

Institutional Enablers and Constraints to Agricultural Innovation: A Quantitative Assessment Across Three Campuses of Cebu Technological University

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Abstract— Agricultural innovation is a critical driver of rural development, sustainability, and food security in the Philippines. This study examines the barriers and motivations influencing research engagement across three campuses of Cebu Technological University (CTU)—Argao, Barili, and Tuburan—each with distinct accreditation status and resource capacities. This study employed a quantitative approach, gathering data from 105 faculty and staff survey respondents to assess institutional support, research culture, and external partnerships. Results reveal that CTU-Argao consistently recorded the highest overall mean scores across institutional support indicators. It scored 3.03 in institutional support for research and development, 2.99 in external partnership engagement, and 2.98 in policy support for collaboration. CTU-Barili followed with scores of 2.93, 2.93, and 3.00, respectively. CTU-Tuburan lagged significantly behind with corresponding scores of 2.51, 2.55, and 2.59. Differences in perceived support were statistically significant across indicators: institutional research and development support ($p = 0.002$), external partnerships ($p = 0.009$), and policy support ($p = 0.006$). The findings suggest that reforms in administrative efficiency, differentiated campus strategies, and increased inter-campus collaboration are vital. With sustained support, CTU's agricultural campuses can evolve into regional hubs for inclusive agricultural transformation.

Keywords- Agricultural innovation, institutional support, quantitative assessment, higher education institutions, Accreditation Status

1. INTRODUCTION

Agricultural innovation is widely recognized as a fundamental driver of food security, environmental sustainability, and economic development. In the Philippines, institutions such as the International Rice Research Institute (IRRI) and the University of the Philippines Los Baños (UPLB) have played significant roles in advancing agricultural technologies through the development of high-yielding crop varieties, improved farming practices, and integrated pest management strategies. As agricultural challenges become increasingly localized and complex, the role of higher education institutions (HEIs) has expanded beyond instruction to include the generation of context-specific research and innovations that directly address the needs of farming communities.

The concept of innovation culture to higher education institutions (HEIs) mostly in the context of engaging in research and development in agricultural state universities and colleges. By combining distinct elements and combining it, we learned the different organizational, human, and collaborative dimensions of innovation culture. According to Leron et al., to identify, assess, and determine the impacts of specific dimensions and elements of innovation culture on R & D productivity, as well as producing innovative graduates, were deemed relevant areas for research.

Modern agricultural innovations anchored on technologies, techniques, systems, and smart farming practices, aim to transform crop cultivation and livestock production by leveraging evidence-based to customize solutions for localized conditions. As what is prescribed by (Taer et al.,2024), agricultural innovations help address pain points in agriculture like optimal resource utilization, minimizing wastage, enhancing yield, adaptive farming practices, through a data-driven approach.

Over the decades, the government has provided extensive support to the agriculture sector particularly the rice industry, yet, its productivity growth has lagged demand growth, leading to higher domestic prices as compared to other countries thereby worsening food security outcomes as noted by Montesclaros et al., (2023) has intimated. It is therefore manifested that there is a need for more nuanced approaches in promoting agricultural transformation that considers the role of broader macroeconomic policies and their lingering impacts to more effectively secure the food sector.

Cebu Technological University (CTU), as a multi-campus state university in Cebu Province, serves as one of the institutions expected to contribute to regional agricultural development through research, instruction, and extension. The three campuses included in this study—CTU-Barili, CTU-Argao, and CTU-Tuburan—represent different institutional contexts characterized by varying accreditation levels, resource availability, and research capacities. CTU-Barili holds Level IV AACCUP accreditation, indicating a more mature institutional system and stronger research infrastructure. CTU-Argao has attained Level III accreditation, reflecting a developing but established research environment, while CTU-Tuburan, with Level II accreditation, continues to strengthen its institutional capabilities. These differences in institutional maturity may influence each campus's capacity to generate agricultural innovations and sustain research productivity.

Despite sharing a common institutional mandate, the three campuses continue to encounter challenges that limit their ability to maximize research and innovation. Delays in procurement processes, inadequate funding, centralized administrative procedures, heavy faculty teaching workloads, and limited research infrastructure remain persistent concerns. These institutional constraints reduce opportunities for faculty and students to engage in meaningful agricultural research and community-based innovation. Furthermore, weak collaborations with industry partners, local government units (LGUs), and non-government organizations (NGOs) restrict the translation of research output into practical applications and community development initiatives.

Previous studies have consistently identified similar institutional barriers affecting research productivity in higher education institutions. Fragmented research agendas, weak university-industry collaborations, insufficient commercialization mechanisms, and inadequate institutional support continue to hinder innovation in Philippine state universities [15,17]. Likewise, research has emphasized that sustainable innovation depends not only on financial resources but also on supportive institutional policies, effective leadership, collaborative networks, and strong organizational commitment [1,13].

Building upon these findings, the present study examines the institutional enablers and constraints influencing agricultural innovation across the three agricultural campuses of Cebu Technological University. Specifically, it investigates how institutional support, administrative systems, faculty motivation, research culture, and stakeholder engagement collectively shape agricultural research and innovation. Through comparative quantitative assessment, the study seeks to identify campus-specific strengths and challenges that can guide evidence-based institutional policies and strategic interventions aimed at strengthening agricultural research and promoting sustainable regional development.

