Land Conversion and Food Security in Sabah: A DPSIR-Based Empirical Assessment

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ABSTRACT

Agricultural land conversion in Sabah poses an increasing challenge to regional food security, particularly in the context of rapid urbanisation, tenure vulnerabilities, and fragmented land governance. This study aims to examines the extent, patterns, and implications of agricultural land conversion in Sabah by analysing 36 verified conversion cases recorded in 2023, involving approximately 238.08 acres of land. A mixed-methods approach was adopted, combining descriptive analysis of verified land conversion records with qualitative document analysis of a rezoning appeal case in Papar. The study applies the Driving Forces–Pressures–State–Impact–Response (DPSIR) framework to systematically interpret the socio-economic, institutional, and governance dynamics influencing agricultural land loss. The findings show that urban expansion, speculative development, and housing demand act as key driving forces that generate pressures on agricultural land, particularly through rezoning applications and weak tenure safeguards. These pressures have weakened the state of agricultural land protection, especially for Native Title holdings, which appear particularly vulnerable to conversion. The impacts of this trend include the reduction of land available for food production, increasing pressure on local food systems, and heightened risks to Sabah's food sovereignty. The Papar case further demonstrates how land designated for food security purposes may remain vulnerable to development pressure when institutional coordination and zoning enforcement are weak. Institutional responses, including zoning controls, departmental objections, and planning procedures, were found to be inconsistent and insufficient. The study underscores the need for stronger and more enforceable land governance mechanisms to protect agricultural land and strengthen food security in Sabah.

Key Words: Agricultural Land Conversion, DPSIR Framework, Food Security, Land Use, Sabah, Native Title Land

INTRODUCTION

Malaysia faces increasing pressure from urban expansion, with agricultural land rapidly being converted for residential, commercial, and industrial purposes. Although national frameworks such as the National Physical Plans (NPPs) aim to regulate land use, enforcement remains uneven. Urban hotspots such as Klang Valley, George Town, and Johor Bahru exemplify how development outpaces land governance capacity (Alias & Daud, 2020; Marzuki & Jais, 2020). In Sabah, these challenges are compounded by a complex land tenure landscape and fragmented planning systems. Despite vast agricultural potential, the state's rice self-sufficiency rate has declined steadily, and only a small fraction of suitable land is cultivated for food crops (Ministry of Agriculture and Food Industry, 2019; Firdaus et al., 2020). Meanwhile, overlapping jurisdictions, zoning inconsistencies, and weak policy safeguards, especially concerning Native Title lands, expose institutional vulnerabilities that enable unchecked agricultural land conversion (Ministry of Agriculture & Food Security, 2021; Ministry of Agriculture and Food Industry, 2019; Sabah Land Ordinance, Cap. 68; Ministry of Agriculture & Food Industry Sabah, 2015; National Physical Plan 3, 2016; DSMN Action Plan, 2021–2025). This study investigates land conversion patterns in Sabah during 2023, with the addition of 2025 land rezoning case in Papar, Sabah. It questions on the key patterns and institutional, economic, governance dimensions influencing agricultural land conversion in Sabah, and how do they compromise regional food security. The

findings aim to inform policy reforms that balance development needs with sustainable land use and food sovereignty. By analysing verified land conversion cases in 2023, with the support of 2025 land rezoning case, the study identifies governance gaps and proposes a strategic policy framework to support agricultural land preservation in Sabah.

LITERATURE REVIEW

Agricultural land conversion is intensifying across Southeast Asia, driven by urban expansion and weak land governance. Experiences in Vietnam and Indonesia highlight challenges in managing land use despite legal reforms. In Malaysia, land matters fall under state jurisdiction, resulting in uneven protection. Sabah is especially vulnerable due to its unique tenure system and high share of Native Title land. Despite policy frameworks, zoning loopholes and limited coordination have enabled widespread farmland conversion. This review outlines regional trends, Malaysia's legal structure, and Sabah's land governance to understand institutional drivers of land loss and its implications for food security.

