

Strengthening Research Management In The International Collaboration

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Article Info	Abstract
Received : 2024-02-13 Accepted : 2024-10-10 Published : 2024-09-30	The number of scientific publications produced by Indonesian Collaborating Partners is still not optimal. When comparing the number of international research partnerships with the indicator of the number of Research Permits issued, the overall performance of international scientific publications resulted by Indonesian Partners, especially joint publications (co-authorship) Indonesian researchers and foreign researchers, is still very low. This study examines the research management undertaken by Indonesian partner institutions in international collaborative research and its positive impact on scientific publication performance. The research adopts a qualitative approach. Primary data were collected through structured in-depth interviews with 31 key informen selected using purposive method. Risk management analysis has been applied as theoretical framework to explain the implementation of research partnership carried out by Indonesian partner institutions in international research collaboration. The performance of scientific publications is more an achievement of strengthening management undertaken by Indonesian partner institutions formulated into mutually agreed clauses in collaborative research agreements with foreign institutions, rather than being the outcome of foreign research permit policy. This study is considered important to provide a recommendation for Indonesian partner institutions.
Key words international collaborative research; management; partnering institution; scientific publication	

INTRODUCTION

International research collaboration is often identified with the achievement of research results with better quality. International cooperation allows academics/researchers together with their partners to increase the value of research and the impact of research more effectively. Collaboration also makes it possible to pool experts and share each other among them, so they can tackle global challenges more quickly (Adams, 2013). International collaborations also indicate a significant increase in co-authorship performance. This is possible due to the merging of talents and other resources. According to Adams (2013), the number of citations to publications increased by 50% from publications with international partnerships. The number of publications that have international partnerships is increasing rapidly in the world, between 20-40%, such as in America and the UK, while in China and Japan 75% of international publications are still produced by their own ability (Adams, 2013).

A significant increase in joint publication performance is also indicated by international research collaboration. The merging of talents and other resources enables this. The number of citations of scientific publications resulting from international partnerships increased by 50%, rising between 20-40%, in America and England (Adams, 2013).

Adams et al. (2013) indicates that the total research output for Africa increased from 13,271 publications indexed by Thomson Reuters Web of Science in 2000 to over 35,000 publications in 2012. Collaboration with international partners has contributed to this increase. The most frequently collaborating countries with partners in Africa are the United States (39,292 papers between 2000 and 2012), France (31,421), the United Kingdom (25,753), Germany (13,879), and Canada (7,604).

Africa has gained more as China-Africa collaboration has contributed a larger percentage to Web of Science (WoS) documents above 3%, while China prints just over 1.5% during 2016. In the ten years (2006-2016) of China-Africa collaboration, each recorded high-volume growth in global collaborative output (tens of thousands of documents) per year. Global collaboration by China produced about 150,000 documents in 2016, while China-Africa cooperation generated about 2,500 out of 80,000 collaborative output documents produced by African countries in the same year.

The 2020s are considered as a new regional network decade that strengthens the shift in research balance based on competencies and capacities emerging from individual scientists and those conducted by economic research teams, and global changes can be seen in the inevitably increasing co-authorship data (Adams, 2012).

On the other hand, in international research collaboration in Indonesia, the number of scientific publications produced by Indonesian Collaborating Partners is still not optimal. This can be measured by the productivity of scientific publications produced. When comparing the number of international research partnerships with the indicator of the number of Research Permits issued by the Ministry of Research and Technology of the Republic of Indonesia, the overall performance of international scientific publications by Indonesian Collaborating Partners, especially joint scientific publications (co-authorship) between Indonesian researchers and foreign researchers, is still low. Based on the MoRTHE data for the period 2010-2020, a total of 5,439 Research Permits have been issued based on Government Regulation Number 41 of 2006 concerning Permits for Conducting Research and Development Activities in Indonesia for Foreign Higher Education Institutions, Foreign Research and Development Institutions, Foreign Business Entities, and Foreign Individuals, while the number of scientific publications produced by foreign researchers who have received Research Permits is 2,192 scientific publications. The number of scientific publications by researchers from the Indonesian Collaborating Partners (local counterpart) is only 1,221 scientific publications mentioning the name of the Indonesian Collaborating Partners. This number includes both as first authors and co-authors.

The amount of co-authorship by Indonesian Collaborating Partners should ideally reach a number almost equal to that achieved by foreign researchers who have received Research Permits.

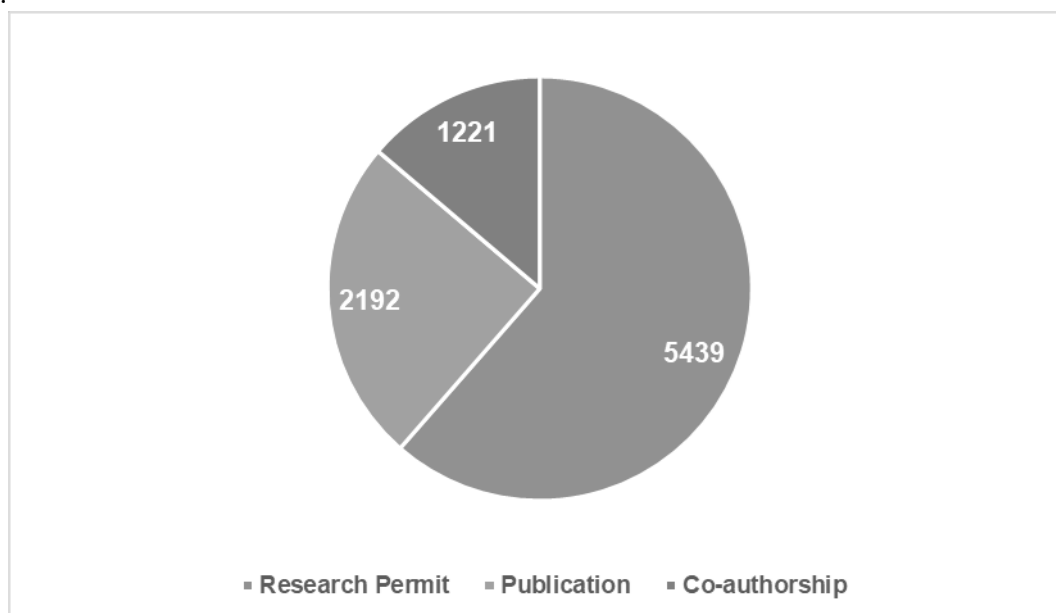


Figure 1. Comparison of Permits, Publications, and Co-authorship (Wahyono, 2022)