2. MATERIALS AND METHODS

2.1 Research Design

This study employed a quantitative research design to examine the institutional barriers, motivational drivers, and enabling factors influencing agricultural innovation across three campuses of Cebu Technological University (CTU): CTU-Barili, CTU-Argao, and CTU-Tuburan. A comparative approach was used to assess how each campus supports agricultural research and development based on their respective operational contexts and accreditation levels. The study is anchored on Innovation Systems Theory and Self-Determination Theory, providing a conceptual lens to analyze how institutional systems and intrinsic motivation affect innovation performance. Data were collected using a structured survey questionnaire administered to faculty, staff and students involved in agricultural research and extension. The survey focused on quantifiable indicators such as funding access, administrative support, research prioritization, incentive structures, and external collaboration.

2.2 Research Environment

The study was conducted across three campuses of Cebu Technological University (CTU), located in Cebu Province, Central Visayas Region, Philippines. These campuses—CTU-Argao (Level III AACCUP Accreditation), CTU-Barili (Level IV), and CTU-Tuburan (Level II)—were purposively selected due to their academic programs in agriculture and their strategic relevance to regional rural development. Each campus reflects distinct institutional profiles within the broader CTU system, with variations in research engagement, administrative capacities, and

community partnerships. A comparative analysis of these three campuses offers valuable insights into how agricultural innovation is supported—or constrained—within the landscape of Philippine state universities.

Cebu Technological University–Argao Campus, with Level III AACCUP accreditation, is home to the College of Agriculture and Environmental Sciences (CAES). As a former state college, it maintains a broader mandate that extends beyond local application, actively participating in projects aligned with national and global agendas in agriculture and environmental sustainability. CTU-Argao is recognized for its strong research culture, with active faculty involvement in applied agricultural studies, community-based innovation, and collaborations with local government units (LGUs), national agencies, and private institutions.

Cebu Technological University–Barili Campus, holding Level IV AACCUP accreditation, hosts the College of Agriculture, Food Science, Business, and Communication (CAFBC). This college integrates agricultural technology with agribusiness, food safety, and rural entrepreneurship. CTU-Barili is distinguished by strong faculty-student collaboration in product development, sustainable agriculture, and value chain initiatives. Its proximity to key farming communities and agribusiness centers in southern Cebu allows for robust field-based innovation and extension.

Cebu Technological University–Tuburan Campus, with Level II AACCUP accreditation, is situated in northwestern Cebu and represents an emerging player in CTU’s agricultural innovation efforts. The campus focuses on student-centered, practice-oriented agricultural research, particularly in commodities such as coconut, coffee, and corn—crops that are socio-economically vital to the region.

Together, these three CTU campuses provide a rich comparative setting to understand how diverse operational environments within a single university system impact agricultural innovation. Their contrasting accreditation levels, engagement strategies, and institutional capacities offer a nuanced view of the structural, administrative, and cultural dynamics that either enhance or hinder higher education’s role in driving inclusive and sustainable agricultural development.

2.3 Research Respondents

The respondents were selected using a purposive sampling method to ensure representation across administrative, faculty, and student sectors:

1. Administration: College Deans and Department Heads from both institutions.
2. Faculty: Full-time faculty members affiliated with the Colleges of Agriculture in both colleges.
3. Students: Fourth-year agriculture students, as they are in their final academic year and likely to have significant exposure to research activities.

The sample size included all eligible respondents from each sector to ensure comprehensive data collection.

2.4 Research Instrument

A validated survey instrument, carefully aligned with the study’s objectives and theoretical framework, was utilized to gather quantitative data from respondents across the three campuses. The questionnaire was organized into four thematic areas to provide a comprehensive analysis of institutional dynamics influencing agricultural innovation. The first theme, Barriers, focused on identifying systemic, structural, and contextual obstacles that impede research engagement and innovation. The second theme, Roles and Contributions, explored the specific functions of faculty and staff, the nature of research outputs, and the degree of stakeholder collaboration in each campus. The third theme, Motivations, Challenges, and Enabling Factors, examined what drives or hinders participation in agricultural research, including internal and external support mechanisms. Lastly, the fourth theme, Institutional Policies and Programs, assessed the presence and effectiveness of university-level guidelines, funding schemes, and administrative support structures that facilitate or constrain innovation-driven activities.

2.5 Data Gathering Procedures

Before data collection, preliminary activities were undertaken to ensure ethical and institutional compliance. Formal approval was sought from the respective campus heads of CTU-Argao, CTU-Barili, and CTU-Tuburan to conduct the study within their academic jurisdictions. In line with ethical research practices, informed consent was also secured from all participants, ensuring that respondents were fully aware of the purpose, scope, and voluntary nature of their involvement.

For the data collection process, a structured survey was administered to all eligible faculty and staff respondents. The questionnaire was distributed in person, allowing for direct engagement and clarification of any items when

necessary. The face-to-face administration of the survey also helped maximize response rates and ensured the accurate collection of data relevant to the study's objectives.

2.6 Data Analysis

The data collected from the three campuses—CTU-Argao, CTU-Barili, and CTU-Tuburan—underwent a comparative analysis to identify significant differences in institutional experiences and perceptions related to agricultural innovation. Given the non-parametric nature of the data, the Kruskal-Wallis test was employed to statistically compare responses across the three groups. This method allowed the researchers to determine whether there were significant variations in the perceptions of faculty and staff on thematic areas such as barriers, motivations, institutional roles, and enabling factors. The analysis provided insights into campus-specific challenges and strengths, contributing to a nuanced understanding of how different institutional contexts shape research engagement and innovation capacity.

2.7 Ethical Considerations

The conduct of the study with the respondents was in accordance with their own free will and consent was obtained from all respondents prior to data collection. Likewise, respondents were informed of the nature of the study, their right to withdraw at any given time and the information they provided was kept strictly confidential.