Agricultural Land Conversion Trends in Southeast Asia

Agricultural land conversion is accelerating across Southeast Asia, driven mainly by urban expansion, infrastructure development, and changing land use priorities. In Vietnam, large-scale land acquisition has contributed to substantial farmland loss, especially in peri-urban areas, while state-dominated land governance continues to create tenure insecurity and weak farmer bargaining power (Suu, 2009; Toan & Yen, 2023). Similar patterns are evident elsewhere in the region, where overlapping legal systems, institutional fragmentation, and rising land values weaken regulatory safeguards and encourage conversion. Evidence from Indonesia also shows that, despite legal and spatial planning measures intended to protect agricultural land, conversion persists under pressure from population growth and non-agricultural development demands (Wulan et al., 2022). These regional trends are relevant to Sabah, where peri-urban expansion, tenure vulnerability, and governance inconsistencies similarly place agricultural land at risk. Overall, the Southeast Asian experience highlights the need for integrated land governance, clearer tenure protection, and stronger policy mechanisms to safeguard agricultural land and food security.

Legal-Institutional Frameworks for Land Preservation in Sabah, Malaysia

Land preservation in Malaysia operates within a federal system in which national agencies, such as MAFI and the Economic Planning Unit (EPU), set broad food security and land-use directions, while land administration remains a state matter under the Ninth Schedule of the Federal Constitution (Ismail, 2011). Although the National Land Council under Article 91 is intended to coordinate land policy, implementation depends on state-level action and is often uneven, particularly in East Malaysia. In Sabah, land governance is primarily regulated by the Sabah Land Ordinance 1930 (Cap. 68), which governs land alienation, classification, and conversion (Salleh, 2021). Spatial planning is guided by the Town and Country Planning Ordinance (Cap. 141), under which rezoning remains discretionary and certain agricultural activities may be exempted from development control (Environment Protection Department, 2003). Together, these legal arrangements shape the conditions under which agricultural land may be retained or converted.

A key concern is the vulnerability of land titles commonly associated with smallholder and customary agriculture. Native Title (NT) and Field Register (FR) lands have historically functioned as important forms of agricultural landholding, but amendments enabling leasing and commercial utilisation have reduced their practical protective function and increased exposure to conversion pressure (Nuar & Lunkapis, 2019; Salleh, 2021). Zoning control is also limited by exemptions for activities such as planting and land clearing, which may create space for informal or speculative land use change, particularly in peri-urban areas (Town and Country Planning Ordinance, 2001; Environment Protection Department, 2003).

These vulnerabilities are compounded by the absence of a permanent food-production zoning mechanism comparable to the Taman Kekal Pengeluaran Makanan (TKPM), allowing agricultural land to remain open to discretionary rezoning for non-agricultural purposes (Ministry of Agriculture & Food Industry, Sabah, 2015). Policy gaps are further reinforced by weak inter-agency coordination, limited incentives for farmland

retention, and an agricultural structure dominated by oil palm, which continues to marginalise food crops (Department of Agriculture Sabah, 2021). Agricultural land preservation in Sabah remains institutionally weak and vulnerable to development pressure. Given these conditions, the DPSIR framework is suitable for this study because it links broader development drivers and institutional pressures to changes in land protection conditions, food security impacts, and possible policy responses (Tscherning et al., 2012).

RESEARCH METHODOLOGY

This study adopts a mixed-methods design to analyse agricultural land conversion in Sabah. The quantitative component summarises verified 2023 conversion cases using descriptive statistics, while the qualitative component uses document analysis of the Papar rezoning appeal to examine institutional decision processes and governance contradictions. Both components are integrated through the DPSIR framework to interpret the relationships between development drivers, conversion pressures, land protection conditions, impacts on food security, and institutional response gaps.

Data Collection

Data were obtained from two sources, which are the official administrative records of verified agricultural land conversion cases in Sabah for 2023, and unpublished planning and administrative documents related to the Papar rezoning appeal. Together, these sources capture both overall conversion patterns and the institutional processes underlying a key case. For the quantitative component, the primary dataset comprised 36 verified agricultural land conversion cases provided by the Department of Town and Regional Planning Sabah (personal communication, 2024). Each case, represented by a planning or conversion application, was treated as the unit of analysis and examined as a record of observed conversion outcomes rather than perception-based data. A deductive coding frame based on Sabah planning classifications was applied, using descriptive coding followed by pattern coding to identify recurring characteristics (Linneberg & Korsgaard, 2019).

