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Research Paper

Evaluation of Composting Technology Cooperation in Southeast Asia: DAC-Based Analysis and Comparison with GIZ

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Abstract
This study conducts a cross-case analysis of compost-related technical cooperation projects implemented by the Japan International Cooperation Agency (JICA) in Southeast Asia, applying the six OECD/DAC evaluation criteria (relevance, coherence, effectiveness, efficiency, impact, and sustainability). The analysis covers six projects in Indonesia, Malaysia, Thailand, and Vietnam. First, publicly available ex-post evaluation reports were analysed through close reading of report narratives and cited evidence. Second, semi-structured interviews with stakeholders were used to triangulate documentary evidence and validate interpretations of the evaluation results. The findings suggest that project performance and sustainability are driven less by the technical sophistication of composting systems per se than by institutional fit and the design of local participation. As a comparative reference, the study also examines three cases under the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)'s ProSoil programme. The comparison indicates that GIZ's strategic combination of standardised 'ready-made' equipment and a long-term programme framework contributed to higher scores on efficiency and sustainability, whereas selected JICA projects demonstrated relative strengths in contextual adaptation and community engagement. Overall, the results imply that effective compost technology cooperation requires project designs that explicitly integrate institutional conditions and an appropriate support horizon, in addition to technical content.

Keywords
Technical Cooperation, Composting Technology, DAC Evaluation, JICA, GIZ, Project Duration

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1. INTRODUCTION

Organic waste management has become an important policy issue in developing countries because biodegradable waste often accounts for a large share of municipal solid waste and inadequate treatment contributes to landfill pressure, methane emissions, and local environmental pollution (Hoornweg and Bhada-Tata, 2012; Wilson et al., 2015). Composting is therefore widely discussed as a resource-recovery option that can reduce waste volumes while returning nutrients to soils (Food and Agriculture Organization of the United Nations, 2011; Aziz et al., 2018).

Yet composting performance is highly uneven. Prior studies show that outcomes depend not only on technical design but also on source separation, market demand, operational fit, stakeholder coordination, and local institutional arrangements (Zurbrugg et al., 2014; Premakumara and Abe, 2015; Dan et al., 2023; Fitriani et al., 2024). This issue is especially salient in technical cooperation projects, where operation and maintenance after external support often determine whether facilities remain functional.

Although the OECD/DAC criteria are widely used in development evaluation, cross-case comparison remains difficult when findings are reported mainly as narrative judgements or through donor-specific formats (Organisation for Economic Co-operation and Development (OECD), 2019, 2021; Mikami, 2022). JICA's evaluation guidelines provide structured definitions for each criterion, but they do not by themselves generate a common numerical basis for comparing multiple projects and donor approaches (Japan International Cooperation Agency (JICA), 2023).

This study has two objectives. First, it evaluates six JICA compost-related technical cooperation projects in Southeast Asia using the six OECD/DAC criteria in a consistent and transparent manner. Second, it examines which design features are associated with stronger performance, with particular attention to institutional fit, stakeholder participation, equipment choice, and support duration. To strengthen the comparative analysis, three cases from GIZ's

ProSoil programme are used as a comparative reference.

The study's contribution lies in applying a simple three-point conversion of qualitative DAC judgements across nine cases and combining this procedure with interview-based triangulation. This design makes it possible to compare patterns across projects while retaining the interpretive depth of qualitative evaluation. The remainder of the paper proceeds as follows. Section 2 explains the methods, case selection, and scoring approach. Section 3 presents the results and discussion for all nine cases. Section 4 concludes, and Section 5 outlines limitations and future research.

2. EXPRIMENTAL SECTION

This section is organised as follows: Section 2.1 describes case selection criteria; Section 2.2 presents the scoring methodology and reliability assurance procedures; Section 2.3 describes the analysis of GIZ cases; Section 2.4 explains the interview data collection; and Section 2.5 explains conservative score adjustments.

Figure 1 summarises the conceptual framework used in this study. It links project design variables, the OECD/DAC criteria employed as the common scoring rubric, and the evaluation outcomes used to derive design implications across cases. The feedback loop indicates that the findings are used to inform the design of future technical cooperation projects.

Figure 2 illustrates the overall research design. The study integrates two primary data sources-JICA ex-post evaluation reports and GIZ ProSoil programme documents-through document analysis, DAC-based scoring, and interview-based triangulation. The following subsections describe each methodological component.

2.1 Selection of Target Projects

The target projects for this study are six composting-related technical cooperation projects implemented by JICA in the Southeast Asian region since 2005 for which official ex-post evaluation reports have been published. Specifically, these include the Bandung City Waste Recycling Project and Bali Island Rural Composting Support Project in Indonesia, Microalgae-Based Recycling Support (COSMOS) and Cameron Highlands Small-Scale Farmer Support in Malaysia, the Local Government Support Project in Chiang Mai suburbs in Thailand, and Urban Organic Waste Treatment Support in Hai Phong City, Vietnam.

The selection of the six JICA projects was guided by three criteria. First, all projects had publicly available official ex-post evaluation reports, ensuring data accessibility and comparability. Second, projects were restricted to Southeast Asia to control for regional context. Third, the set was designed to represent variation in technology type (mechanised versus simple/decentralised), scale (urban versus rural), and national context, thereby maximising the range of design patterns observable within a feasible case number. A broader initial pool of JICA composting-related projects was reviewed; those lacking published ex-post reports or outside the composting domain were excluded. The three GIZ cases were selected because they represent the most comparable programme in terms of composting focus under the ProSoil framework, and because programme-level documentation and secondary evaluations are publicly accessible. Table 1 summarises key characteristics of all nine cases.