The productivity of scientific publications by Indonesian researchers in Southeast Asia also indicates a significant gap. When compared to some ASEAN countries such as Malaysia and Singapore, the number of journal articles written by Indonesian researchers is still below those of the authors from these two countries. Even until 2017, the number of journal articles written by Thai authors was greater than those written by Indonesian authors.

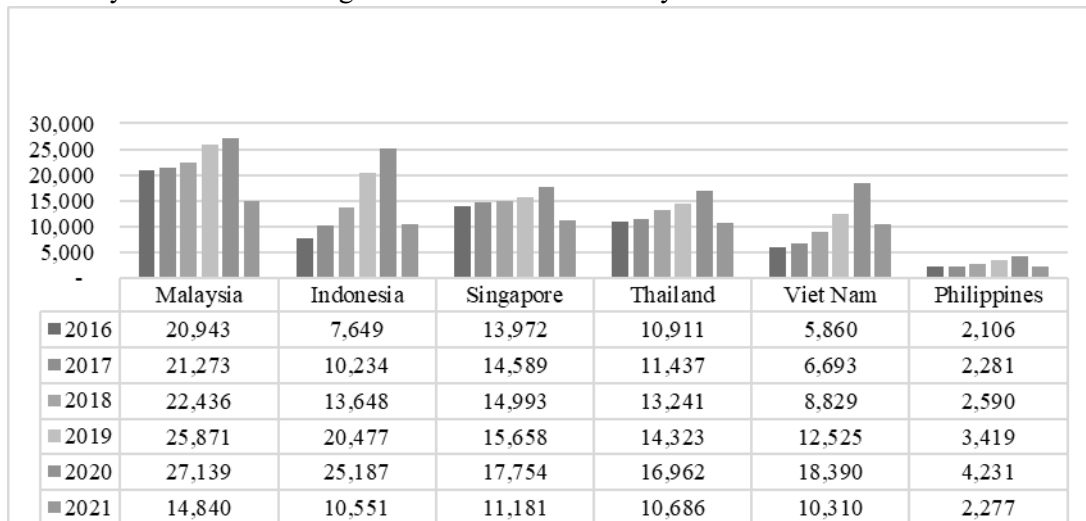


Figure 2. Comparison of Article Productivity in ASEAN Countries (Wahyono, 2022)

The low productivity of scientific publications has prompted the [Ministry of Research, Technology, and Higher Education of the Republic of Indonesia \(MoRTHE\)](#) to enacted [Regulation of the Minister of Research, Technology, and Higher Education Number 20 of 2017](#) concerning the Provision of Lecturer Professional Allowance and Professorial Honorarium.

This regulation explicitly emphasizes that, in order to improve the quality and quantity of scientific publications in Indonesia, lecturers with the position of head lecturer are required to produce a minimum of three scientific works published in accredited national journals or at least one scientific work published in an international journal within a three-year period. Professional allowances for lecturers are temporarily suspended if they do not meet the requirements. Honorary allowances are granted to professors who meet the requirement of having produced a minimum of three scientific works published in international journals or at least one scientific work published in a reputable international journal within a three-year period.

[Costello and Zumla \(2000\)](#) described semicolonial practices carried out by foreign researchers from Western countries in collaborative research in African and Asian countries. Further more [Costello and Zumla](#) developed the principles behind investing in international research collaborations in developing countries. Does current practice over emphasize research results and ignore issues such as ownership, sustainability, and national research capacity building? They criticize that the research model supported by many funding agencies remains semi-colonial [14]. Foreign dominance in setting research priorities and management of research projects may have negative consequences that outweigh the actual benefits of research findings. National academic leaders and institutions need to be involved if research is to be translated into practice. The deterioration of academic infrastructure in many developing countries needs to be considered as part of any research investment. According to [Costello and Zumla \(2000\)](#), a truly cooperative research partnership, which donor agencies must monitor, rests on four general principles: 1) Mutual trust and joint decision making; 2) National ownership; 3) Emphasis on incorporating research findings into policy and implementation; and 4) National research capacity development.

There are two research models that exist in developing countries, namely: 1) the semicolonial model and 2) the partnership model. Some research interaction styles pay less attention to ownership, sustainability and development of national research capacity. "Post research" in which foreign researchers from Western countries ask their African research colleagues to send them biological samples, is still practiced, though less frequently than in the

past. “Parachute research” in which researchers travel to Africa or Asia for short periods and collect and bring home biological samples, is still relatively common. Results from both types of research are often published with minimal co-authorship of African or Asian authors. “Annexed research sites” for field research, led and managed by foreign researchers, still dominate as models for research investment. Undoubtedly, these sites have produced some of the most important, influential and innovative research in tropical medicine, and many of the best researchers have been trained there. Proponents of such a model might argue that tight foreign controls increase the likelihood of good quality research results when work is carried out in difficult environments. The authors believe these “annexed sites” now attract potential academics from national institutions and their research findings are less likely to translate into policy and practice.

The research gap represents an opportunity for the study to contribute new knowledge or understanding to a particular field or topic of research management in international Science and Technology cooperation.

In Indonesia, the examination of research management pertaining to international collaboration, particularly utilizing Research Permits as an indicator of international research partnership, represents a nascent field of study.