Table 1. Data Standardisation and Coding Format

VARIABLE	ISSUES DETECTED	CODING FORMAT
Land Title Status	Mixed formats (e.g., "NT.", "CL.", "FR".	Standardized to: *Native Title*, *Country Lease*, *Provisional Lease*, *Field Register*
Land Use Before/After Conversion	Consistently agricultural before; diverse, ungrouped after	Grouped "After" into: *Residential*, *Commercial*, *Industrial*, *Public Utility*, *Tourism*
Land Status	Descriptive and inconsistent phrases	Recoded into themes: *Agriculture*, *Crop Type*, *Conservation*, *Quarry*, *Homestead*, etc.
Land Zoning	Variations in spacing, casing, and detail	Harmonised based on Sabah's official codes (e.g., *R(B)*, *R(H)*, *IN(G)*, *PU*, *T(T)*)

Source: Author's own work

Because the records contained inconsistent abbreviations and non-standard descriptors, the dataset was cleaned and standardised across four variables: land title, post-conversion land use, land status or requirements, and zoning codes. Land titles were harmonised into standard categories, post-conversion uses were grouped into five classes, land status terms were recoded into broader themes, and zoning labels were standardised according to Sabah's official codes (Table 1 above). This process improved consistency and comparability across cases prior to analysis.

Qualitative Supplementary Case Study: Rezoning Appeal in Papar (2025)

To complement the 2023 dataset and strengthen the institutional explanation of agricultural land conversion, this study included a supplementary qualitative case study on a rezoning appeal in Papar, Sabah, in 2025. The case was not intended for statistical generalisation, but to provide a process-based explanation of how conversion pressure can persist through planning procedures, inter-agency interactions, and appeal mechanisms, even where land is formally linked to food security protection. This case study was necessary because the quantitative dataset mainly identifies the overall pattern of conversion, including the scale of land affected, the dominant post-conversion uses, and the tenure categories most exposed.

However, descriptive analysis alone cannot fully explain how particular conversion decisions are advanced and contested within the planning system. The Papar case was therefore used to trace the institutional pathway behind conversion pressure. The case was selected through purposeful sampling because it represents a tenure- and food security-sensitive context. It involved three Native Title parcels with paddy land conditions, covering 8.332 acres, and located within a gazetted Paddy Conservation Area. Despite this protected status, the land was proposed for high-density residential development involving 127 two-storey terrace houses. The case strengthens the institutional explanation by showing that food security zoning can remain vulnerable, that agencies may adopt conflicting positions, and that conversion pressure may continue through appeal even after initial rejection.

Data Sources and Analytical Procedure

The qualitative data comprised official planning and administrative documents related to the rezoning application and subsequent appeal process. These included the rezoning or alteration summary, planning reports and written justifications, local authority recommendations, inter-agency correspondence containing technical comments or objections, and decision and appeal documents where available. All records were compiled into a single case file and reviewed through a structured extraction process. Key information was organised into a case matrix covering land particulars, zoning status, development proposal, agency positions, and decision sequence. This enabled reconstruction of the decision pathway and identification of institutional contradictions, justification narratives, and governance gaps, which were then interpreted through the DPSIR framework.

DPSIR Framework Operationalisation and Analytical Procedure

The Driving Forces–Pressures–State–Impact–Response (DPSIR) framework was used in this study as an analytical framework rather than as a standalone statistical method. Its role was to organise and interpret the relationships between land conversion patterns, governance processes, and policy implications identified from both components of the study, namely the 2023 verified land conversion dataset and the supplementary 2025 Papar rezoning case study. In this research, DPSIR was operationalised in two stages. First, the quantitative dataset was analysed descriptively to identify recurring empirical patterns, including the scale of conversion, dominant post-conversion land uses, land title exposure, and zoning-related inconsistencies.

These recurring patterns were then interpreted analytically and mapped into the DPSIR structure. Second, the Papar case documents were analysed deductively using the same DPSIR structure in order to trace how development pressures were articulated, how the rezoning process progressed institutionally, what state conditions characterised the land, what impacts were at stake, and how different agencies responded.