2.2 Scoring Methodology and Reliability Assurance

This study employed a method of converting qualitative evaluations to scores out of 3 points for each of six items: relevance, coherence, effectiveness, efficiency, impact, and sustainability. Specifically, "high" was assigned 3 points, "medium" 2 points, and "low" 1 point, with total scores representing each project's overall evaluation. Additionally, evaluation tables were created to ensure transparency and reproducibility in scoring for each project. The evaluation tables present scores (1-3 points) and their rationale for each of the six DAC evaluation criteria in a list format.

To strengthen transparency and reproducibility, Table 2 presents the explicit scoring criteria used for each DAC dimension. The scoring rubric was anchored to published OECD/DAC criterion definitions (Organisation for Economic Co-operation and Development (OECD), 2019) and to JICA's evaluation guidelines (Japan International Cooperation Agency (JICA), 2023). To assess consistency, a subset of five cases was independently scored by an academic colleague with experience in development evaluation; discrepancies were discussed and resolved through reference to the original report passages, and the agreed scores were adopted. This process confirmed that the rubric was sufficiently explicit to yield consistent judgements for the large majority of criterion-case combinations, with disagreements concentrated in borderline cases where interview evidence subsequently provided clarification.

2.3 Analysis of GIZ Cases

For the comparative reference, three GIZ cases associated with ProSoil were analysed using the same criteria and scoring rubric. Project documents and relevant secondary sources were reviewed, and the scoring rationales were documented in the same table format to maximise comparability.

2.4 Interviews

Semi-structured interviews were conducted with stakeholders involved in equipment provision, project management, engineering, training, and related sectors. Interviews were conducted on an anonymous basis. A total of fifteen stakeholders were interviewed between 2023 and 2025, including equipment provision company executives (n=5), project managers and researchers (n=4), engineering company representatives (n=3), and technical education institution officials and coordinators (n=3). Interviews were conducted primarily in Japanese and English. The interview evidence was

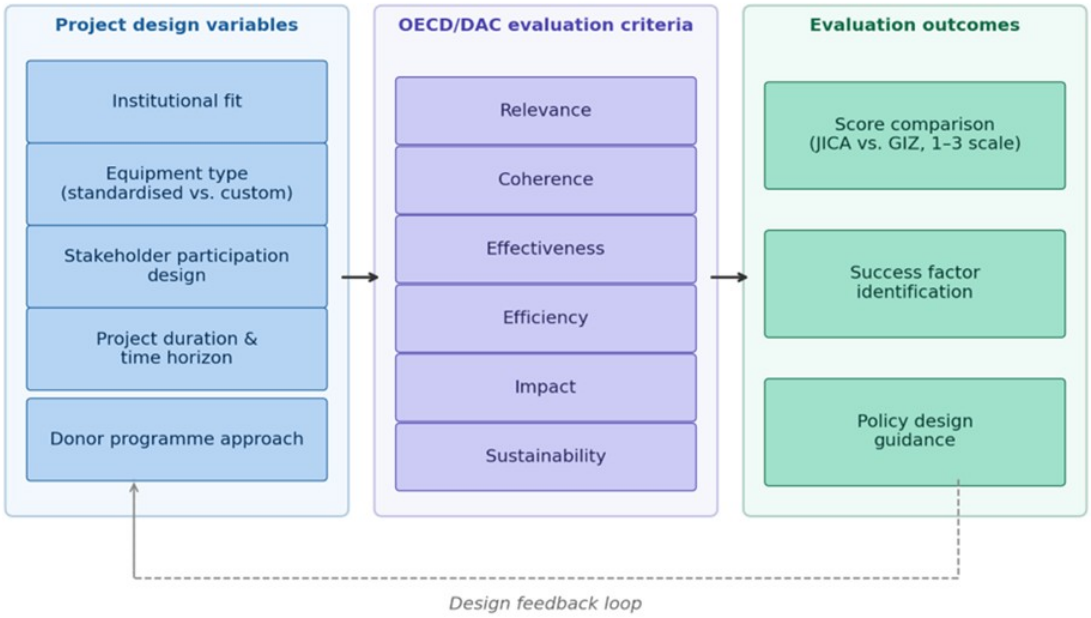

Figure 1. Conceptual Framework: Project Design Variables, OECD/DAC Evaluation Criteria, and Performance Outcomes

Table 1. Characteristics of the Nine Case Studies

Country	Project / Area	Technology Type	Scale	Duration (Years)	Agency
Indonesia	Bandung	Mechanised (centralised)	Urban, large-scale	5	JICA
Indonesia	Bali	Simple (decentralised)	Rural	4.5	JICA
Malaysia	COSMOS	Microalgae-based, research	Research/demonstration	6	JICA
Malaysia	Cameron Highlands	Community-based composting	Rural / agr. cooperative	5	JICA
Thailand	Chiang Mai	Centralised + staff training	Municipal	5	JICA
Vietnam	Hai Phong	Mechanised (urban)	Urban, medium-scale	5	JICA
India	Maharashtra	Standardised ready-made	Urban	10.5	GIZ
Vietnam	Mekong Delta	Standardised ready-made	Rural / agr. cooperative	10	GIZ
Pakistan	Lahore	Standardised ready-made	Urban, large-scale	10	GIZ

Source: Compiled by the author from project documents.

used to clarify ambiguous points in documentary sources, identify operational constraints not fully captured in reports, and validate the interpretation of evaluation narratives.

2.5 Conservative Score Adjustment

Where interviews provided credible, project-specific information that materially affected the interpretation of a criterion, minor score adjustments were made. The adjustments were conservative and were applied only when interview evidence complemented or corrected the documentary record.