The purpose of this research is to explain how strengthening management has been implemented by Indonesian counterpart institutions in international research collaboration. This research comprehends the implementation of strengthening research management within the Indonesian Partner Institutions. This is undertaken as a means to enhance and optimize the international scientific publications within collaborative research endeavors in Indonesia.

LITERATURE REVIEW

Focusing on the challenges and benefits of international research collaboration, particularly in the context of developing countries, Eduan and Jiang (2018), stated that African countries have the lowest research funding levels globally (0.3% of GNP). Researchers in these countries suffer from poorly defined research policies, inadequate research management structures, political instability, and brain drain, which affect their ability to generate higher education knowledge, manage international collaborative research, and participate in global research networks (Teferra and Greijn, 2010). Similar views echoed by Blom et al. (2015) indicate that research in Sub-Saharan Africa is characterized by low financial capacity, covering only operational costs; salaries and research operations are often funded through international research cooperation, and the quality of research often depends on collaboration.

Poor performance in funding management is not surprising. Research collaboration often provides the necessary funding and access to research infrastructure in partner countries, thus enhancing the impact of collaborative research. In contrast to the research funding and infrastructure issues in Africa, China seeks international cooperation with developed countries to advance research in specific fields such as nanotechnology. International collaboration contributes significantly to China's qualitative and quantitative research growth.

Challenges in Multinational Collaborations, four main aspects of the research cycle outlined by [Rayadin and Buřivalova \(2021\)](#) that present opportunities for building more equitable partnerships. The challenges faced by researchers working in multinational collaborations in forestry and nature conservation. In these collaborations, foreign researchers often come from countries that are unequal in terms of financial and institutional support, among other factors contributing to power imbalances. Drawing from personal experiences and challenges, they outline four main aspects of the research cycle that present opportunities to build or strengthen more equitable research partnerships: 1) defining a shared research agenda, 2) securing funding, 3) scientific publication, and 4) effective communication networks. The authors provide recommendations for scientists visiting or local scientists hosting international research collaborations, as well as for institutions involved in forestry and nature conservation research collaborations.

The quality of research outcomes is often associated with international research collaboration. Researchers, working together with their partners, can enhance the value and impact of research more effectively through international cooperation. Collaborations allow the pooling of expertise and sharing, enabling faster resolution of global challenges. Shi states that to advance the development of science and technology in a country, and even globally, collaboration among scientists is crucial (Shi, et al., 2020).

Rodríguez, et al.(2018), comparing the mobility of researchers and the number of publications in international collaborations in the context of scientific and economic capacity.

There is a significant correlation between the flow of researchers with high mobility and publishing capacity with foreign partners in more productive countries, although mobility is always lower than collaboration.

The increase in international research collaboration indicates a comprehensive global network centered around a group of core countries (developed countries). This network is driven by generic socio-economic factors in which the global system influences all outcomes at the national and institutional levels. The total research output for Africa increased from 13,271 publications indexed in Thomson Reuters Web of Science in 2000 to over 35,000 publications in 2012 (34,528 cataloged as of December 15, 2012). Research in Africa can be boosted by international collaborative partnerships, as observed by Onyanche (2011). The countries most frequently collaborating with partners in Africa are the United States (39,292 articles between 2000 and 2012), France (31,421), the United Kingdom (25,753), Germany (13,879), and Canada (7,604) (Adams, et al. 2013).

The role of developed countries in driving the global research network and the potential benefits for developing countries, such as increased research output is very essential. The policy regarding Indonesia's international science and technology cooperation has been formulated within Law No. 11 of 2019 concerning the National System of Science and Technology. The S&T network constitutes an interactive nexus of human resources, amalgamating institutional elements of S&T to yield performance and benefits greater than those produced by each institutional element in a partial and sectoral manner, through S&T partnerships.

Every institutional element of S&T is obligated to engage in partnerships within the implementation of science and technology to develop the network. Moreover, S&T partnerships are encouraged to be established with foreign institutional elements

METHODS

This research utilizes a qualitative approach. The research sample is purposively selected, employing internal sampling techniques. The sample is intentionally chosen based on specific criteria and categories that are strictly defined to be relevant to the qualitative research design, as they are considered to have specific characteristics that can enrich the research data. Furthermore, in the technique of internal sampling, qualitative research will decide who will be interviewed, what documents and how many need to be examined (Agustinova, 2015).

In this study, the primary data collection technique involves structured in-depth interviews with 31 key informants, following strict criteria. Key informants selected for interviews are based on several criteria as follows: a) regulators or Directors of Intellectual Property Management at the MoRTHE (2015–2019); b) researchers or lecturers with a minimum of 10 years of experience in international research collaboration; c) Foreign researchers with a minimum of 20 years of experience in international research collaboration in Indonesia; d) Senior officials of foreign research institutions/foreign research funding institutions with a minimum of 15 years of experience in research management; e) Officials of research and development agencies or universities with a minimum of 10 years of experience in international research collaboration; f) Heads of research and development agencies of Ministries or universities with a minimum of 10 years of international research management experience; and g) Coordinators of international research consortia with a minimum of 20 years of experience. Potential key informants to be interviewed in-depth include foreign researchers with research interests in the following areas: 1) Cultural Anthropology; 2) Archaeology; 3) Botany; 4) Zoology; 5) Primatology; 6) Oceanography; 7) Health and Tropical Diseases; 8)

Molecular Biology; 9) Agriculture; 10) Veterinary Medicine & Parasitology; 11) Primatology; 12) Geology; and 13) Ecology.

To complement the primary data obtained through the interview technique, secondary data collection will also be conducted by gathering relevant documents to the research questions and objectives. The documents include a) legislation; b) scientific publications in the form of books, journals, and scientific proceedings; c) reports from the MoRT; d) research collaboration agreement manuscripts such as Memorandum of Understanding (MoU) and Technical Agreement; e) Strategic Plan of the MoRT f) List of Budget Implementation (DIPA) of the MoRT.