3. RESULTS AND DISCUSSION

3.1 Barriers in Agricultural Innovation

Funding and Resource Limitations

Table 1 presents the comparison of funding and resource limitations perceived by respondents from the three agricultural campuses of Cebu Technological University (CTU), namely CTU-Argao, CTU-Barili, and CTU-Tuburan. The analysis focused on three indicators: insufficiency of funds, limited access to external funding sources, and insufficiency of financial support. The Kruskal–Wallis test was employed to determine whether significant differences existed among the campuses.

TABLE 1: COMPARISON OF FUNDING AND RESOURCE LIMITATIONS AS PERCEIVED BY THREE CEBU TECHNOLOGICAL UNIVERSITY AGRICULTURAL CAMPUSES

Cebu Technological University Campus	Funding Resource Limitation			Mean Interpretation
	Insufficiency of Funds	External Fund Source	Insufficiency of Financial Support	
CTU-Argao Campus	2.68	2.70	2.84	2.74
CTU-Barili Campus	2.88	2.91	2.98	2.92
CTU-Tuburan Campus	2.59	2.66	2.78	2.67
P-value	0.110	0.108	0.459	0.073

As shown in Table 1, CTU-Barili obtained the highest overall mean score (2.92), indicating that respondents from this campus perceived greater limitations in research funding and financial support than those from CTU-Argao (2.74) and CTU-Tuburan (2.67). Specifically, CTU-Barili recorded the highest mean scores for insufficiency of funds (2.88), limited external funding sources (2.91), and insufficiency of financial support (2.98). Conversely, CTU-Tuburan consistently registered the lowest mean scores across all three indicators.

Despite these observed differences in mean scores, the Kruskal–Wallis test revealed no statistically significant differences among the campuses, with p-values of 0.110, 0.108, and 0.459 for insufficiency of funds, external funding sources, and financial support, respectively. The overall p-value (0.073) likewise exceeded the 0.05 level of significance, indicating that the perceived funding-related barriers are generally common across the three campuses.

These findings suggest that although the severity of funding constraints varies, financial limitations remain a shared challenge affecting agricultural research within the university system. Similar observations were reported by Auranen and Nieminen [1], who argued that research performance depends not only on the amount of available funding but also on institutional efficiency in managing research resources. Likewise, Ordonez [15] emphasized that disparities in financial and infrastructural capacities among Philippine state universities often result in unequal research productivity and innovation outcomes.

The findings can also be interpreted using the Resource-Based View (RBV), which posits those institutional resources, including research funding, infrastructure, and organizational capabilities—constitute strategic assets that influence an institution's ability to sustain innovation and achieve competitive research performance [2]. Limited financial resources may reduce research opportunities, restrict access to modern facilities, and weaken the institution's capacity to generate quality research output.

The relatively higher perception of insufficient financial support among respondents from CTU-Barili is likewise consistent with the work of Lach and Schankerman [12], who found that inadequate funding may constrain both the quantity and quality of university research unless accompanied by effective institutional incentives and support mechanisms. Similarly, Dela Cruz [5] reported that faculty members in Philippine state universities often prioritize teaching responsibilities over research when institutional support and research funding are perceived to be insufficient.

From the perspective of knowledge creation, Nonaka and Takeuchi [14] emphasized that innovation flourishes in organizations that provide enabling conditions, including adequate resources, supportive organizational structures, and continuous knowledge exchange. When these enabling conditions are lacking, research productivity and innovation may be adversely affected despite the presence of capable researchers.

Overall, although statistical analysis indicates no significant differences among the three campuses, the descriptive findings reveal meaningful variations in how funding limitations are perceived. These results underscore the need for university administrators to strengthen institutional funding mechanisms, improve access to external research grants, streamline resource allocation processes, and establish sustainable financial support systems that encourage faculty and student participation in agricultural research and innovation.

Administrative Processes

Table 2 presents the comparison of administrative process-related barriers perceived by respondents from the three agricultural campuses of Cebu Technological University (CTU). The assessment focused on bureaucratic approval, procurement delays, and lengthy administrative procedures to determine whether differences existed in respondents' perceptions of institutional administrative efficiency.

TABLE 2: COMPARISON OF ADMINISTRATIVE PROCESSES AS PERCEIVED BY THREE CEBU TECHNOLOGICAL UNIVERSITY AGRICULTURAL CAMPUSES

Cebu Technological University Campus	Administrative Processes			Mean
	Bureaucratic Approval	Procurement Delays	Lengthy Administrative Procedure	
CTU-Argao Campus	2.72	2.94	2.52	2.73
CTU-Barili Campus	2.76	2.92	2.35	2.68
CTU-Tuburan Campus	2.88	2.95	2.71	2.85
P-value	0.568	1.000	0.091	0.468

The results indicate that CTU-Tuburan obtained the highest overall mean score (2.85), suggesting that respondents from this campus perceived greater administrative barriers than those from CTU-Argao (2.73) and CTU-Barili (2.68). CTU-Tuburan consistently recorded the highest ratings for bureaucratic approval (2.88), procurement delays (2.95), and lengthy administrative procedures (2.71). Procurement delays received relatively high ratings across all three campuses, indicating that this issue is commonly experienced throughout the university system.

Despite these variations in mean scores, the Kruskal–Wallis test revealed no statistically significant differences among the campuses. The computed p-values for bureaucratic approval (0.568), procurement delays (1.000), lengthy administrative procedures (0.091), and the overall mean (0.468) all exceeded the 0.05 significance level. These findings suggest that administrative barriers are perceived similarly across the three campuses.