3. RESULT AND DISCUSSION

3.1 Indonesia

In Bandung, Indonesia, the project aligned composting system design with high waste volumes and an administration-led implementation model, covering processes from separation and collection to maturation. The project scored high on relevance and coherence because its objectives matched local needs and municipal policies, and the intervention was consistent with local waste management plans without duplicating other donors' activities. Effectiveness was also rated high as the facility commenced operation and key indicators were largely achieved. Efficiency was rated medium due to the operational burden associated with introducing costly mechanised equipment, particularly regarding maintenance requirements. Sustainability was also rated medium, reflecting continuing challenges in covering operating costs and sustaining citizen participation and awareness. Table 3 summarises the criterion-by-criterion scores and rationale for the Bandung case.

In contrast, the Bali Island project in Indonesia adopted simple decentralised composting technology designed specifically for local characteristics, suppressing advanced equipment introduction and assuming resident maintenance, lever-

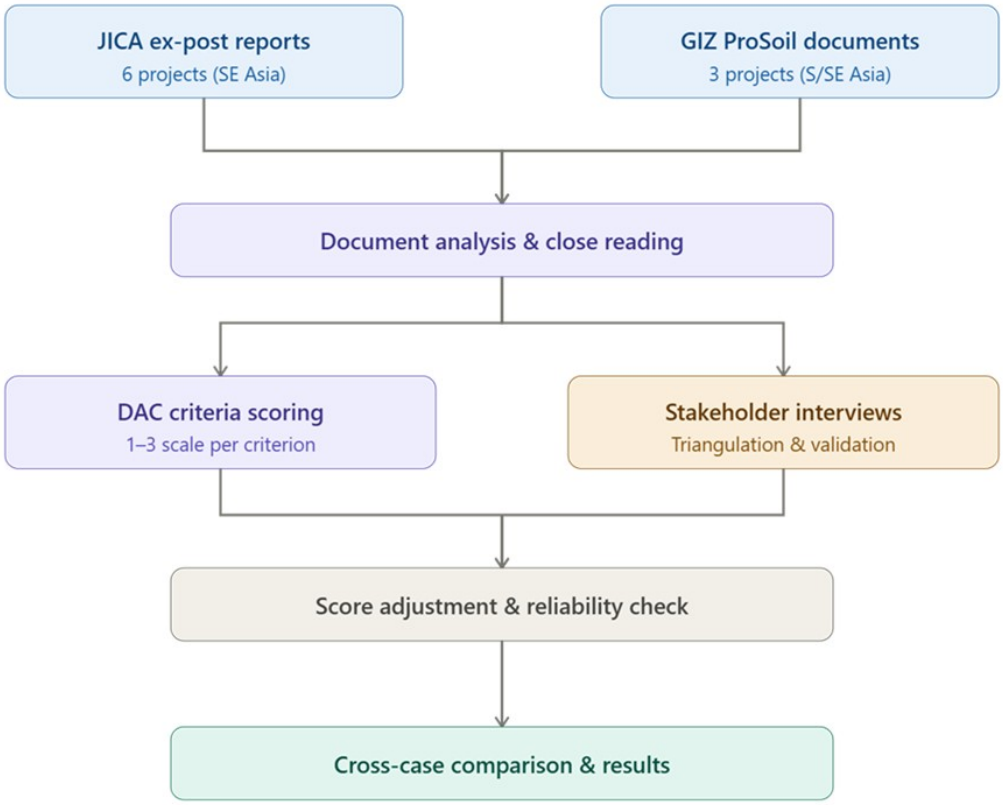

Figure 2. Research Methodology Flowchart

aging rural areas' decentralised lifestyles and existing farmer cooperative networks. This project received high scores (3 points) for "relevance," "impact," and "sustainability" due to high resident initiative, despite medium scores for "coherence," "effectiveness," and "efficiency" (2 points each). The detailed scoring rationale for the Bali case is presented in Table 4.

3.2 Malaysia

In Malaysia, the COSMOS project sought to demonstrate an innovative approach using microalgae-based technology. While the project attracted attention for technical novelty, its applicability and institutional embedding remained limited. The project scored relatively lower on sustainability, reflecting challenges in long-term continuation beyond the research and demonstration phase. Table 5 reports the criterion-level scores and rationale for the COSMOS case.

In Malaysia's Cameron Highlands case, the project leveraged agricultural cooperatives and community-level arrangements to promote organic agriculture and local resource circulation. Strong alignment with local priorities and cooperation structures contributed to high scores in relevance and coherence. Community engagement and institutional fit supported higher sustainability relative to more technology-centric projects. Table 6 presents the criterion-level scores and supporting rationale for the Cameron Highlands case.

3.3 Thailand

In Thailand's Chiang Mai case, the project utilised local government authority and combined facility development, training of municipal staff, and awareness-raising through school education. The project was evaluated highly on relevance and coherence and achieved substantial effectiveness. However, sustainability remained constrained by the need for stable financing of operating costs, resulting in medium scores on sustainability and efficiency. Table 7 summarises the criterion-level scores and rationale for the Chiang Mai case.

