipelagic region. Utilization of the "Solar Drip Reservoir System" serves as a drought mitigation breakthrough capable of increasing water efficiency by up to

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60% while saving operational costs due to its renewable energy basis (59). Simultaneously, weaknesses in land asset protection are addressed by formalizing the local wisdom of Kono Lada into the Sustainable Agricultural Land Protection (LP2B) Qanun. This approach provides sociological legal protection to prevent land conversion rates threatening long-term food production stability (39).

The WT Strategy (Weaknesses-Threats) is defensive-transformative, optimizing digital platforms and inclusive funding models to mitigate systemic program failure risks. Digitalizing coordination systems through simple platforms is proven to cut transaction costs and improve extension accuracy by up to 30% in remote areas (4); (60). To overcome central budget limitations, this strategy encourages financing diversification through Village Funds and community-based crowdfunding as a funding gap solution. A farmer-centered learning approach is applied to reduce traditional farmer resistance, ensuring that innovation adoption remains inclusive and sustainable at the grassroots level (61).

VI. CONCLUSION

Conclusion The Food Brigade Program in Simeulue Regency has a solid foundation through land availability (>200 ha), high social capital, and access to modern mechanization capable of boosting efficiency by up to 30%. However, program sustainability is still hindered by weak monitoring systems, socio-cultural resistance of traditional farmers, and financial dependence on external funding vulnerable to policy fluctuations. Nevertheless, synergy between local resource potential and government policy opportunities provides strategic space to address climate change threats and land degradation through technological intervention and institutional strengthening. The optimal strategy is implemented through an aggressive growth-oriented strategy via the Land Optimization Program (OPLA) and renewable energy-based irrigation modernization ("Solar Drip Reservoir System") to increase the Cropping Index (IP) up to 2.5. Organizational independence strengthening is conducted by integrating independent funding systems through farmer cooperatives and coordination digitalization based on the "Brigade Pangan Simeulue" platform. This overall strategy relies on the revitalization of Kono Lada local wisdom and premium organic rice certification to increase market competitiveness and ensure inclusive rice production sustainability in Simeulue Regency.

RECOMMENDATIONS

- Strengthening Farmer Groups through Field Schools: It is suggested to establish field schools in every farmer group focusing on direct practice (demonstration plots/demplot). Training must involve successful farmers as mentors to accelerate mechanization technology transfer. Additionally, periodic evaluations must be conducted so that farmer competence development is clearly monitored.

- Synergy through Cooperatives: Strengthening cooperation between farmers, government, and the private sector through cooperatives is necessary. Concrete steps required include building post-harvest processing units and developing joint business plans to facilitate capital access.

- Routine Coordination: Routine coordination meetings every three months must be conducted to resolve field issues promptly.

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