The findings support the observations of Querijero et al. [17], who reported that bureaucratic procedures and administrative inefficiencies remain significant barriers to research implementation in Philippine state universities. Similarly, Jones [11] emphasized that procurement delays and rigid administrative systems reduce the efficiency of public institutions by slowing project implementation and limiting the timely utilization of research resources.

These findings may also be interpreted through the Innovation Systems Framework, which emphasizes that innovation depends not only on financial resources but also on efficient institutional governance and administrative support [9]. Administrative systems that are overly centralized or procedurally complex may delay research implementation, discourage faculty participation, and reduce institutional responsiveness to emerging research opportunities.

Likewise, the Resource-Based View (RBV) suggests that organizational capabilities, including efficient administrative processes—are valuable institutional resources that contribute to sustained research productivity and organizational competitiveness [2]. Administrative efficiency therefore represents an intangible strategic asset that directly supports research performance.

From the perspective of knowledge creation, Nonaka and Takeuchi [14] argued that organizations generate innovation more effectively when institutional structures facilitate collaboration and minimize procedural barriers. Consequently, streamlining procurement systems, simplifying approval procedures, and improving administrative efficiency could significantly strengthen the research environment across all CTU campuses.

Roles and Contributions

Table 3 presents the comparison of respondents' perceptions regarding institutional roles and contributions in agricultural research across the three Cebu Technological University (CTU) campuses. The assessment examined weak partnerships, limited collaboration, and insufficient institutional support to determine how these factors influence research engagement and innovation.

TABLE 3: COMPARISON OF ROLES AND CONTRIBUTION AS PERCEIVED BY THREE CEBU TECHNOLOGICAL UNIVERSITY AGRICULTURAL CAMPUSES

Cebu Technological University Campus	Roles and Contribution			Mean
	Weak Partnership	Limited Collaboration	Insufficient Institutional Support	
CTU-Argao Campus	2.58	2.66	2.66	2.63
CTU-Barili Campus	2.83	2.88	2.81	2.84
CTU-Tuburan Campus	2.46	2.66	2.78	2.63
P-value	0.109	0.134	0.550	0.236

The results show that CTU-Barili registered the highest overall mean score (2.84), indicating stronger perceptions of institutional limitations in partnerships, collaboration, and organizational support compared with CTU-Argao and CTU-Tuburan, both of which obtained an overall mean of 2.63. Among the indicators, CTU-Barili recorded the highest mean scores for weak partnerships (2.83), limited collaboration (2.88), and insufficient institutional support (2.81).

Although numerical differences were observed, the Kruskal–Wallis test indicated that none of these differences were statistically significant. The p-values for weak partnerships (0.109), limited collaboration (0.134), insufficient institutional support (0.550), and the overall mean (0.236) all exceeded the 0.05 level of significance. These findings suggest that institutional collaboration and support remain common concerns across the three campuses.

The findings are consistent with Leron and Bacongus [13], who emphasized that strong institutional commitment, leadership, and structured research support systems are essential for improving research productivity within Philippine state universities. Likewise, Auranen & Nieminen [1] argued that research collaboration and institutional support mechanisms are critical determinants of sustainable research performance and innovation.

The Triple Helix Model further explains these findings by emphasizing the importance of collaboration among universities, government agencies, and industry partners in promoting innovation [7]. Weak institutional partnerships may therefore limit opportunities for knowledge exchange, external funding, technology transfer, and community engagement.

Similarly, Social Capital Theory suggests that institutional networks, trust, and collaborative relationships enhance research productivity by facilitating information sharing and coordinated action [16]. The relatively higher perception of limited collaboration reported by CTU-Barili may indicate greater awareness of institutional expectations associated with its more advanced accreditation status rather than substantially poorer collaboration.

Overall, while statistical analysis indicates comparable perceptions among the campuses, the descriptive results highlight opportunities for Cebu Technological University to strengthen institutional partnerships, expand collaborative research initiatives, and develop policies that encourage greater engagement among faculty, government agencies, industry partners, and local communities. Strengthening these collaborative networks is expected to improve research productivity and enhance the university's contribution to agricultural innovation.

3.2 Roles and Contribution in addressing national and region-specific agricultural challenges

Research Output

Table 4 presents the comparison of research outputs perceived by respondents across the three agricultural campuses of Cebu Technological University (CTU). The indicators include research addressing national challenges, research addressing region-specific challenges, and externally funded research. The Kruskal–Wallis test was employed to determine whether significant differences existed among the campuses.

TABLE 4: COMPARISON OF RESEARCH OUTPUT AS PERCEIVED BY THREE CEBU TECHNOLOGICAL UNIVERSITY AGRICULTURAL CAMPUSES

Cebu Technological University Campus	Research Output			Mean
	Research addresses National Challenges	Research addresses Region-Specific Challenges	Research Externally Funded	
CTU-Argao Campus	3.12	2.98	2.72	2.94
CTU-Barili Campus	3.00	3.27	2.65	2.97
CTU-Tuburan Campus	2.46	2.78	2.24	2.50
P-value	0.001	0.004	0.007	0.001

The results show that CTU-Barili obtained the highest overall mean score (2.97), followed closely by CTU-Argao (2.94), while CTU-Tuburan recorded the lowest overall mean score (2.50). CTU-Argao demonstrated the highest Mean for research addressing national challenges (3.12) and externally funded research (2.72), whereas CTU-Barili obtained the highest score for research addressing region-specific challenges (3.27). In contrast, CTU-Tuburan consistently registered the lowest scores across all indicators.