3.4 Vietnam

In Vietnam's Hai Phong case, the project responded to the needs of a port city facing stronger environmental regulation by introducing relatively advanced mechanised treatment equipment. The project achieved operational outputs, but the overall evaluation reflected continuing constraints in efficiency and sustainability. Interviews indicated that construction and operational realities can impose burdens that

Table 2. Dac Evaluation Criteria Scoring Rubric (1–3 Scale)

Criterion	Score 3 (High)	Score 2 (Medium)	Score 1 (Low)
Relevance	Fully aligned with beneficiary needs and national/local policy priorities.	Partially aligned; moderate fit with needs or policy.	Limited alignment; objectives diverge from local needs.
Relevance	Fully aligned with beneficiary needs and national/local policy priorities.	Partially aligned; moderate fit with needs or policy.	Limited alignment; objectives diverge from local needs.
Coherence	No duplication; strong synergy with other policies, programmes, and donors.	Partial coordination; minor inconsistencies remain.	Significant inconsistencies with related policies or parallel activities.
Effectiveness	Most or all planned outcomes achieved; key indicators met.	Outcomes partially achieved; some indicators unmet.	Limited achievement; major intended outcomes not realised.
Efficiency	Outputs generated with reasonable resource use; manageable operational burden.	Some inefficiencies in resource use, timeline, or operating cost.	Significant cost overruns, operational burdens, or delayed outputs.
Impact	Clear broader effects beyond direct outputs; spillovers evidenced.	Some spillover effects; limited in scope or geographic reach.	Negligible broader effects; impacts confined to direct outputs.
Sustainability	Continuation mechanism established; independent operation likely post-project.	Some elements continued; external support likely still needed.	Continuation unlikely; no independent operation mechanism established.

Source: Developed by the author based on Organisation for Economic Co-operation and Development (OECD) (2019) and Japan International Cooperation Agency (JICA) (2023).

are not fully visible in ex-post reports, particularly regarding maintenance capacity and long-term financing. Table 8 reports the criterion-level scores and supporting rationale for the Hai Phong case.

3.5 Cross-Case Score Summary

Table 9 summarises the six projects' scores. Overall, JICA projects performed relatively well on relevance and coherence, whereas efficiency tended to be rated lower across cases, reflecting the persistent difficulty of operating and maintaining composting systems under budgetary and capacity constraints.

Table 10 summarises the average scores for each DAC criterion across the JICA cases (n=6) and GIZ cases (n=3), highlighting differences at the criterion level. GIZ cases scored notably higher in efficiency (3.00 vs. 1.83) and relevance (3.00 vs. 2.67), whereas JICA cases showed relative strength in impact (2.50 vs. 2.33). These patterns are illustrated in Figure 3.

3.6 GIZ Cases (ProSoil)

3.6.1 Programme Overview

ProSoil (Soil Protection and Rehabilitation for Food Security) is a programme implemented by GIZ with support from the German Federal Ministry for Economic Cooperation and Development and other partners. The programme emphasises a long-term engagement horizon, iterative learning, and network-building among implementing organisations. In the cases analysed here, standardised 'ready-made' equipment packages were adopted, emphasizing ease of operation, availability of spare parts, and replicability across sites.

3.6.2 Maharashtra, India

In Maharashtra, India, the project achieved high scores across all six criteria. The intervention was fully aligned with urban waste management needs and circular economy policies. Strong linkages with a state agricultural university and producer organisations supported coherence. A composting model became established and networks expanded, and the use of standardised equipment reduced training time and improved operational efficiency. A self-reliant compost sales system involving the private sector and communities contributed to sustainability. The detailed scoring rationale

Table 3. Bandung, Indonesia: Evaluation Rationale

Criterion	Score	Rationale
Relevance	3	Project objectives were highly aligned with local needs and municipal policies.
Coherence	3	No duplication with other donors; consistent with the city's waste management plan.
Effectiveness	3	Most of the indicators were met, and the composting facility has begun operations.
Efficiency	2	Costly mechanised equipment increased operational burdens, especially for maintenance.
Impact	3	Spillover effects in surrounding areas were observed after facility operation began.
Sustainability	2	Challenges remained regarding operating costs and sustained improvement in public awareness.

Source: Created by the author.

Table 4. Bali, Indonesia: Evaluation Rationale

Criterion	Score	Rationale
Relevance	3	Highly aligned with local administrative systems and community needs.
Coherence	2	Coordination with local institutions was partial; some inconsistencies remained.
Effectiveness	2	Planned outputs were achieved to a moderate extent; diffusion remained limited.
Efficiency	2	Operational costs and capacity constraints reduced cost-effectiveness.
Impact	3	Positive effects on local waste practices and related environmental outcomes were observed.
Sustainability	3	A locally managed continuation mechanism was established, but expansion constraints remained.

Source: Created by the author.

for the Maharashtra case is presented in Table 11.

3.6.3 Mekong Delta, Vietnam

GIZ's project in Vietnam's Mekong Delta region adopted highly versatile equipment suited to cooperative and farmer skill levels. Ready-made equipment was selected as the main equipment, succeeding in achieving results with only initial setup using manufacturer instructions and basic operation training (Agamuthu and Babel, 2023). GIZ internal evaluations confirmed that operating costs decreased by an average of 12% within 6 months of introduction (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2025). A Vietnamese engineer reported that "we were able to master equipment handling immediately after introduction, and young people can also be active. Ready-made products make parts procurement easy during breakdowns and maintenance is possible without calling external technicians." Table 12 presents the criterion-level scores and rationale for the Mekong Delta case.

3.6.4 Lahore, Pakistan

The project in Lahore, Pakistan introduced standardised composting equipment, stably achieving processing of 1,000 tons per day (Agamuthu and Babel, 2023). This processing scale is among the largest urban composting plants in the South Asian region, demonstrating the scalability of ready-made equipment. Initial concerns about local operator skill shortages were resolved with only basic operation training, and rapid maintenance and repair were achieved. This case is positioned as a successful example where role division was established: city government bears collection and transport costs, plant operators handle processing and sales, and agricultural cooperatives provide distribution networks (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2025). Table 13 reports the criterion-level scores and supporting rationale for the Lahore case.