Accordingly, DPSIR served as a synthesis tool that linked descriptive results with governance interpretation. The framework made it possible to move beyond identifying what land conversion occurred, toward explaining why it occurred, through which mechanisms, under what land and institutional conditions, with what implications, and how existing responses performed.

Table 2. Operational Definition and Coding Basis of DPSIR in This Study

Elements	Operational Meaning in This Study	Main Evidence Used for Coding
Driving Forces	Broad structural factors that create incentives for agricultural land conversion	Recurring development trends in the 2023 dataset, especially residential-led conversion, and development rationales identified in the Papar case documents such as housing demand, strategic location and local economic growth
Pressures	Immediate mechanisms through which conversion is pursued or justified	Rezoning applications, planning briefs, discretionary approval processes, appeal pathways, and narrative claims such as "inactive" or low-viability paddy land
State	Existing condition of the land and governance setting at the point conversion pressure occurs	Land title status, land condition, zoning status, paddy conservation designation, and observed tenure or zoning vulnerability patterns
Impacts	Observed or likely consequences of conversion for agriculture and food security	Loss of agricultural land area, shift to non-agricultural uses, reduced paddy-related production capacity, weakening of zoning credibility
Responses	Institutional actions, objections, controls, and governance gaps revealed by the analysis	Existing zoning instruments, departmental objections, planning decisions, rejection and appeal processes, and evidence of coordination or enforcement weaknesses

Source: Own analysis, based on: Tscherning et al., (2012)

For the 2023 dataset, DPSIR coding was applied after descriptive analysis had identified the main empirical patterns, this can be seen in Table 2 above. For example, the dominance of residential conversion and broader development-oriented trends were interpreted as driving forces; while rezoning and approval pathways were interpreted as pressures. The concentration of conversion on Native Title land and the inconsistency between agricultural intent and actual land use outcomes were interpreted as part of the state condition of land governance.

For the Papar case, the documentary evidence was coded more directly using the same DPSIR structure. The applicant's housing-related justification was treated as a Driving Force, while the rezoning and appeal process was classified as a Pressure. The land's Native Title status, paddy condition, and conservation zoning were interpreted as the State. The potential loss of paddy land and the weakening of food security zoning were identified as the Impact, while the contrasting positions of the local authority and the Department of Agriculture, together with the rejection and subsequent appeal, were interpreted as the Response.

Analytical Value of the DPSIR Framework

While descriptive statistics provide a useful overview of land conversion patterns, they are limited in their ability to explain the underlying mechanisms driving these changes. The DPSIR framework adds analytical value by structuring the relationships between broader development dynamics, institutional processes, and land-use outcomes, thereby making cause-effect linkages more explicit (Tscherning et al., 2012).

In this study, DPSIR enabled a clear distinction between underlying structural drivers (Driving Forces), such as urbanisation, housing demand, and economic incentives, and proximate mechanisms of change (Pressures), including rezoning applications, planning approvals, and appeal processes. This distinction is consistent with

the framework's role in clarifying causal relationships between socio-economic drivers and environmental outcomes (Smeets & Weterings, 1999; Tscherning et al., 2012). The framework also facilitated the systematic tracing of institutional responses, including regulatory decisions, departmental objections, and appeal pathways, which are often difficult to capture through descriptive analysis alone. By linking responses to impacts, DPSIR supports policy-relevant analysis and helps identify governance gaps and intervention points (Tscherning et al., 2012).

Furthermore, DPSIR provided a common analytical structure for integrating quantitative and qualitative findings**.** The framework has been widely recognised for its ability to support interdisciplinary analysis and integrate social, economic, and environmental dimensions within a unified structure (Lewison et al., 2016; Tscherning et al., 2012). At the same time, existing studies note that integrating diverse data types and disciplinary perspectives within DPSIR remains a challenge, particularly when combining qualitative institutional insights with quantitative datasets (Lewison et al., 2016). Acknowledging this limitation, this study addresses such challenges by using DPSIR as a structured synthesis tool to align descriptive statistics with case-based institutional analysis. Without the DPSIR framework, the analysis would have produced a descriptive account of conversion patterns without adequately explaining how development pressures translate through institutional pathways into land protection failures and food security impacts. By linking drivers, pressures, state conditions, impacts, and responses, DPSIR supports a more comprehensive and policy-relevant interpretation of land-use change (Tscherning et al., 2012).

