

Knowledge and Technology Transfer in Agriculture: A Tripartite Management System

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HOW TO CITE:

Rashid T. Halipa (2026).
Knowledge and Technology
Transfer in Agriculture: A Tripartite
Management System.
International Journal of Special
Education, 41(14s), 592-596

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ABSTRACT:

Purpose: This study assessed the status of agricultural knowledge and technology transfer (KTT) and developed a Tripartite Management System involving the academe, government, and farming communities in Tawi-Tawi. **Novelty & Contribution:** Unlike traditional top-down extension models, this system emphasizes shared governance, two-way knowledge flow, and integration of scientific and indigenous knowledge—addressing coordination gaps common in island provinces. **Methodology:** A descriptive-correlational research design was used with 265 respondents selected through purposive sampling. The questionnaire was validated by experts and tested for reliability. **Key Findings:** Knowledge transfer ($M = 3.40$) and technology transfer ($M = 3.37$) were rated Very High, while challenges were also rated Highly Challenged ($M = 3.43$). No significant differences were found across stakeholder groups ($p > 0.05$), confirming uniform experiences. **Practical Value:** The validated Tripartite Management System provides a structured, sustainable framework to strengthen coordination, reduce barriers, and improve agricultural productivity and livelihoods in geographically isolated regions.

Keywords: Knowledge and Technology Transfer, Tripartite Management System, Agricultural Extension, Stakeholder Collaboration, Sustainable Agriculture, Tawi-Tawi, Philippines

Introduction

To ensure food security and sustainable farming, effective knowledge and technology transfer (KTT) is essential to bridge the gap between research outputs and on-farm application. Traditional models often rely on one-way delivery from government agencies, which frequently fail to adapt to local conditions, especially in archipelagic regions like Tawi-Tawi (Maulana & Antriandarti, 2022).

Research Gap & Need for a Tripartite System

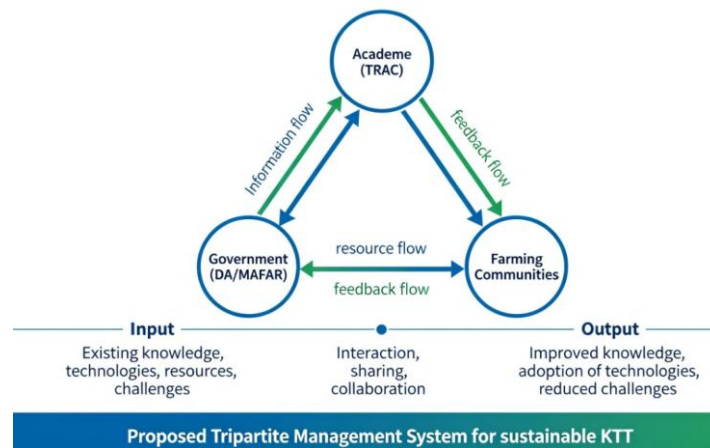
Most existing approaches operate in isolation: research institutions generate knowledge without

considering local needs, government agencies deliver services without sufficient technical updates, and farmers rely only on traditional practices. Studies by Dela Cruz et al. (2022) and Flórez Gómez et al. (2023) note that fragmented systems lead to low adoption rates, poor resource utilization, and limited impact. This study fills the gap by proposing and validating a Tripartite Management System—an integrated model where the academe, government, and farmers work as equal partners. Unlike previous models, it ensures two-way knowledge exchange: science meets indigenous practices, resources are shared, and responsibilities are clearly defined. This is

especially needed in Tawi-Tawi, where geography, limited infrastructure, and cultural diversity require a more coordinated and inclusive approach.

Theoretical & Conceptual Framework

This study is anchored on the Agricultural Knowledge and Information System (AKIS)



This conceptual framework outlines the structured flow of knowledge and action for sustainable Knowledge and Technology Transfer (KTT), starting with key inputs including existing knowledge, available technologies, accessible resources, and prevailing challenges in the sector. At the core of the process is dynamic interaction, sharing, and collaboration across three interconnected parties: the Academe (represented by TRAC), Government agencies (DA/MAFAR), and Farming Communities, visualized as a triangular diagram with bidirectional arrows that reflect the continuous exchange of information, resources, and feedback between all groups. This collaborative engagement yields immediate outputs: enhanced knowledge capacity, wider adoption of appropriate technologies, and effective mitigation of identified challenges. Ultimately, these combined results lead to the long-term outcome of a proposed Tripartite Management System designed to institutionalize and sustain KTT efforts over time.

Objectives of the Study

1. Determine the Level of Knowledge and Technology Transfer Across Key Agricultural Domains.

Framework (Leeuwis & van den Ban, 2023), which views KTT as an interactive process among actors. It is also supported by the Tripartite Model of Agricultural Innovation (Akteer et al., 2018; updated by Mendoza et al., 2024).

2. Identify Challenges Encountered in The Current System.
3. Compare Perceptions and Experiences Across Stakeholder Groups.
4. Develop, Validate, And Propose A Tripartite Management System To Enhance Efficiency And Sustainability.

Methodology

Research Design

This study employed a descriptive-correlational and developmental research design. This design not only assesses the current status but also guides the creation and validation of a new management system (Creswell & Creswell, 2024).

Research Locale

The study was conducted in the municipalities of Bongao and Panglima Sugala, Tawi-Tawi—representing the provincial center and major agricultural areas.