Table 5. Malaysia Cosmos: Evaluation Rationale

Criterion	Score	Rationale
Relevance	2	Relevance was moderate; the project prioritised demonstration and research needs.
Coherence	3	The project was coherent with related policy agendas and partner institutions.
Effectiveness	2	Effectiveness was moderate; technical demonstration progressed but adoption was limited.
Efficiency	2	Efficiency was moderate due to the resource intensity of advanced technology development.
Impact	2	Impacts were moderate and largely confined to research and demonstration outputs.
Sustainability	1	Sustainability was low because continuation beyond the project framework was limited.

Source: Created by the author.

Table 6. Cameron Highlands, Malaysia: Evaluation Rationale

Criterion	Score	Rationale
Relevance	3	Highly aligned with local agricultural priorities and community needs.
Coherence	3	Strong consistency with local cooperative structures and relevant policies.
Effectiveness	2	Outcomes were achieved to a moderate extent; implementation faced constraints in scaling.
Efficiency	2	Operational burdens and resource constraints limited efficiency gains.
Impact	3	Broader benefits in the region were observed through strengthened local networks.
Sustainability	3	High prospects for continuation due to cooperative-based management and local ownership.

Source: Created by the author.

3.6.5 GIZ Project Evaluation Scores

Table 14 shows that all three GIZ cases score high on relevance (REL=3), indicating a strong problem–solution fit for composting-based resource recovery. Overall totals differ mainly because coherence, impact, and sustainability vary (India 18; Vietnam 16; Pakistan 14). India's consistently strong profile implies firm institutional embedding and durable post-project arrangements. Vietnam scores well on effectiveness and efficiency, yet lower coherence and impact suggest partial alignment with wider policy and institutional contexts and less evidenced broader effects. Pakistan's lower profile suggests greater difficulty translating outputs into sustained outcomes. Efficiency scores should not be equated with short project duration.

3.6.6 Shared Success Factors

Across the three GIZ cases, shared success factors include reduced learning burdens for local operators and stable long-term operation. First, the adoption of standardised ready-made equipment substantially shortened operator training periods. Whereas projects using customised equipment often required approximately six months of training tailored to site-specific specifications, the three GIZ projects analysed here reduced training periods to around two months by using standardised equipment packages. This was enabled by unified operating manuals and training programmes that could be reused across projects, increasing the efficiency of human resource development. This pattern is consistent with the appropriate technology literature, which emphasises maintainability, operator fit, and manageable support requirements as determinants of successful diffusion (Schumacher, 1973; United Nations Industrial Development Organization (UNIDO), 1978; Tanaka, 2017).

Second, high operating rates were supported by both technical and institutional conditions. Technically, standardisation secured parts interoperability and enabled timely repairs when failures occurred. In contrast, customised equipment often relies on non-standard parts, and procure-

Table 7. Chiang Mai, Thailand: Evaluation Rationale

Criterion	Score	Rationale
Relevance	3	Highly aligned with local government needs and waste management priorities.
Coherence	3	Strong coherence through integration with local administrative authority and education efforts.
Effectiveness	3	Most planned outcomes were achieved, including facility use and human capacity development.
Efficiency	2	Efficiency was moderate because operating cost burdens persisted despite implementation progress.
Impact	2	Impacts were moderate, including partial spillover through awareness raising and institutional learning.
Sustainability	2	Sustainability was moderate due to continuing constraints in financing operation and maintenance.

Source: Created by the author.

Table 8. Hai Phong, Vietnam: Evaluation Rationale

Criterion	Score	Rationale
Relevance	2	Relevance was moderate; the project responded to urban needs but faced contextual constraints.
Coherence	2	Coherence was moderate due to limited integration with other initiatives and policy mechanisms.
Effectiveness	2	Effectiveness was moderate; outputs were delivered but outcomes were constrained operationally.
Efficiency	1	Efficiency was low because mechanised systems imposed high operational and maintenance burdens.
Impact	2	Impacts were moderate but limited in scale and duration.
Sustainability	2	Sustainability was moderate; long-term financing and maintenance capacity remained challenging.

Source: Created by the author.

ment can take several months. Institutionally, the long-term programme framework facilitated continuous engagement, enabling adaptive management and sustained capacity building.

3.6.7 Project Duration and Performance

A comparison of project implementation periods suggests that duration differences may contribute to performance differences. The average implementation period of the GIZ cases (10.17 years) is approximately twice that of the JICA cases (5.08 years). However, longer duration does not automatically guarantee higher performance. For example, the Lahore case (10 years) scored 14, which is below the JICA Bandung and Cameron Highlands cases (16 each). The higher evaluation of selected GIZ cases appears to be attributable less to duration itself than to strategic design choices enabled by a long-term horizon-namely, efficiency gains from standardised equipment, staged target setting, and adaptive management through intermediate review. Regarding efficiency, it is also important to evaluate not only annual costs but the total inputs needed to generate durable outcomes. If short-term projects fail to be institutionalised and require repeated support, long-term efficiency may be lower. Accordingly, this study evaluates efficiency by focusing on outcome achievement relative to inputs, rather than cost per year. Table 15 summarises the implementation periods for the six JICA and three GIZ cases.

3.7 Discussion

3.7.1 Key Insights from Cross-Case Comparison

Based on the evaluation tables, the cross-case comparison highlights both strengths and limitations of JICA and GIZ approaches. The three GIZ cases (average total score: 16) received a higher overall assessment than the six JICA cases (average total score: 14.2) (Table 16; see also Figure 3 and Table 10). The difference is largely associated with two strategic choices evident in the GIZ cases: a long-term approach (a minimum of five years, with continuation over approximately ten years in the programme context) and the adoption of standardised ready-made equipment.