RESULTS AND DISCUSSION

There is a substantial correlation between the movement of highly mobile researchers and their publishing capacity in conjunction with foreign partners in more industrially productive nations, despite mobility consistently being lower than collaboration (Rodríguez, et al, 2018).

The significance and strategic of international collaboration have been highlighted by (Adams,2012). He argues that co-authorship networks are a valid proxy for collaborative research laboratory work and authorship sharing, reflecting the dominance of the United States and European knowledge and technology engagement. Such publication data has marked the research world since 1945. However, these transatlantic countries are unlikely to be the main disciplines with deep and high-quality research without collaborating with resource-rich developing countries (Adams, 2012).

Research Management

Research management encompasses a diverse range of processes aimed at advancing research endeavors, including goal setting, approval acquisition, progress monitoring, and compliance assurance. For effective project management and decision-making, research administrators must possess a comprehensive understanding of these facets (Cayuse, n.d.).

The following is an overview of the five primary areas of research management formulated by Cayuse (n.d.), along with strategies for administrators to enhance research outcomes: 1) Strategic Planning; 2)Project Oversight; 3) Compliance and Ethics ; 4) Data Management; 5) Reporting and Intellectual Property.

Managing intellectual property rights (IPR) is crucial for protecting data discoveries through patents and copyrights. Clear guidelines for publishing reports are essential for collaborative, international, and sponsored research. Lack of clarity in this area may result in litigation, jeopardizing projects and damaging institutional reputation. Administrators must be well-versed in IPR laws and establish guidelines for reporting and disseminating findings (Cayuse, n.d.).

According to the Regional Research Guidelines on European Intellectual Property Management in International Research Collaboration Agreements between European and Non-European Partners (2012), research partnerships are a crucial element in the innovation landscape, essential for driving knowledge-based economic growth.

Research management involves the allocation of resources undertaken by research institutions and universities as collaborating entities in international research collaborations within Indonesia. Research management encompasses human resources, finances, infrastructure, and notably, the management of intellectual property (especially scientific publications) generated from international research collaborations.

Within research collaborations with foreign researchers, planning is a crucial aspect. Planning, in its broad sense, includes preparing human resources participating in joint fieldwork, conducting sample analyses together, and providing matching funds or supplementary funding for joint fieldwork.

The international research collaboration planning conducted by Indonesian partnering institutions generally comprises three stages. These stages are: firstly, the pre-research stage, which occurs before the foreign research partners arrive and before they craft research proposals, among other things. The emphasis in international research collaboration

planning lies within the pre-research stage, where collaborators from both sides commence intensive communication through emails, online meetings, or workshops to formulate the plan of operation and research proposal. This phase involves drafting and discussing Memorandum of Understanding (MOUs) and Letters of Agreement, as the foundation and guidelines for research collaboration, whether it will span 3 or 5 years.

The planning stages have previously been carried out by the reputable biological research institution with foreign research partners in collaborations with prominent university from USA, and the Natural History Museum from Germany. The pre-research stage was also conducted by Bogor Agriculture University (IPB), Tadulako University (UNTAD), and Jambi University (UNJA) alongside the Georg-August-Universität Göttingen, Germany, in the CRC 990 *EFForTs* research consortium (2010 – 2023). Then, how do they determine the necessary personnel, who participates, and how the research schedule is arranged? All of these are meticulously organized by the collaborating institution before they embark on the research.

The second stage involves the research execution. During this phase, collaborating researchers conduct joint fieldwork for the collection of primary data, including field sampling, observations, sample transportation, and analysis in laboratory settings.

Subsequently, the third stage involves post-research activities. Following the joint fieldwork by foreign and Indonesian partner researchers, in the research execution phase, the subsequent research collaboration stage involves an evaluation of the planned and implemented activities in the field. This includes assessing whether there are revisions to the research proposal, changes in the research team members, adjustments to the joint research plan based on conditions in the research area, and research findings.

Logistical matters such as accommodation, transportation, and establishing a research base camp in the field are meticulously arranged upon their arrival. The research schedule is strictly adhered to due to its association with the application for the research visa, Research Permit, and related permits such as the Conservation Area Entry Permit (SIMAKSI), Genetic Resource Access Permit (SDG), Domestic Plant and Animal Transport Permit (SATSDN) Overseas Plant and Animal Transport Permit (SATSLN), among others. Similar research collaboration planning is also undertaken by the CRC 990 Research Consortium, enabling a controlled execution of research collaboration, albeit encountering some shortcomings related to partner commitments. For instance, constraints arise from the provision of counter-budget funding, prompting researchers participating in research collaborations, as advised by the biological research institution, to propose research proposals funded from government research institution Budget Implementation List (DIPA). These proposals are tailored to align with the schedule of foreign researcher collaboration, thereby optimizing the research outcomes from the Indonesian partnering institution.

Human Resource Management

When planning research collaborations after the signing of the MOU, followed by the technical agreement, the Indonesian counterpart prepares plans, such as the allocation of research personnel based on either research groups or researchers' competencies.

Once the Principle Investigator (PI) has been designated—either appointed by superiors or having initiated the collaboration—the PI communicates with the head of the research center, particularly for multidisciplinary or interdisciplinary research projects (Zoology, Botany, and Microbiology). The Division Head for Collaboration will coordinate with the head of the research center. Subsequently, decisions regarding the team's allocation are made by the research center's Head and research division Head.

For research collaborations confined to a single field, such as Zoology alone, coordination suffices with the Head of the Zoology research division. Typically, within the implementing agreement of significant research projects, the scope of cooperation is divided into several subfields based on the research interests of the researchers. For instance, subfields like Insects, Begonia, Primates, and Mammals. If Research Group A aligns with the field of insects, the Principal Investigator or researchers from the insect research group involved, determine their roles and responsibilities. This includes identifying who from the foreign research partner is involved and what tasks they'll undertake, ensuring a matching research

partner almost always exists. Therefore, for Subfield A, it specifies the PI, the foreign research partner, the representatives from Indonesian research partner institution in Subfield B, and their corresponding foreign research partners, continuing similarly for Subfields B, C, and so forth.