Statistical analysis revealed significant differences among the campuses. The p-values for research addressing national challenges (0.001), region-specific challenges (0.004), externally funded research (0.007), and the overall mean (0.001) were all below the 0.05 significance level, indicating meaningful institutional differences in research productivity and relevance.

These findings support the work of Auranen & Nieminen [1], who emphasized that institutional research productivity is strongly influenced by funding systems, organizational priorities, and institutional capacity. The stronger performance of CTU-Argao and CTU-Barili suggests that these campuses possess more established research systems capable of addressing both national and regional development priorities.

The Regional Innovation System (RIS) framework further explains the higher regional relevance demonstrated by CTU-Barili. The framework highlights the importance of geographically embedded institutions in generating innovations that respond to local socio-economic needs. Strong community linkages and closer engagement with local stakeholders enable universities to produce research that directly addresses regional concerns [13].

The comparatively lower research output reported by CTU-Tuburan may reflect limited institutional capacity, weaker research networks, and fewer opportunities for external funding. David et al. [4] observed that inadequate institutional support and limited research mentoring often reduce research productivity in Philippine state universities. Likewise, Dela Cruz [5] noted that insufficient incentives and administrative support may discourage faculty participation in research activities. These findings suggest that strengthening institutional support mechanisms and expanding external collaborations are essential to improve research productivity across all campuses.

Research Focus and Application

Table 5 presents respondents' perceptions regarding the research focus and application of agricultural research across the three CTU campuses. Specifically, the analysis examined research addressing emerging technologies, research translated into practical applications, and publication of research outputs.

TABLE 5. COMPARISON OF RESEARCH FOCUS AND APPLICATION AS PERCEIVED BY THREE CEBU TECHNOLOGICAL UNIVERSITY AGRICULTURAL CAMPUSES

Cebu Technological University Campus	Research Focus and Application			Mean
	Research addresses Emerging Technologies	Research Translated to Practical Applications	Research Output are published	
CTU-Argao Campus	2.94	3.16	2.94	3.01
CTU-Barili Campus	2.78	3.18	2.85	2.94
CTU-Tuburan Campus	2.66	2.83	2.29	2.59
P-value	0.186	0.049	0.002	0.002

The findings indicate that CTU-Argao obtained the highest overall mean score (3.01), followed by CTU-Barili (2.94), while CTU-Tuburan recorded the lowest mean score (2.59). CTU-Argao reported the highest ratings for research addressing emerging technologies and published research outputs, whereas CTU-Barili achieved the highest rating for translating research into practical applications. Significant differences were observed in research translated into practical applications ($p = 0.049$), published research outputs ($p = 0.002$), and the overall mean ($p = 0.002$). However, no significant difference was found in research addressing emerging technologies ($p = 0.186$).

The ability of CTU-Argao and CTU-Barili to translate research into practical applications supports the Knowledge-to-Action (KTA) Framework, which emphasizes that research should progress beyond knowledge generation toward implementation and societal impact [8]. Institutions that effectively transfer research findings into practice are more likely to contribute to agricultural development and community empowerment.

Similarly, Nonaka and Takeuchi's knowledge creation model highlights that organizational learning occurs through the continuous conversion of tacit and explicit knowledge, resulting in innovation and improved institutional performance [14]. The stronger publication performance observed in CTU-Argao and CTU-Barili suggests more effective knowledge management practices and institutional support for research dissemination.

The relatively similar perceptions regarding emerging technologies across campuses may also be explained by Rogers' Diffusion of Innovations Theory, which proposes that awareness of technological innovations often develops uniformly across organizations, while actual adoption depends on institutional readiness and available resources [18]. These findings indicate that although awareness of emerging technologies exists throughout the university system, additional support is needed to strengthen research dissemination and practical application, particularly in CTU-Tuburan.

Stakeholder Engagement and Policy Contribution

Table 6 presents respondents' perceptions of stakeholder engagement and the contribution of research to policy development across the three agricultural campuses of Cebu Technological University. The indicators include engagement with local farmers, research collaboration, and the contribution of research findings to policy formulation.

TABLE 6. COMPARISON OF STAKEHOLDER ENGAGEMENT AND POLICY CONTRIBUTION AS PERCEIVED BY THREE CEBU TECHNOLOGICAL UNIVERSITY AGRICULTURAL CAMPUSES

Cebu Technological University Campus	Stakeholder Engagement and Policy Contribution			Mean
	Research Projects Actively Engage with Local Farmers	Research Collaboration	Research Findings	
CTU-Argao Campus	3.1	2.66	2.9	2.89
CTU-Barili Campus	3.20	2.67	2.87	2.91
CTU-Tuburan Campus	2.95	2.03	2.00	2.33
P-value	0.241	0.001	0.001	0.001

The results reveal that CTU-Barili obtained the highest overall mean score (2.91), followed closely by CTU-Argao (2.89), while CTU-Tuburan registered the lowest overall mean (2.33). Although no statistically significant difference was observed in engagement with local farmers ($p = 0.241$), significant differences were found in research collaboration ($p = 0.001$), contribution of research findings to policy ($p = 0.001$), and the overall mean ($p = 0.001$).

The higher perceptions reported by CTU-Barili and CTU-Argao indicate stronger institutional linkages with external stakeholders and greater involvement in collaborative research activities. Wenger's Communities of Practice theory explains that sustained collaboration among researchers, practitioners, and stakeholders enhances knowledge sharing and promotes innovation through collective learning [20].

Likewise, Nonaka & Takeuchi [14] emphasized that organizational knowledge is strengthened when institutions establish environments that encourage collaboration and continuous exchange of expertise. Strong stakeholder engagement facilitates the transformation of research findings into practical interventions and policy recommendations.