Table 9. Evaluation Scores for the Six JICA Projects

Country	Project	REL	COH	EFF	EFI	IMP	SUS	Total
Indonesia	Bandung	3	3	3	2	3	2	16
Indonesia	Bali	3	2	2	2	3	3	15
Malaysia	COSMOS	2	3	2	2	2	1	12
Malaysia	Cameron H.	3	3	2	2	3	3	16
Thailand	Chiang Mai	3	3	3	2	2	2	15
Vietnam	Hai Phong	2	2	2	1	2	2	11

Note: REL=Relevance, COH=Coherence, EFF=Effectiveness, EFI=Efficiency, IMP=Impact, SUS=Sustainability. Source: Created by the author.

Table 10. Average DAC Criterion Scores

Agency	Rel	Coh	Eff	Efi	Imp	Sus	Ave. Total
JICA (n=6)	2.67	2.67	2.33	1.83	2.50	2.17	14.2
GIZ (n=3)	3.00	2.33	2.67	3.00	2.33	2.67	16.0
Difference (GIZ – JICA)	+0.33	–0.33	+0.33	+1.17	–0.17	+0.50	+1.8

Note: REL=Relevance, COH=Coherence, EFF=Effectiveness, EFI=Efficiency, IMP=Impact, SUS=Sustainability. Scores are arithmetic means of individual project ratings. Source: Calculated by the author.

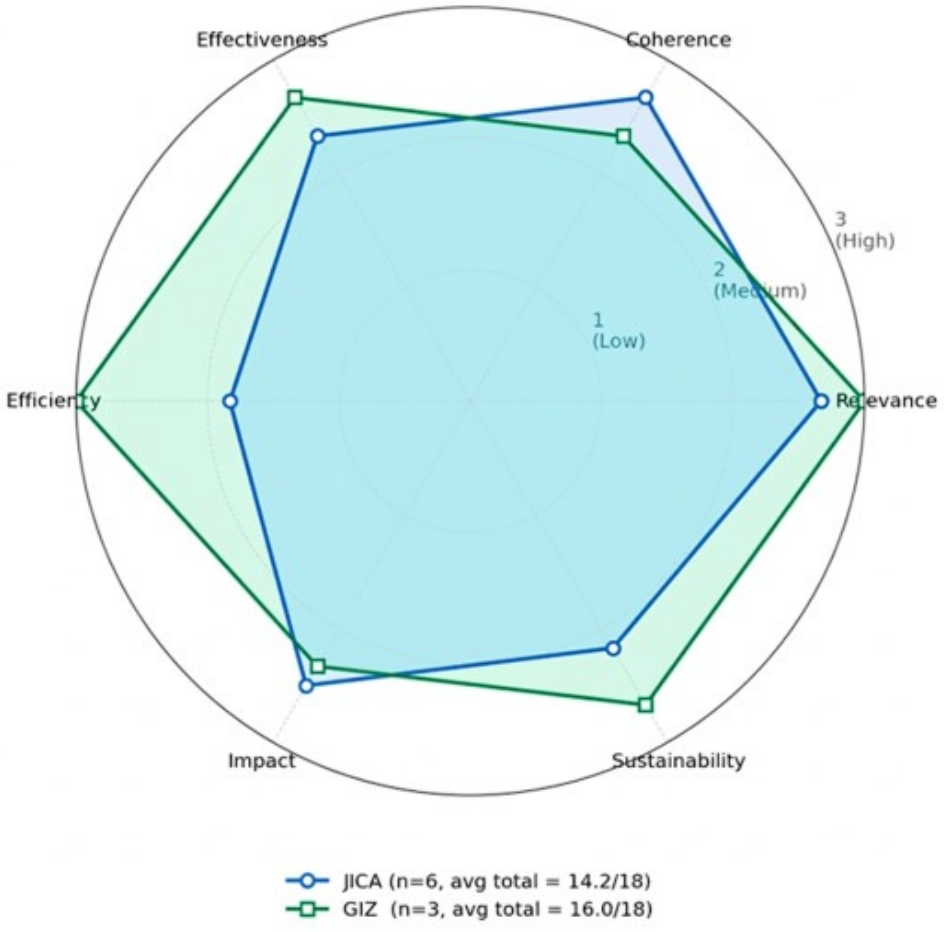

Figure 3. Radar Chart Comparing Average DAC Criterion Scores Scale: 1 = Low, 2 = Medium, 3 = High

Table 11. Maharashtra: Evaluation Rationale

Criterion	Score	Rationale
Relevance	3	Fully aligned with urban waste management needs and circular economy policy.
Coherence	3	Strong coordination with state agricultural university and producer organisations.
Effectiveness	3	Composting model became established and producer networks expanded.
Efficiency	3	Ready-made equipment reduced training time and improved operational efficiency.
Impact	3	Economic and environmental spillovers were observed in surrounding areas.
Sustainability	3	A self-reliant compost marketing system was established by private and community actors.

Source: Created by the author.

Table 12. Mekong Delta: Evaluation Rationale

Criterion	Score	Rationale
Relevance	3	Highly aligned with local needs and policy directions for organic waste management.
Coherence	2	Coordination existed but integration with other initiatives was partial.
Effectiveness	3	Key outcomes were achieved and composting practices were adopted.
Efficiency	3	Standardised equipment and manuals improved efficiency and reduced learning burdens.
Impact	2	Spillover effects were observed but were moderate in breadth.
Sustainability	3	High continuation prospects supported by long-term programme engagement.

Source: Created by the author.

At the same time, GIZ does not uniformly outperform JICA across all criteria. In institutional fit with local systems and the facilitation of community agency, selected JICA projects demonstrated strong performance. In Bali, for example, flexible project design attentive to administrative practices and local customs promoted community engagement and helped build a structure for continued use after project completion.