Work division within the research management of the Biology Research in international collaborations is analogous to the work division implemented by the CRC 990 *EFForTS* research consortium (Ecological and Socioeconomic Functions of Tropical Lowland Rainforest Transformation Systems). Within the CRC 990 consortium, involving IPB, UNJA, UNTAD, and the Georg-August-Universität Göttingen, the collaborative research project is divided into 12 sub-projects. These sub-projects reflect the breakdown of research groups, with a PI and an Indonesian counterpart within each sub-project. The twelve sub-projects are structured based on research interests and also mirror the competencies of the researchers involved, such as the Riverian, Crop Pest, Socio-Economic Agriculture, Soil Nutrition, Agroclimate, and others.

During the implementation of international research collaborations, efforts have been made to allocate opportunities for researchers to contribute scientifically to the research projects. The primary consideration lies in competency. For instance, when Indonesian reputable research institution collaborates with a prominent university from USA in the Biodiversity research project in the Mekongga Mountains of Southeast Sulawesi, consisting of sub-projects in Botany, Zoology, and Microbiology, three competent researchers were selected to coordinate these sub-projects. Within these sub-projects, junior members, particularly those in need of funding for Master's and Ph.D. studies, were recruited to engage in collaborative research and training. This collaboration opportunity is beneficial as it aligns with the research interests of competent researchers while providing a platform for the development of junior researchers' scientific capabilities. Senior Indonesian researchers believe that collaboration with foreign researchers, protected by clear regulations, remains essential for Indonesia's interests.

In the management of human resources for researchers, based on the prevailing traditions within a leading research institution, it appears that the initiator of collaborative research assumes an almost absolute right. This is especially evident when the initiator is a senior researcher. In the distribution of opportunities for joint research with foreign researchers, for instance, a senior researcher tends to invite anyone who has long been part of their research group, despite the Head of the Research and Development Institute consistently advising against being overly exclusive with their research group in joint research with foreign researchers. There should be no overly dominant personal cliques while also providing opportunities for young researchers.

However, beyond the dominance of research groups and the breadth of research networks, a more inclusive distribution of opportunities greatly depends on the scope of the research. If the collaboration offer focuses on the sub-field of mammals, researchers from the mammal research group will be given the first opportunity to participate in joint research. Yet, in extensive research collaborations or international research consortiums involving several research institutions and foreign or national universities, such as the Collaborative Research Center (CRC 990), Mekongga Expedition, and Lengguru Expedition, the participation of researchers in joint research can be carried out in a more inclusive manner. This is possible because in research consortiums where the collaboration scope and research topics within the agreed-upon research project are extensive, it requires a multitude of scientific and technological human resources with various specialized expertise. Furthermore, these research consortiums typically constitute multi-year research projects with meticulous planning and are funded by substantial research grants from foreign funding agencies such as the National Science Foundation in the United States or the DFG in Germany.

In general, offers for research collaboration from foreign researchers undergo a selection process and are subsequently chosen by researchers from partner institutions in Indonesia that align with or support programs with their vision, mission, targets, and performance objectives. Naturally, negotiations always involve compromises based on the capacity and research budget of the partner institution. For instance, in cases involving research specimen programs or scientific collections, when collaboration opportunities arise, they might

propose expanding the scope of research cooperation to enhance specimen collections. Eventually, these output could be utilized by the monitoring and evaluation team to calculate key performance indicators. These indicators could include the increase in the number of specimen collections and scientific publications resulting from research collaborations.

According to a Research Professor from a prominent national research institute, approximately 80% of international research collaborations support the achievement of the research institute's work programs.

The tangible outputs and outcomes of research collaborations not only consistently strengthen institutional capacities but often serve as complementary support in achieving the targets of partner institutions.

The benefits of international research collaborations are evident because, in general, when researchers actively engage in collaborative research with foreign counterparts, they are selective and accept offers for research collaboration that can support the achievement of Key Performance Indicators within their research institution.

Bogor Agriculture University

The Human Resource Management at IPB, revolves around efficiently managing faculty members who are occupied with teaching, community service, and research activities. IPB faculty members who double as researchers are adept at self-management, handling teaching duties, research endeavors, and community engagement. During field research, they often involve students in data collection activities. They form research groups with shared research interests within specific academic fields. IPB establishes research clusters, ensuring that several clusters possess competencies and research interests relevant to foreign research collaborators based on specific research interests. For instance, clusters such as CRC, NUS NUT, the Universitat Goettingen cluster, and the Australian International Center cluster each have a Principal Investigator. International research collaboration management primarily focuses on facilitating and controlling potential risks.

Collaborative patterns where an institution is not institutionally engaged and not fully integrated into research institutions fail to leverage and harness available resources. When research management is integrated across partner institutions, research collaborations can produce optimal outputs and outcomes, rendering research collaborations increasingly productive.

Research Management of PTNBH

The research management of in Legal Entity State University (PTNBH) provides counter budgets through community funds. These counter budgets are offered to support international research collaborations, especially as some research mandates cash contributions. Therefore, the counter budget is included in the Work Plan and Budget of PTNBH as the collaborating partner.

IPB has a policy aimed at becoming a World-Class University with international recognition, primarily assessed through international scholarly publications.

Another significant indicator utilized is active participation in international conferences. Being a speaker at international academic forums can serve as an indicator, demonstrating the feasibility of both becoming part of the IPB Rector's program and establishing internationalization as a key initiative at IPB. Internationalization efforts can be pursued through two main avenues: 1) international research collaborations and 2) international educational cooperation. These components are interconnected and thus necessitate consolidation. Consequently, the university management has established the Directorate of International Programs to amalgamate these two aspects—education and research—into one unit.

The management's vision for international cooperation is detailed in the IPB's five-year Strategic Plan, where IPB's strategy for the future revolves around transforming into a 'transformation university' through the establishment of an international consortium.