The Knowledge-to-Action Framework likewise highlights stakeholder participation as an essential component in translating research into evidence-based policies and community programs [8]. The significantly lower perceptions reported by CTU-Tuburan suggest opportunities to strengthen partnerships with local government units, industry, farmers' organizations, and other community stakeholders to increase the relevance and societal impact of research activities.

Overall, the findings demonstrate that stronger stakeholder engagement contributes to more collaborative research, improved knowledge dissemination, and greater policy influence. Strengthening institutional partnerships and promoting interdisciplinary collaboration will enable the university to maximize the impact of agricultural research on regional development.

3.3 Motivations, Challenges, and Enabling Factors

Personal and Professional Motivations

Table 7 presents the comparison of personal and professional motivations perceived by faculty and staff across the three agricultural campuses of Cebu Technological University (CTU). The indicators assessed include motivation to engage in research, professional recognition, and opportunities that encourage research participation. The Kruskal–Wallis test was used to determine whether significant differences existed among the campuses.

TABLE 7: COMPARISON OF PERSONAL AND PROFESSIONAL MOTIVATIONS AS PERCEIVED BY THREE CEBU TECHNOLOGICAL UNIVERSITY AGRICULTURAL CAMPUSES

Cebu Technological University Campus	Personal and Professional Motivations			Mean
	Engage in Research	Professional Recognition	Driven by the Opportunity	
CTU-Argao Campus	3.04	2.78	3.14	2.99
CTU-Barili Campus	3.09	2.87	3.18	3.05
CTU-Tuburan Campus	2.59	2.37	2.78	2.58
P-value	0.005	0.022	0.052	0.005

The findings indicate that CTU-Barili recorded the highest overall mean score (3.05), followed closely by CTU-Argao (2.99), while CTU-Tuburan obtained the lowest overall mean (2.58). CTU-Barili also registered the highest ratings for motivation to engage in research (3.09), professional recognition (2.87), and opportunities that encourage research participation (3.18). Statistical analysis revealed significant differences in motivation to engage in research ($p = 0.005$), professional recognition ($p = 0.022$), and the overall Mean ($p = 0.005$). However, the perceived opportunities for research participation did not differ significantly among the campuses ($p = 0.052$).

These findings suggest that institutional recognition and research opportunities play important roles in motivating faculty members to participate in research activities. Herzberg's Two-Factor Theory explains that recognition, achievement, and opportunities for professional growth function as motivating factors that enhance employee satisfaction and productivity [10]. Institutions that acknowledge research accomplishments and provide meaningful opportunities for professional development are therefore more likely to foster active research engagement.

Similarly, Cruz and Sta. Maria [3] emphasized that institutional support mechanisms, including recognition programs and research incentives, significantly influence faculty participation in research within Philippine state universities. The lower motivation perceived by respondents from CTU-Tuburan may indicate the need for enhanced recognition programs, stronger mentoring initiatives, and more accessible research opportunities to encourage sustained research engagement.

Overall, although opportunities for research participation were perceived similarly across campuses, the significant differences in research motivation and professional recognition highlight the importance of strengthening institutional policies that recognize faculty research accomplishments and promote a supportive research culture.

Institutional Support and Incentives

Table 8 presents respondents' perceptions regarding institutional support and incentives for research across the three agricultural campuses of Cebu Technological University. The indicators examined include institutional grants, recognition programs, and access to training and professional development.

TABLE 8: COMPARISON OF INSTITUTIONAL SUPPORT AND INCENTIVES AS PERCEIVED BY THREE CEBU TECHNOLOGICAL UNIVERSITY AGRICULTURAL CAMPUSES

Cebu Technological University Campus	Institutional Support and Incentives			Mean
	Institutional Grants	Recognition Program	Access to Training and Development	
CTU-Argao Campus	2.74	2.76	3.00	2.83
CTU-Barili Campus	2.98	2.79	3.00	2.92
CTU-Tuburan Campus	2.24	2.27	2.83	2.45
P-value	0.001	0.001	0.508	0.003

The results indicate that CTU-Barili obtained the highest overall mean score (2.92), followed by CTU-Argao (2.83), whereas CTU-Tuburan recorded the lowest mean score (2.45). CTU-Barili reported the highest perceptions regarding institutional grants (2.98) and recognition programs (2.79), while both CTU-Argao and CTU-Barili reported equally high perceptions regarding access to training and development (3.00). Significant differences were observed in institutional grants ($p = 0.001$), recognition programs ($p = 0.001$), and the overall mean ($p = 0.003$). Conversely, access to training and development did not significantly differ among the campuses ($p = 0.508$).

The findings demonstrate that institutional funding and recognition programs remain important components of research support. According to Eisenberger et al. [6], employees who perceive strong organizational support are generally more committed, motivated, and productive because they believe their contributions are valued by the institution. Adequate institutional support therefore strengthens faculty commitment to research activities and promotes long-term research productivity.

These results are likewise consistent with Cruz and Sta. Maria [3], who reported that funding opportunities, institutional recognition, and supportive research policies are essential for cultivating a sustainable research culture in Philippine higher education institutions. Although training opportunities were generally perceived positively across all campuses, the lower ratings reported by CTU-Tuburan regarding research grants and recognition programs suggest the need for more equitable institutional support mechanisms that encourage greater faculty participation in research.

Overall, strengthening research funding schemes, recognition programs, and institutional incentives may contribute to increased faculty engagement and improved research productivity throughout the university system.