3.7.2 Implications from the GIZ Cases

A key implication from the GIZ cases is the importance of designing technical cooperation as a long-term institutional process, rather than a short-lived technology transfer. The programme framework enabled phased goal setting, iterative learning, and trust building among stakeholders. Another implication concerns implementation tools: standardised equipment can reduce training burdens and facilitate maintenance through parts compatibility and simplified procedures.

3.7.3 Strengths of JICA Approaches

The JICA cases nonetheless indicate two important strengths. Flexible project design can improve alignment with local institutions and cultural contexts, thereby supporting community participation and contextual adaptation. In addition, the diversity of implementation modalities-including administrative-led and cooperative-based approaches-allows project design to be matched more closely to local conditions.

3.7.4 Challenges in Contextual Adaptation of Equipment Provision

Challenges remain in equipment provision. Mechanised systems can impose substantial burdens where maintenance capacity, spare-parts supply chains, and financing mechanisms are weak. Equipment selection should therefore explicitly consider maintainability, procurement lead times, and the availability of local service ecosystems.

Table 13. Lahore: Evaluation Rationale

Criterion	Score	Rationale
Relevance	3	Highly aligned with local waste management needs and policy priorities.
Coherence	2	Coherence was moderate; alignment with other development activities remained limited.
Effectiveness	2	Effectiveness was moderate; achievements were below the strongest cases.
Efficiency	3	Efficiency was high, supported by standardised equipment and training design.
Impact	2	Impact was moderate; broader effects were less evident.
Sustainability	2	Sustainability was moderate; longer-term continuation required further strengthening.

Source: Created by the author.

Table 14. GIZ Project Evaluation Scores

Country	Project	REL	COH	EFF	EFI	IMP	SUS	Total
India	Maharashtra	3	3	3	3	3	3	18
Vietnam	Mekong	3	2	3	3	2	3	16
Pakistan	Lahore	3	2	2	3	2	2	14

Note: REL=Relevance, COH=Coherence, EFF=Effectiveness, EFI=Efficiency, IMP=Impact, SUS=Sustainability. Source: Based on Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (2025), (Kawai et al., 2017, 2020), and stakeholder interviews, created by the author.

3.7.5 Maintenance and Training Burdens

Maintenance and training burdens are recurrent determinants of efficiency and sustainability. Even when facilities are constructed and initial operations begin, insufficient routine maintenance and limited operator capacity can cause downtime, increasing costs and undermining confidence. Reducing learning costs through standardisation and designing continuous training systems are therefore critical.

3.7.6 Design Implications Beyond 'Longer Duration'

The primary lesson is not simply to extend project duration. Rather, the appropriate time horizon depends on the depth of change sought. Where the aim is technology transfer and initial institutionalisation, a three- to five-year framework can be reasonable. Where the objective is deeper institutional integration and policy embedding, a longer programme framework with adaptive management may be beneficial.

3.7.7 Interaction Between Duration and Strategy

Project duration therefore interacts with design and implementation strategy. Longer horizons can enable staged outcomes and adaptive correction, but only when coupled with clear governance arrangements and practical mechanisms that reduce operational burdens.

3.7.8 Operational Mechanisms Linking Institutional Coherence to Sustainability

Institutional coherence influences sustainability primarily through operational mechanisms rather than through the intrinsic sophistication of composting technology. When a project is embedded in an existing policy and administrative mandate, roles and responsibilities are clarified across the implementing agency, local government, and facility operators. This alignment typically creates predictable budget lines (for utilities, consumables, and basic maintenance), legitimises enforcement or coordination functions (e.g., waste collection routing, feedstock quality control), and reduces reliance on a small number of individual 'champions' whose departure can otherwise destabilise operations.

A second mechanism concerns routinisation. Coherent institutional arrangements tend to formalise standard operating procedures for feedstock intake, process monitoring, product quality assurance, and reporting. Even when equipment is modest, regular measurement and documentation strengthen corrective maintenance and enable managers to justify procurement decisions to finance units. Conversely, where institutional fit is weak, monitoring is often treated as a project requirement rather than as a local management tool, and maintenance becomes reactive. The cross-case pattern therefore suggests that sustainability is better understood as a function of governance continuity, budget predictability, and routine management capacity than as a direct function of technology level alone. In causal terms, insti-

Table 15. Comparison of Project Duration (Years)

Country	Project / Area	Duration (Years)	Agency	Average (Years)
Indonesia	Bandung	5		
Indonesia	Bali	4.5		
Malaysia	COSMOS	6		
Malaysia	Cameron H.	5	JICA	5.08
Thailand	Chiang Mai	5		
Vietnam	Hai Phong	5		
India	Maharashtra	10.5		
Vietnam	Mekong	10	GIZ	10.17
Pakistan	Lahore	10		

Source: Created by the author.

Table 16. Comparison of Total Evaluation Scores

Country	Project / Area	Total Score	Agency	Average Score
Indonesia	Bandung	16		
Indonesia	Bali	15		
Malaysia	COSMOS	12		
Malaysia	Cameron H.	16	JICA	14.2
Thailand	Chiang Mai	15		
Vietnam	Hai Phong	11		
India	Maharashtra	18		
Vietnam	Mekong	16	GIZ	16.0
Pakistan	Lahore	14		

Source: Created by the author.

tutional coherence influences sustainability through at least three distinct pathways: (1) budget legitimacy-embedded mandates generate predictable recurrent budget lines for maintenance; (2) role clarification-clear governance structures reduce coordination costs and limit the dependency on individual champions; and (3) routinisation-formal standard operating procedures make corrective maintenance systematic rather than reactive. These pathways are consistent with embeddedness theory Granovetter (1985), which emphasises that economic activities are shaped by the social structures in which they are situated.