As of 2020-2021, there were 35 international research consortia and 8 educational consortia. Through these consortia, IPB engages not in solitary efforts but in inclusive endeavors involving multiple stakeholders from both domestic and international spheres, provided they are willing to contribute. An exemplary instance is the CRC 990 research

consortium. The Collaborative Research Center (CRC 990), operational for 12 years, allows strong and contributing researchers to persist. Institutions involved in the CRC 990 *EFForTS* consortium in Jambi and the STORMA consortium in Central Sulawesi, involved IPB, UNTAD, UNJA and the University of Goettingen. Continual improvement of the management of these research consortia remains a priority.

Financial Management

IPB has significantly improved its financial administration. Financial management for collaborative research is crucial. Previously, the handling of foreign research funds from abroad was unclear and could even be directly deposited into the collaborating researchers' personal accounts. However, presently, all research funds are channeled into IPB's accounts, duly recorded, and subsequently allocated to various research projects, ensuring heightened accountability. With these financial management enhancements, in the event of delays in funds from foreign research funding agencies, IPB can initiate pre-financing, ensuring that collaborative research projects proceed as agreed upon.

In research consortiums among research institutions, IPB, as a collaborating partner institution, assumes responsibility for financing based on contracts, ensuring pre-financing to avoid interruptions in research projects. IPB strengthens research management through institutionalizing international research collaborations, focusing on institutional roles rather than individual researcher dominance. Institutional roles become crucial, transcending individual aspects. Administrative officials serve merely as facilitators; hence, in cases of personnel changes, all programs continue unimpeded, as tasks and finances are clearly delineated.

IPB's status as a Legal Entity State University enables the Rector to establish standard tariff rates, granting autonomy in financial management. This status facilitates the creation of varied standard tariff rates for Man/Hours paid by potential donor institutions for researchers participating in international research projects. IPB's status as a Legal Entity State University fosters flexibility and self-sufficiency in financial management and resources supporting international research collaborations. IPB enjoys greater autonomy in financial administration.

The status as a Legal Entity State University significantly influences agility in financial management and other resource aspects.

Outcome Achievement

The achievement of research outcomes by institutions in international collaborative projects depends on the readiness of Human Resources. Especially when their foreign partners are internationally reputable research institutions or universities. Particularly in outcomes like joint publications or co-authorships, the Indonesian partner institutions understand the challenges faced. For instance, in collaborative research projects with China, nearly all first authors (99%) in international scientific journals are Chinese researchers.

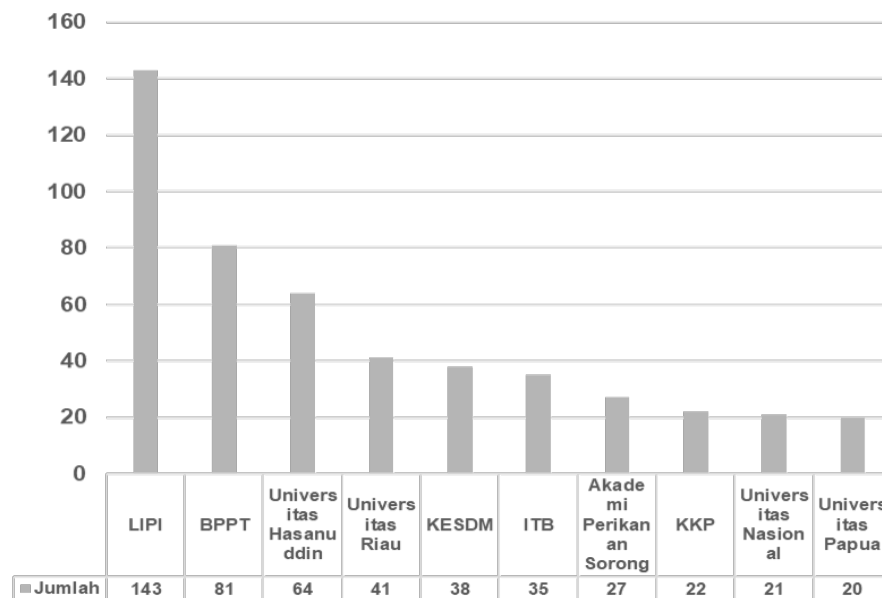


Figure 3. Top 10 First Authors of Indonesian Counterparts (National Research and Innovation Agency, 2021a)

Regarding conference proceedings papers, Indonesian researchers are confident in taking the lead authorship. However, for international journal articles, especially those indexed in Q1, the challenge remains significant. Even for the majority of senior researchers, competing for the first author position in Q1 or Q2 indexed international scientific journals remains difficult. This challenge persists even for a senior researcher at LIPI with a Ph.D. education level.

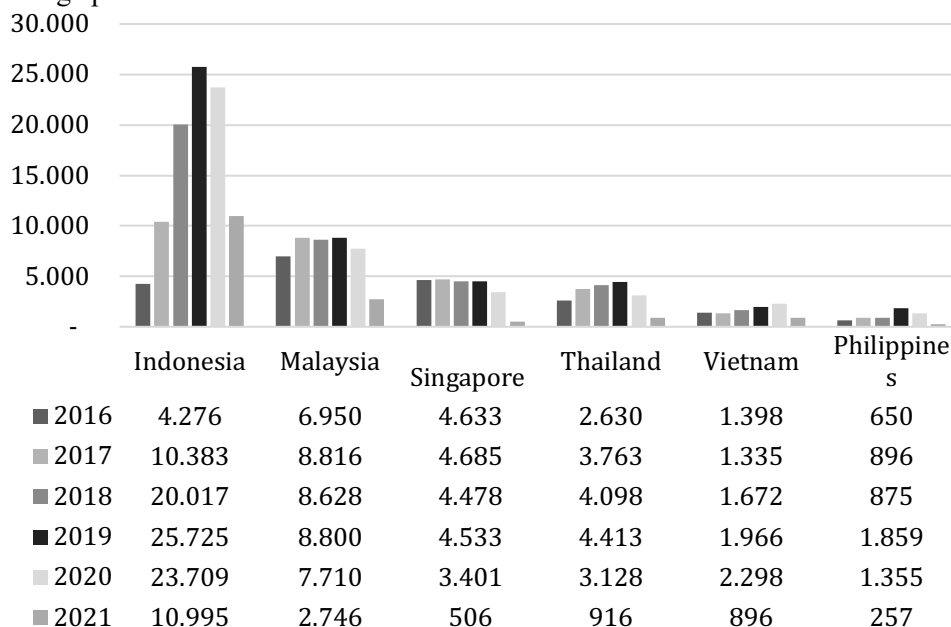


Figure 4. Performance of Conference Papers in ASEAN Countries (National Research and Innovation Agency, 2021b)