Collaborative and Environmental Enablers

Table 9 presents respondents' perceptions regarding collaborative and environmental factors that facilitate agricultural research across the three Cebu Technological University campuses. The assessment focused on collaboration with colleagues, the presence of a supportive research environment, and opportunities to participate in interdisciplinary or community-based research.

TABLE 9: COMPARISON OF COLLABORATIVE AND ENVIRONMENTAL ENABLERS AS PERCEIVED BY THREE CEBU TECHNOLOGICAL UNIVERSITY AGRICULTURAL CAMPUSES

Cebu Technological	Collaborative and Environmental Enablers	Mean
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University Campus	Collaborating with Colleagues	Supportive Research Environment	Opportunities to work on Interdisciplinary or Community based	
CTU-Argao Campus	2.98	3.24	3.2	3.14
CTU-Barili Campus	3.04	3.04	3.08	3.06
CTU-Tuburan Campus	2.59	2.68	2.55	2.61
P-value	0.047	0.016	0.001	0.005

The findings show that CTU-Argao obtained the highest overall mean score (3.14), followed by CTU-Barili (3.06), while CTU-Tuburan recorded the lowest overall mean (2.61). CTU-Barili reported the highest perception of collaboration with colleagues (3.04), whereas CTU-Argao achieved the highest ratings for supportive research environment (3.24) and opportunities for interdisciplinary or community-based research (3.20). Statistical analysis revealed significant differences across all indicators, including collaboration with colleagues ($p = 0.047$), supportive research environment ($p = 0.016$), interdisciplinary or community-based research opportunities ($p = 0.001$), and the overall Mean ($p = 0.005$).

These findings highlight the importance of collaborative institutional environments in promoting research productivity. Wenger's Communities of Practice theory proposes that knowledge creation is strengthened through continuous interaction, collaboration, and shared learning among members of an organization [20]. Institutions that encourage collegial collaboration and interdisciplinary engagement are therefore more likely to develop sustainable research cultures.

Likewise, Nonaka and Takeuchi [14] emphasized that innovation develops through continuous knowledge sharing and collaboration among organizational members. A supportive research environment facilitates the exchange of ideas, strengthens institutional learning, and encourages the generation of innovative solutions to complex problems.

The Innovation Systems Framework also recognizes that institutional innovation depends not only on financial resources but also on effective communication networks, collaborative partnerships, and supportive organizational structures [9]. In addition, Social Capital Theory suggests that strong professional networks, trust, and collaborative relationships enhance organizational effectiveness by facilitating knowledge exchange and collective problem-solving [16].

Overall, the significantly lower perceptions reported by CTU-Tuburan indicate opportunities to strengthen collaborative research networks, expand interdisciplinary initiatives, and cultivate a more supportive institutional environment. Enhancing these organizational conditions is expected to improve research engagement, increase knowledge sharing, and promote sustainable agricultural innovation across all campuses.

3.4 Institutional Policies and Programs

Policy Support for Collaboration

Table 10 presents the perceptions of faculty and staff regarding institutional policy support for research collaboration across the three agricultural campuses of Cebu Technological University (CTU). The indicators examined include policies that facilitate partnerships, policies providing clear research guidelines, and institutional policies that prioritize research activities. The Kruskal–Wallis test was employed to determine whether significant differences existed among the campuses.

TABLE 10: COMPARISON OF POLICY SUPPORT FOR COLLABORATION AS PERCEIVED BY THREE CEBU TECHNOLOGICAL UNIVERSITY AGRICULTURAL CAMPUSES

Cebu Technological University Campus	Policy Support for Collaboration			Mean
	Policies Facilitate Partnerships	Policies Provide Clear Guidelines	Institutional Policies Prioritize Research	
CTU-Argao Campus	2.82	3.06	3.06	2.98
CTU-Barili Campus	2.81	3.06	3.13	3.00
CTU-Tuburan Campus	2.54	2.56	2.66	2.59
P-value	0.100	0.003	0.019	0.006

The findings indicate that CTU-Barili obtained the highest overall mean score (3.00), closely followed by CTU-Argao (2.98), while CTU-Tuburan recorded the lowest overall mean score (2.59). Both CTU-Argao and CTU-Barili reported similarly high perceptions regarding policies that provide clear research guidelines (3.06), whereas CTU-Barili obtained the highest rating for institutional policies that prioritize research (3.13). Statistical analysis revealed significant differences in policies providing clear guidelines ($p = 0.003$), institutional policies prioritizing research ($p = 0.019$), and the overall Mean ($p = 0.006$). However, no significant difference was observed in policies facilitating partnerships ($p = 0.100$).

These findings indicate that respondents generally perceive differences in the clarity and implementation of institutional research policies rather than in the existence of partnership policies. Scott's Institutional Theory explains that formal policies, organizational rules, and institutional structures shape employee behavior by providing stability, legitimacy, and direction for organizational activities [19]. Clear and well-communicated policies encourage faculty participation in research and strengthen institutional commitment to innovation.

Similarly, Eisenberger et al. [6] argued that employees are more likely to demonstrate organizational commitment when institutional policies consistently support their professional responsibilities and recognize their contributions. The relatively lower ratings reported by CTU-Tuburan may therefore reflect the need for clearer policy communication and stronger institutional support for research activities.

The Knowledge-to-Action (KTA) Framework further emphasizes that effective institutional policies serve as mechanisms for translating research knowledge into practical actions and organizational improvements [8]. Policies that clearly define research priorities, funding mechanisms, and collaborative procedures facilitate greater faculty engagement and improve institutional research performance.

Overall, the findings suggest that strengthening policy communication, improving procedural clarity, and reinforcing institutional research priorities may further enhance collaborative research and innovation across the three campuses.