3.7.9 Designing Equipment Provision as an Adaptive, Service-Oriented Package

Designing equipment provision as an adaptive, service-oriented package shifts attention from the binary choice of "ready-made" versus "customised" machinery to the conditions that keep facilities operating after external support ends. Across the cases reviewed, equipment performance depended less on nominal specifications than on whether a maintainable local ecosystem existed: predictable access to wear parts, competent repair services, and operators able to identify faults before minor issues become prolonged downtime. A service orientation therefore treats hardware as one component of a delivery system that also includes maintenance, learning, and accountability.

An adaptive package should be specified around total cost of ownership rather than initial procurement. At minimum, this entails a standard bill of spares with lead times and locally available substitutes identified; preventive maintenance schedules linked to simple logbooks and checklists; operator training calibrated to baseline skills (including basic troubleshooting and safe shutdown procedures); and a commissioning period with repeated coaching visits until routines stabilise. Clear acceptance tests and performance thresholds-such as target throughput, moisture-control ranges, screening quality, and safe operating temperatures-help distinguish design limitations from operational deviations and focus corrective support. Documentation should be designed for use after project completion, with concise standard operating procedures, fault trees, and procurement specifications for consumables.

Adaptation can be strengthened through modular configurations and phased commissioning. Rather than installing maximal capacity at the outset, projects can prioritise a stable "core line" (feedstock preparation, primary composting, screening) and add optional modules (aeration upgrades, refiners, bagging) once routines and demand are demonstrated. This sequencing reduces sunk costs, supports learning-by-doing, and creates decision points where performance data (downtime, throughput, reject rates, and unit operating costs) inform scale-up. Where procurement rules constrain

multi-year service contracts, projects can still approximate a service model by standardising parts across sites, contracting local workshops for periodic inspections, and establishing a small recurrent budget line for consumables and maintenance. Embedding these provisions in institutional mandates clarifies who pays, who authorises repairs, and how performance is monitored, thereby improving the likelihood of sustained operation.

3.7.10 Implications for Evaluation Design and Interpretive Robustness

The scoring approach used in this study is intended as a structured synthesis of narrative judgements rather than as a substitute for primary performance measurement. To mitigate interpretive bias, the conversion of qualitative statements into 1–3 scores was anchored to explicit criterion definitions, and the interview evidence was used to triangulate plausibility where report narratives were ambiguous. Nonetheless, two cautions remain. First, ex-post evaluation reports differ in depth and emphasis, which may affect cross-case comparability.

Second, sustainability outcomes can be shaped by exogenous shocks (price changes, staff turnover, or policy shifts) that are not fully captured in documentary sources. Future research could strengthen robustness by conducting sensitivity checks on the scoring thresholds, incorporating longitudinal facility-level operational data where available (e.g., downtime, output, cost recovery), and applying comparable coding rules across donors and sectors. As a preliminary sensitivity check, the criterion means in Table 10 were recalculated under two alternative boundary conditions: (a) treating all borderline cases as one point lower (conservative scenario), and (b) treating them as one point higher (optimistic scenario). The overall ranking of criteria and the relative positions of JICA and GIZ were stable across both scenarios, with efficiency and sustainability remaining the largest differentials. This suggests that the main qualitative conclusions are not sensitive to reasonable variation in scoring thresholds, though the magnitude of cross-donor differences should be interpreted with appropriate caution given the small number of cases.

First, evaluators could document the rationale for ratings with a short evidence table that records the specific passages or indicators used, making subsequent synthesis less dependent on tacit judgement. Second, projects could standardise a small set of post-project follow-up indicators-such as months of continuous operation, proportion of planned maintenance tasks completed, share of compost distributed through stable channels, and the presence of a dedicated budget line-collected at 6-12-month intervals for at least two years. These indicators do not require sophisticated monitoring systems but would allow a clearer distinction between temporary outputs and durable institutionalisation. Such a design would also help disentangle sustainability from external shocks by showing whether operational routines persist despite adverse conditions in practice.

4. CONCLUSIONS

This study presents a cross-case analysis of compost-related technical cooperation, covering six JICA projects in Southeast Asia and three cases under GIZ's ProSoil programme, evaluated using the six OECD/DAC criteria. Combining close reading of ex-post evaluation reports with semi-structured interviews, the analysis finds that project performance is shaped less by the technical sophistication of composting systems per se than by institutional fit, feasible operation and maintenance arrangements, and the design of local participation. The comparison identifies two design patterns associated with higher efficiency and sustainability in the GIZ cases: a long-term programme framework enabling phased goal setting and adaptive management, and the strategic use of standardised 'ready-made' equipment that reduces learning and maintenance costs. However, the comparison does not indicate a uniform donor advantage; selected JICA projects-most notably Bali and Cameron Highlands-demonstrated relative strengths in contextual adaptation and community engagement, suggesting that standardisation and local embedding should be treated as complementary, not competing, design logics.

From a methodological standpoint, the study contributes to ODA evaluation literature by demonstrating the utility of converting qualitative DAC judgements into a structured three-point scoring framework for cross-case synthesis. It extends the embeddedness perspective (Granovetter, 1985) to technical cooperation, and updates the 'appropriate technology' tradition (Schumacher, 1973; United Nations Industrial Development Organization (UNIDO), 1978) to encompass maintainability, parts compatibility, and institutional embeddedness alongside technical simplicity. The policy implication with respect to project duration is not simply to extend all technical cooperation projects; rather, the time horizon should be aligned with the depth of institutional change sought, with longer programme frameworks reserved for objectives requiring deeper policy embedding and system-wide integration.

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