Population and Sampling

The total population covered all active stakeholders involved in agriculture, including faculty and extension staff, government personnel, and farmers. The sample size consisted of 265 respondents, determined using

Slovin's Formula with a 5% margin of error. Purposive sampling was applied with clear inclusion criteria: respondents must have at least 2 years of experience in agriculture, be actively involved in production, extension, or research, and be willing to participate and provide informed consent. This approach ensures data are collected from information-rich respondents capable of providing accurate insights (Nikolopoulou, 2022).

Research Instrument

A structured questionnaire was developed and adapted from Dela Cruz et al. (2022) and Mendoza et al. (2021). For content validity, it was reviewed by 5 experts—agriculturists, extension specialists, and statisticians—yielding a Content Validity Index (CVI) of 0.93, which exceeds the acceptable threshold of 0.80. Reliability was established through pilot testing with 30 non-participating respondents, resulting in a Cronbach's Alpha of 0.89, indicating high internal consistency. The instrument is structured into sections covering the demographic profile,

Knowledge Transfer scale, Technology Transfer scale, and Challenges scale.

Ethical Considerations

Ethical approval was secured from the TRAC Research Ethics Committee and the Department of Agriculture – Tawi-Tawi. Written informed consent was obtained from all participants, with the research purpose, procedures, and right to withdraw fully explained. Strict confidentiality was maintained throughout the study: no personal identifiers were recorded, and all collected data were used solely for this research.

Data Analysis

Descriptive statistics including mean, frequency, and percentage were computed to summarize the data. Inferential statistics, specifically One-way ANOVA, were run using IBM SPSS Version 29, with the significance level set at $\alpha = 0.05$. For system validation, the proposed management system was reviewed by a panel of 7 stakeholders representing each sector, who rated it in terms of relevance, feasibility, and clarity.

Results and Discussion

Level of Knowledge and Technology Transfer

Table 1 Summary of KTT Levels

Variable	Overall Mean	Interpretation
Knowledge Transfer	3.40	Very High
Technology Transfer	3.37	Very High
Challenges Encountered	3.43	Highly Challenged

Discussion

High levels of knowledge and acceptance confirm that the foundation is strong, but the high challenge rating indicates that application

and scaling remain difficult. This aligns with Rajak et al. (2023), who noted that awareness does not automatically translate to practice when infrastructure and support are lacking.

Comparison Across Stakeholders

Table 2 Test of Significant Differences

Domain	F-value	p-value	Decision
Knowledge Transfer	0.038	0.964	Accept H_0
Technology Transfer	0.331	0.987	Accept H_0
Challenges	0.615	0.951	Accept H_0

Discussion

No significant differences were found, meaning all three groups share the same perceptions and face the same barriers. This validates the need for a unified system—since problems are common, solutions must be collaborative. This finding supports Flórez Gómez et al. (2023), who emphasized that shared challenges require shared governance.

Proposed Tripartite Management System

Development and Validation

The system was developed based on study findings, reviewed by technical experts, and validated during a stakeholder consultation. It received an overall rating of 4.7/5, confirming it is relevant, feasible, and appropriate for Tawi-Tawi's context.

Roles and Responsibilities

Stakeholder	Core Responsibilities
Academe (TRAC)	Generate research, develop appropriate technologies, conduct training, document best practices, and provide technical backstopping.
Government (DA/MAFAR)	Provide policy support, funding, infrastructure, inputs, and coordinate regulatory services.
Farming Communities	Share indigenous knowledge, adopt technologies, provide feedback, and participate in planning and evaluation.

Implementation Framework

The implementation framework follows four sequential phases: the Planning Phase involves quarterly meetings to identify needs and set priorities; the Implementation Phase focuses on joint delivery of services, combining training, demonstrations, and field visits; the Monitoring Phase conducts monthly tracking using the indicators of adoption rate, yield increase, and cost reduction; and the Evaluation Phase consists

of an annual review to adjust strategies based on results.

Monitoring & Sustainability

For monitoring, key indicators include the percentage of farmers adopting new practices, average yield change, number of training sessions, and feedback satisfaction. To ensure long-term sustainability, the framework establishes a Joint Coordination Committee, secures annual

funding, develops local resource persons, and creates a shared knowledge database.

Conclusions

Knowledge and technology transfer levels are high, but significant barriers limit full application. Uniform experiences across stakeholders confirm that a single, integrated system is needed. The Tripartite Management System is a novel and practical solution that shifts from individual action to collective responsibility, ensuring better alignment of resources and goals.

Limitations

The study is limited to two municipalities; results may not represent all islands. It relies on self-reported data; no long-term impact measurement was conducted. It is also focused on technical aspects; economic analysis was not included.

Recommendations

Implement the Tripartite System as the official model for extension services in the province. Invest in infrastructure such as roads, internet,

and irrigation to reduce barriers. Develop ICT-based tools to improve communication and information access. For future research, expand coverage, conduct economic impact studies, and evaluate the system's performance over 3–5 years.

Acknowledgements

The author expresses sincere gratitude to Tawi-Tawi Regional Agricultural College for providing the necessary support and resources to complete this research. Deep appreciation is extended to the Department of Agriculture in Tawi-Tawi and its dedicated personnel for their cooperation and technical assistance throughout the study. Special thanks go to the farmers, college staff, and agricultural extension workers who generously shared their time, experiences, and valuable insights, serving as the primary source of data for this work. The researcher also acknowledges the administration and faculty members of the institution for their encouragement and guidance, which greatly contributed to the successful completion of this academic endeavor.

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