Types of Partnership

Table 11 presents respondents' perceptions regarding institutional partnerships with external stakeholders across the three agricultural campuses of Cebu Technological University. The assessment focused on partnerships with industry, government agencies, and non-government or community-based organizations.

TABLE 11: COMPARISON OF TYPES OF PARTNERSHIP BY THREE CEBU TECHNOLOGICAL UNIVERSITY AGRICULTURAL CAMPUSES

Cebu Technological University Campus	Types of Partnership			Mean
	Industry Partners	Government Agencies	NGOs or Community Organization	
CTU-Argao Campus	2.96	3.02	3.00	2.99
CTU-Barili Campus	2.91	2.96	2.91	2.93
CTU-Tuburan Campus	2.49	2.59	2.56	2.55
P-value	0.005	0.020	0.047	0.009

The results reveal that CTU-Argao obtained the highest overall mean score (2.99), followed by CTU-Barili (2.93), while CTU-Tuburan recorded the lowest overall mean score (2.55). CTU-Argao consistently reported the highest perceptions of engagement with industry partners (2.96), government agencies (3.02), and non-government or community organizations (3.00). Statistical analysis demonstrated significant differences among the campuses across all indicators, including industry partnerships ($p = 0.005$), government agency partnerships ($p = 0.020$), community organization partnerships ($p = 0.047$), and the overall mean ($p = 0.009$).

The findings underscore the importance of external collaboration in strengthening institutional research and innovation. The Triple Helix Model explains that sustainable innovation is achieved through dynamic collaboration among universities, government agencies, and industry partners [7]. Institutions that establish stronger partnerships are better positioned to access research funding, technical expertise, and opportunities for knowledge transfer.

Likewise, Social Capital Theory emphasizes that productive organizational relationships are built upon trust, collaboration, and sustain interaction among institutional stakeholders [16]. Stronger partnerships enhance the

exchange of knowledge, improve research relevance, and facilitate the implementation of research outcomes within local communities.

The Knowledge-to-Action Framework also recognizes stakeholder engagement as a critical step in translating research findings into practical innovations and evidence-informed policies [8]. The comparatively lower partnership ratings reported by CTU-Tuburan suggest opportunities to expand collaboration with government agencies, industry partners, and community organizations to improve research productivity and societal impact.

Overall, strengthening institutional partnerships across multiple sectors will contribute to more responsive agricultural research, greater technology transfer, and enhanced regional development.

Institutional Support for Research and Development

Table 12 presents respondents' perceptions regarding institutional support for research and development (R&D) across the three agricultural campuses of Cebu Technological University. The assessment included institutional funding programs, initiatives that promote knowledge development, and policies that prioritize research.

TABLE 12: COMPARISON OF INSTITUTIONAL SUPPORT FOR RESEARCH AND DEVELOPMENT BY THREE CEBU TECHNOLOGICAL UNIVERSITY AGRICULTURAL CAMPUSES

Cebu Technological University Campus	Institutional Support for Research and Development			Mean
	Programs provide Funding	Initiatives Promote Knowledge	Institutional Support Prioritizes Research	
CTU-Argao Campus	3.00	3.04	3.06	3.03
CTU-Barili Campus	2.95	2.89	2.95	2.93
CTU-Tuburan Campus	2.54	2.53	2.48	2.51
P-value	0.009	0.011	0.002	0.002

The findings indicate that CTU-Argao recorded the highest overall mean score (3.03), followed by CTU-Barili (2.93), while CTU-Tuburan obtained the lowest overall mean score (2.51). CTU-Argao consistently received the highest ratings for institutional funding programs (3.00), knowledge promotion initiatives (3.04), and institutional prioritization of research (3.06). Statistical analysis confirmed significant differences among the campuses for funding programs ($p = 0.009$), knowledge promotion initiatives ($p = 0.011$), institutional prioritization of research ($p = 0.002$), and the overall mean ($p = 0.002$).

These findings demonstrate that perceptions of institutional support for research vary significantly across the three campuses. According to Eisenberger et al. [6], perceived organizational support strengthens employee commitment, enhances motivation, and encourages greater participation in institutional activities. Adequate institutional support, particularly in the form of research funding, professional development, and organizational recognition, therefore contributes directly to improved research productivity.

The Resource-Based View (RBV) further explains that institutional resources, including financial support, organizational capabilities, and research infrastructure, represent strategic assets that enable universities to achieve sustained research excellence and competitive advantage [2]. Campuses with stronger institutional support systems are consequently more capable of generating high-quality research outputs and responding effectively to regional development needs.

Similarly, the Innovation Systems Framework highlights the importance of organizational support mechanisms, institutional coordination, and knowledge-sharing initiatives in promoting innovation and research development [9]. Strong institutional commitment to research creates an enabling environment that encourages collaboration, knowledge generation, and continuous improvement.

Overall, the findings indicate that strengthening institutional funding mechanisms, expanding research development programs, and reinforcing organizational commitment to research will contribute to a more vibrant research culture across all campuses. Attention should be given to CTU-Tuburan, where respondents consistently reported lower perceptions of institutional support, suggesting opportunities for targeted interventions that will enhance research capacity and innovation.

4. CONCLUSIONS

The study concludes that while motivation and institutional commitment to agricultural innovation are present across CTU campuses, systemic and procedural barriers impede optimal performance. Quantitative data confirms that decentralizing research management, formalizing inter-campus collaboration, and strengthening infrastructure can significantly enhance innovation capacity. Targeted reforms based on campus-specific needs and existing strengths are recommended to ensure sustained agricultural transformation in Central Visayas.

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