FINDINGS

The findings highlight the principal empirical patterns and institutional dynamics underlying agricultural land conversion in Sabah. Based on the 2023 verified conversion dataset and a supplementary 2025 rezoning case in Papar, the analysis identifies the scale and direction of land use transitions, the tenure categories most exposed to conversion, and the procedural inconsistencies that weaken agricultural land protection. Table 3 below summarises the principal findings before the detailed discussion in the following subsections.

Table 3. Summary of Key Findings on Agricultural Land Conversion and Governance in Sabah

Finding Dimension	**Summary of Key Finding**	**Implication**
Scale of conversion	In 2023, approximately 238.08 acres of agricultural land were converted across 36 verified cases in Sabah.	This indicates that agricultural land conversion remains substantial and may undermine long-term food security.
Post-conversion pattern	Residential development accounted for the largest share of conversion area and case frequency, followed by commercial, industrial, public utility, and tourism uses.	Agricultural land is being converted mainly to non-agricultural urban and development-oriented uses.
Tenure exposure	Native Title land constituted the largest share of converted land in both case frequency and total area, while Country Lease and other titles accounted for a smaller share.	Native Title land appears particularly vulnerable to conversion pressure.
Zoning inconsistency	Several cases involved land with agricultural intent or status that nevertheless proceeded through rezoning or approval pathways for non-agricultural development.	Agricultural zoning or land status alone does not consistently ensure effective land protection.
Papar case	The Papar case involved 8.332 acres of Native Title land with paddy land conditions	Even land associated with food security protection can remain vulnerable to

evidence	within a gazetted Paddy Conservation Area, yet it was proposed for 127 two-storey terrace houses.	development pressure.
Institutional contradiction	The local authority supported forwarding the proposal, while the Department of Agriculture Sabah objected on paddy suitability and food security grounds.	Agricultural land governance is weakened by fragmented institutional priorities and inconsistent inter-agency alignment.
Appeal pathway	Although the application was initially rejected, a formal appeal was subsequently submitted.	Appeal mechanisms can prolong conversion pressure even after technical objection and initial rejection.
DPSIR interpretation	The findings show that urbanisation and housing demand act as driving forces, rezoning and appeals act as pressures, Native Title and paddy conservation land reflect the vulnerable state, and responses remain fragmented.	Stronger, more enforceable, and better coordinated land governance is needed to protect agricultural land and food security.

Source: Author's own work

As shown in Table 3, agricultural land conversion in Sabah is shaped not only by development pressure, but also by tenure vulnerability, zoning inconsistency, and fragmented institutional responses.

Agricultural Land Conversion Patterns in Sabah (2023)

The 2023 dataset shows that agricultural land conversion in Sabah remained substantial, involving 36 verified cases covering approximately 238.08 acres. Overall, the results indicate that converted agricultural land was directed mainly toward non-agricultural development functions. Post-conversion land use was dominated by residential development, which recorded the highest number of cases and the largest converted area, with 19 cases covering 121.39 acres. This was followed by commercial use with 12 cases involving 51.32 acres, industrial use with 4 cases covering 30.38 acres, and tourism use with 1 case covering 34.99 acres (Table 4). The pattern suggests that residential expansion was the most prominent conversion outcome in the dataset, followed by other urban and service-related land uses.

Table 4. Land Use After Conversion

Post-Conversion Use	No. of Cases	Total Area (acres)
Residential Land	19	121.39
Commercial Land	12	51.32
Industrial Land	4	30.38
Tourism Land	1	34.99

Source: Author's own work

The distribution of land title types also reveals an uneven pattern of exposure to conversion. Native Title land accounted for the largest share, involving 22 cases and 140.72 acres. This was followed by Country Lease with 11 cases and 78.39 acres, Provisional Lease with 2 cases and 13.26 acres, and 1 case for Field Register with 5.71 acres (Table 5). These results indicate that Native Title land was the most affected category in both case frequency and total converted area.