International research collaborations contributed significantly to approximately 50% of all scientific publications produced by ITB. Their contribution represents 50% of the international scientific publications jointly produced with foreign researchers.

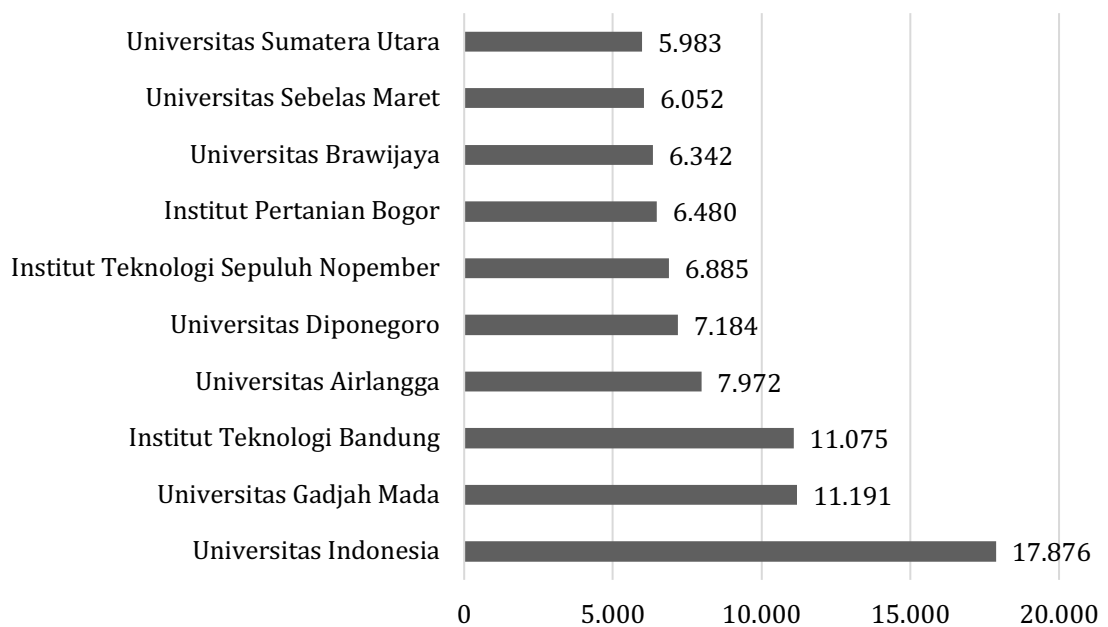


Figure 5. The Top 10 Total Number of Publications by Indonesian Higher Education Institutions (National Research and Innovation Agency, 2021b)

UGM's Professors, more than 80%, have established working linkages with foreign counterparts. However, 80% of these professors have established international research collaboration links due to their high performance in scientific publications and possessing extensive international networking.

Senior LIPI scientists also said that more than 80% of LIPI scientists' international scientific publications, resulted from international research collaboration.

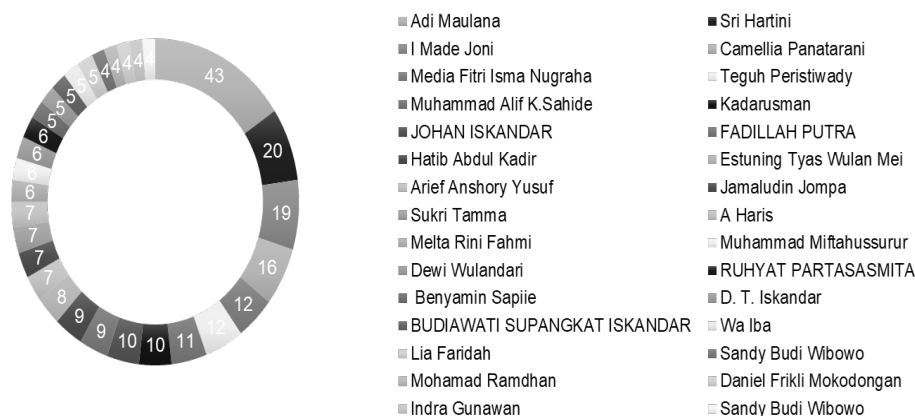


Figure 6. Top 30 Indonesian First Authors (Wahyono, 2022)

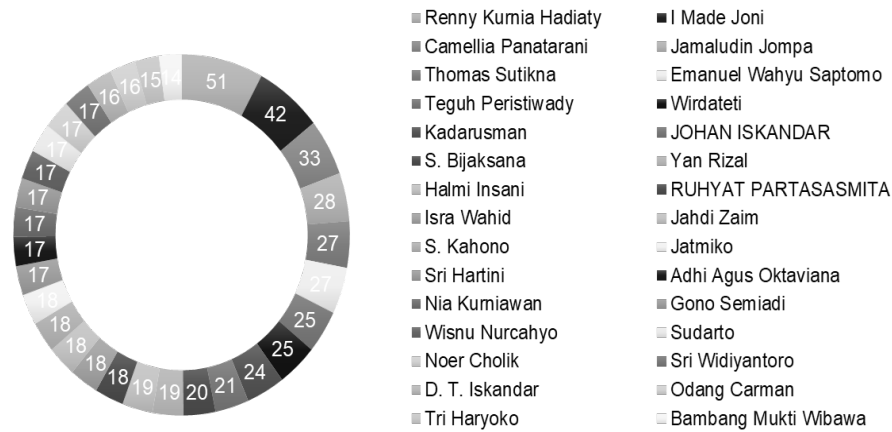


Figure 7. Top 30 Indonesian Co-authors (Wahyono, 2022)

The achievements in Molecular Biology research are largely driven by individual efforts. A senior researcher at the Molecular Biology Institute actively engaged in research collaboration with foreign researchers has contributed to approximately 10 SCOPUS Q1-indexed international scientific publications out of a total of 76 international scientific publications.