Table 5. Land Title Type

Land Title	No. of Cases	Total Area (acres)
Native Title (NT)	22	140.72
Country Lease (CL)	11	78.39
Provisional Lease (PL)	2	13.26
Field Register (FR)	1	5.71

Source: Author's own work

Taken together, the descriptive findings establish the empirical baseline for the study by showing that agricultural land conversion in Sabah in 2023 was shaped mainly by residential-led development and was disproportionately concentrated on Native Title land. These patterns provide the basis for the subsequent discussion of zoning inconsistency, institutional pressures, and governance implications. The "State" condition identified in this study should not be interpreted as a static snapshot, but rather as part of a dynamic and potentially evolving governance context. In particular, the vulnerability of Native Title land appears to reflect not only its current institutional status, but also a progressive erosion of protective mechanisms over time. This erosion may be associated with policy and legal changes that have enabled leasing, commercial utilisation, and greater exposure to development pressures, thereby weakening the original intent of Native Title as a form of agricultural land protection (Nuar & Lunkapis, 2019; Salleh, 2021).

Although this study is based on cross-sectional data from 2023 and does not include longitudinal analysis, the observed concentration of land conversion in Native Title holdings suggests that vulnerability may be cumulative rather than incidental, shaped by incremental institutional and regulatory shifts. This interpretation is consistent with broader findings that land governance weaknesses often emerge gradually through overlapping policy changes and discretionary planning practices. Future research should therefore incorporate temporal analysis of land conversion patterns, including year-by-year trends, changes in zoning enforcement, and evolving tenure arrangements, in order to better understand how agricultural land vulnerability develops over time. Such analysis would strengthen the evidence base for policy interventions aimed at addressing not only individual conversion cases, but also the systemic and cumulative drivers of land-use change.

Papar Rezoning Case and DPSIR Interpretation (2025)

The supplementary Papar case helps explain the institutional mechanisms behind the broader patterns observed in the 2023 dataset. The case study analysis was based on unpublished planning and appeal documents provided by the Department of Town and Regional Planning Sabah (personal communication, 2025). The case involved 8.332 acres of Native Title land with paddy land conditions, located within a gazetted Paddy Conservation Area, but proposed for high-density residential development comprising 127 two-storey terrace houses. The proposal was justified in terms of housing demand, strategic location, and local socio-economic benefit, while also portraying nearby paddy land as "inactive." The case revealed divergent institutional positions. Majlis Daerah Papar supported forwarding the proposal for further consideration, whereas the Department of Agriculture Sabah objected on the grounds of paddy suitability and food security protection. Although the application was initially rejected, a formal appeal was subsequently submitted, showing that conversion pressure can continue even after technical objection and an initial rejection. From a DPSIR perspective, the case shows that urbanisation, housing demand, and development incentives act as driving forces, while rezoning and appeal mechanisms function as pressures. The state condition was one of formally protected agricultural land, yet still vulnerable in practice. The likely impacts include loss of paddy-related land and reduced food production capacity, while the responses remained fragmented and insufficiently

binding. Taken together, the Papar case demonstrates how institutional contradictions and appeal pathways can weaken agricultural land protection despite formal zoning intent.

Policy Implications and Response Strategies

The findings indicate that agricultural land conversion in Sabah is shaped by peri-urban development demand, tenure vulnerability, zoning inconsistency, and fragmented institutional responses. The concentration of conversions in peri-urban districts is consistent with wider evidence that urban expansion is a major driver of farmland loss (Suu, 2009; Ustaoglu & Williams, 2022), including in Malaysian urban fringe areas (Marzuki & Jais, 2020). The high exposure of Native Title land suggests a gap between formal tenure protection and practical enforceability, echoing concerns that regulatory loopholes have weakened Native Title safeguards (Nuar & Lunkapis, 2019). These pressures may be further reinforced by speculative development, limited agricultural support, and economic incentives favouring non-agricultural land use (Wulan et al., 2022; Toan & Yen, 2023). The Papar rezoning appeal also shows that Paddy Conservation or Food Security zoning remains vulnerable when discretionary decision pathways and appeal mechanisms allow conversion pressure to continue. Overall, the findings suggest that zoning designation alone is insufficient without stronger inter-agency coordination, clearer procedural thresholds, and more enforceable land protection mechanisms. In response, this study proposes six strategic dimensions as an integrated DPSIR "Response" package: social, economic, regional, farmland, technological, and accessibility measures. Social strategies such as community-supported agriculture, urban farming, and participatory planning can strengthen stewardship for farmland protection (Vassalos et al., 2017; Sanyal et al., 2023; Wahanisa et al., 2021). Economic instruments, including subsidies, tax relief, use-value assessment, land trusts, and conservation easements, can reduce conversion incentives and improve farm viability (Adelaja et al., 2011; Khatun, 2019; Smith, 2022). Regional and farmland governance measures, including Agricultural Protection Zones, Food Security Impact Assessments, zoning audits, and stronger safeguards for Native Title land, can improve coordination and reinforce zoning integrity (Caldwell et al., 2022; Hashimoto & Nishi, 2016; Rissman, 2013). Technological and accessibility strategies, such as GIS monitoring, climate-resilient farming, better infrastructure, and targeted support for smallholders, can strengthen compliance, productivity, and livelihood resilience (Bogomazov et al., 2021; CGIAR, 2023; Tong et al., 2017; Koppmair et al., 2016; Asirvatham et al., 2023).

Study Limitations

This study has several limitations that should be acknowledged. First, the dataset comprises 36 verified agricultural land conversion cases derived from official administrative records and therefore reflects only conversions that proceeded through formal planning channels. Informal, unrecorded, or unauthorized land conversion activities are not captured and may lead to an underestimation of the actual extent of agricultural land conversion in Sabah. Second, the analysis relies on administrative records provided by a single institutional source, namely the Department of Town and Regional Planning Sabah. While these records provide important official evidence, they may not fully capture conversion activities processed through other agencies or affected by internal reporting and classification limitations. Third, the Papar rezoning appeal was included as a supplementary qualitative case study to provide a process-based explanation of institutional mechanism underlying land conversion pressure. While analytically valuable, it remains a single case and its findings are not intended to be statistically generalisable to all districts or land conversion contexts in Sabah. Further comparative case research across multiple districts would be needed to assess the consistency of the institutional patterns identified here. Fourth, this study does not include an economic analysis of land value differentials, compensation incentives, or farmer livelihood impacts, as such analysis would require additional data beyond the scope of the available administrative and documentary sources. These dimensions remain important for future research on the broader consequences of agricultural land conversion. Finally, although the quantitative dataset refers to 2023 and the Papar case study refers to 2025, this temporal gap does not undermine the analytical purpose of the study. The Papar case is used not to establish temporal trends, but to illustrate institutional mechanisms and governance contradictions that are likely to persist over time. Nevertheless, future research would benefit from longitudinal analysis that tracks year-by-year conversion patterns, regulatory changes, and the evolving vulnerability of agricultural land, particularly Native Title land.

CONCLUSION

This study assessed agricultural land conversion and food security risk in Sabah using 36 verified conversion cases from 2023, covering 238.08 acres, and a supplementary rezoning appeal case in Papar (2025). The results show increasing conversion of agricultural land especially in peri-urban areas toward residential and other non-agricultural uses, with Native Title holdings most frequently affected, indicating persistent weaknesses in tenure safeguards and zoning enforceability. The Papar case further demonstrates that even recently gazetted Paddy Conservation areas can remain vulnerable to rezoning and appeal pressures, reflecting fragmented institutional priorities and limited coordination. Interpreted through DPSIR, development-driven forces generate administrative pressures that weaken the protective state of agricultural land and create impacts extending beyond land loss to reduced productive capacity and declining zoning credibility. In response, this paper proposes an Integrated Agricultural Land Preservation Framework across six dimensions (social, economic, regional, farmland, technological, and accessibility) to strengthen zoning integrity, inter-agency coordination, Native Title protection, and data-driven monitoring. Future work should extend the dataset across multiple years and validate the framework through stakeholder engagement and modelling.

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