Best Practice

The best practice in Indonesia's international research collaboration is defined by its achievements in scholarly publications.

CRC 990 Management

In the management structure of the CRC 990 research collaboration, an interesting feature is the presence of a Joint Management Board (JMB). The JMB is comprised of representatives from Indonesia (IPB, UNJA, UNTAD) and representatives from the University of Göttingen. Each representative selects members, resulting in a combined board formed by those designated by both representatives. This composition includes 3 members appointed by the University of Göttingen, and 3 members representing UNJA, 3 members from IPB, and 3 members from UNTAD. As this involves 3 universities with 3 representatives from each institution. The speakers and JMB members convene at least twice a year, and beforehand, they agree on the issues to be discussed during these meetings, which are then brought forward within the JMB discussions.

CRC 990 OUTCOME

During the collaboration period of 2012 to 2022, total of 374 scholarly publications were achieved.

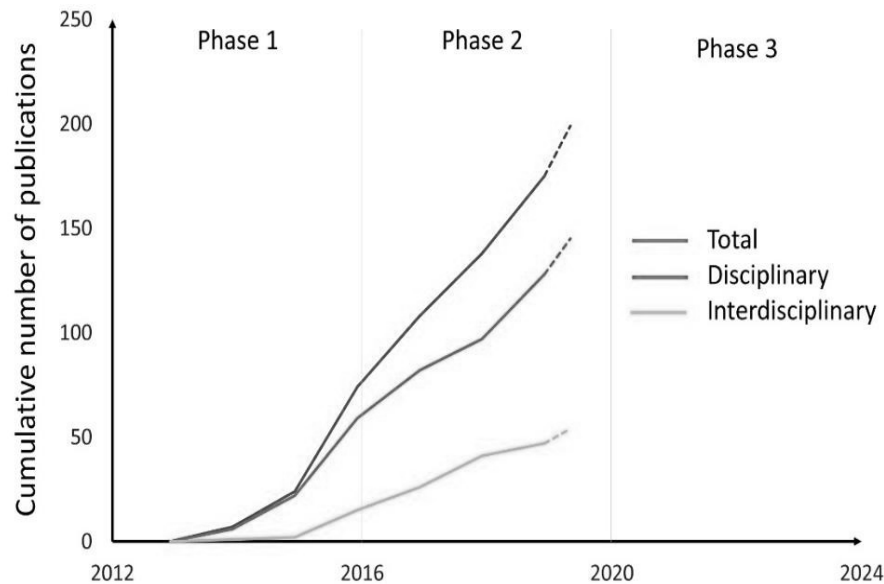


Figure 10. Comparison of Disciplinary and Interdisciplinary Publication
(Tjoa, 2023)

Table 1. Internasional Scientific Publication of CRC 990 (2012–2023) (Tjoa, 2023)

No.	High impact publication	Total
1	Papers (80%) <i>peer</i> and (25%) <i>multidisciplines</i>)	318
2	Peer reviewed papers	254
3	Multidisciplines research outcome paper	79 (25%)
4	Indonesian counterpart co-authorship papers	254 (80%)
5	Indonesian first author publications	86

These comprised 339 articles published in various international scientific journals and 35 discussion papers originating from several sub-projects. It's important to note that the CRC management calculated publications as "interdisciplinary (across multiple fields of study) or single (within a specific field)" within a single article.

CONCLUSION

The performance achievements in scientific publications by Indonesian researchers collaborating with foreign counterparts primarily stem from strengthened research management of partner institutions within research collaboration. This is more prevalent than as an outcome of foreign research permit policy, leading to their scientific publications accounting for nearly 50% of the total Research Permit issued. This represents a significant achievement considering the limited policy intervention by regulator and the notably small budget allocation.

The positive impact of international research collaboration on the productivity of scientific publications is remarkably significant despite minimal policy intervention by regulator.

SUGGESTION

1. For BRIN (Indonesian National Research and Innovation Agency);
Provision of Matching Funds:
National science institutions currently collaborating on research with foreign researchers on topics relevant to the National Science and Technology Development Plan can receive assistance through matching fund agreements based on output-based research fund utilization. This scheme covers all research expenses, from primary data collection in the field, sample analysis in laboratories, manuscript writing processes, including translation costs and Article Processing Charges (APCs) paid to international scientific journal publishers.
2. For the Director-General of Higher Education, Ministry of Education and Culture;
Expanding Research Programs:
Enhancement the productivity of scientific publications can be achieved by expanding research programs with diversified roles based on collaborative research project. For instance, a research assistant program could be introduced for fresh graduates holding Bachelor's, Master's, and Doctorate degrees, with a one-year work contract extendable further. Research activities can be undertaken by fresh graduate students and Post-Doctoral Fellows serving as research assistants to professors in various research project funding schemes funded by the universities. They have no teaching obligations. Other job positions, like Research Associate, Chair Professorship positions should be existed. Creating job classifications in the research field is crucial.
3. For Indonesian partnering Institutions:
Strengthening research management:
Research management is a key factor in the success of international research collaborations. It involves research collaboration planning, managing human resources in science and technology, financial management, research infrastructure management such as laboratories and research equipment, and intellectual property management for publications.

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