

Research article

International Collaborative Research: Responsive Partnership, Value and the Missing Link in Indonesia

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Abstract.

Academic research is increasingly international. Collaboration across cultural and geographic boundaries increases efficiency and speeds up the new discoveries of science and technology by combining skills. However, the management of international research collaborations is far from simple. The equity and impact of a partnership must be supported by strong management and support systems. The success in organizing a research partnership is substantially dependent on the supporting management system. Researchers who search for partnerships, obtain funding and are responsive partners should be supported by the State. The Government should assist these partnerships, not only regulate and control them. Providing support e.g., matching funds, assisting capacity building for researchers, developing infrastructure and institutional development capacity, and providing research management training can boost the achievement of ideal international research collaborations with high impacts and benefits for all parties. This research examined the conditions and obstacles for international research collaborations in Indonesia of various research and development institutions and universities with their international research partners. Qualitative methods were used. The study used a range of research permit and publication indicators to measure the benefits obtained from international partnerships. It was found that one of the most successful international research partnerships in Indonesia, which has existed for 20 years, has been able to achieve optimal benefit-sharing such as co-authorship, co-supervision, mobility of students and staff, and capacity building of the Indonesian scientists and institutions.

Keywords: international research collaboration, permit, research management, supporting system

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Published 20 May 2022

Publishing services provided by Knowledge E

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Selection and Peer-review under the responsibility of the ICoGPASS Conference Committee.

1. INTRODUCTION

Research is an activity carried out according to scientific principles and methods systematically to obtain data and information related to understanding and proving the truth or untruth of an assumption and/or hypothesis in the field of science and technology as well as drawing scientific conclusions for the purposes of the advancement of science and technology [1]. That definition of research is based on Chapter I of the General Provisions of the Law of the Republic of Indonesia Number 11 of 2019 on the National

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System of Science and Technology. Research can also be defined as an activity carried out according to scientific methodologies to obtain data and information relating to an understanding of natural and/or social phenomena, proving the truth or untruth of an assumption and/or hypothesis, and drawing scientific conclusions [2].

Research is a systematic inquiry process with an appropriate methodology, defined by a particular professional or academic field. Research is conducted to validate hypotheses or interpretive frameworks with the aim of gathering substantive knowledge and findings, and sharing that information in an appropriate manner and to generate further research questions. Research is continuous and carried out by humans. The basis for the development of research itself is the working relationship between people based on references/other discoveries, so that collaboration is indeed the basis of the research activity itself.

The basic principle of research activities is not like financial activities, where activities can be easily quantified. Research activities are not like capital expenditures, which will immediately get a return, point of return from research activities, often also not producing materials. A good understanding of the background of research activities, as well as the basis for the interests of partners, will have a positive impact on the instruments for regulating partnerships with foreign countries [3].

Institutions often have core tasks and functions that are almost the same as other institutions, for example, universities or research institutions in Indonesia, will have tasks and functions that overlap with universities or research institutions abroad. To save resources and time, it will also have a wider effect, collaboration is the right thing [4, 5].

In Article 71 of Law Number 11 of 2019 on the National System of Science and Technology, it is explained that the science and technology network is an interactive relation of human resources employed in science and technology sectors that combines elements of science and technology institutions to produce better performance and benefits greater than that produced by every element of the institution of science and technology [1]. Furthermore, in Article 72 of the Law, it is also emphasized that the institutional elements of science and technology are required to form partnerships in the implementation of science and technology to develop a science and technology network which includes: a) easy access to information; b) easy access to science and technology facilities and infrastructure; and c) the mobility of human resources in science and technology [1]. Partnerships can be made with foreign partners. In carrying out the partnership, science and technology institutions are required to carry out technology transfers and are guided by a free and active foreign policy.

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.

International collaborations also show a significant increase in co-authorship performance. This is possible due to the merging of talents and other resources. According to Adams, the number of citations to publications increased by 50% from publications with international partnerships [6]. 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 [6].

TABLE 1: Scientific Publication Performance in International Research Collaboration.

Country/World	Joint Publication partner	Details
UK (2011)	10.000*	Doubled compared to 2003
Germany (2011)	10.000*	
Malta (2011)	50 joint publication with the UK	The number is 25% of total Malta's publication
USA (2011)	19.141 joint publication with China 19.090 joint publication with the UK 6.753 joint publication with Germany	50% papers produced by research partnerships
1989	There is no research partnership were able to produce 1.000 papers in the world	

Source: Adams (2013) [6]

Currently, Indonesian researchers are generally “inbound”, that is, they become local partners for international researchers. In general, Indonesian researchers conduct research partnerships with foreign researchers from various research and development institutions and universities where they have continued their postgraduate studies in various countries such as Japan, the United States, Australia, Canada, and European countries. They started research collaborations through alumni relationships with former professors who became their promoters or supervisors from various universities abroad. Researchers from various R&D institutions and Indonesian universities who then act as research counterparts of foreign researchers, rarely or almost never prepare research collaboration plans and prepare matching funds as part of research management with several targets for achieving outputs and outcomes as well as a clear exit strategy. They also did not prepare a budget as a research collaboration fund for the implementation

of fair and equitable benefit sharing in accordance with the provisions of the Nagoya Protocol which has been ratified by the Government of Indonesia with the principle of equitable and fair benefit sharing in international collaboration. In fact, on many occasions, Indonesian research collaborators have accepted research collaboration proposals while hoping to get funds for joint fieldwork in various regions or training facilities abroad. Indonesian partner institutions, both R&D institutions and national universities, are still very short-term oriented. In general, the principles of mutual respect, mutual trust, and mutual benefit in international research collaborations have not been fully implemented in Indonesia.

In the context of collaborative research in the field of biodiversity, the concept of benefits based on the Nagoya Protocol strongly supports countries that own biological resources such as Indonesia. As a country that owns genetic resources (provider country), the concept of benefit must be distinguished between research for industry and fundamental research. The ability to use short but careful, efficient rules can provide high benefits for local partners. However, mistakes in the field that often occur in ABS (Access & Benefit Sharing) policy formulations are more interested in political values, trade values, and the desire to get short-term benefits without considering research capabilities, levels, and support for domestic research. Laird and Wynberg suspected those will slow down the benefits of the existence of the ABS rule itself [7]. The most concrete example is that Indonesia does not have bioinformation and genomic databanks such as NCBI (National Center for Biotechnology Information) and Bioinformation DDBJ (Bioinformation and DNA Data Bank of Japan).

The ideal condition is that Indonesia becomes a hub or axis for world scientific research activities and the Government of the Republic of Indonesia can invite and provide funding for foreign researchers to conduct joint research & development with various national researchers and scientists in accordance with the National Research Master Plan which focused in technology innovations on 10 research fields such as New and Renewable Energy Resources, Disaster, Maritime Affairs, Health & Medicine, Advanced Materials, Food & Agriculture, Defense & Security, Social Humanities, Cultural Arts & Education, Information & Communication Technology (ICT), and Transportation as enacted by President Decree Number 38 of 2018 on National Research Master Plan 2017–2045 [8].

The priority topics of international research cooperation set and offered by Indonesia have not been well received. The domination of international parties in setting priorities for research topics offered in collaboration is very clear. Currently, the favorite topics of foreign researchers in research collaboration in Indonesia are still related to terrestrial

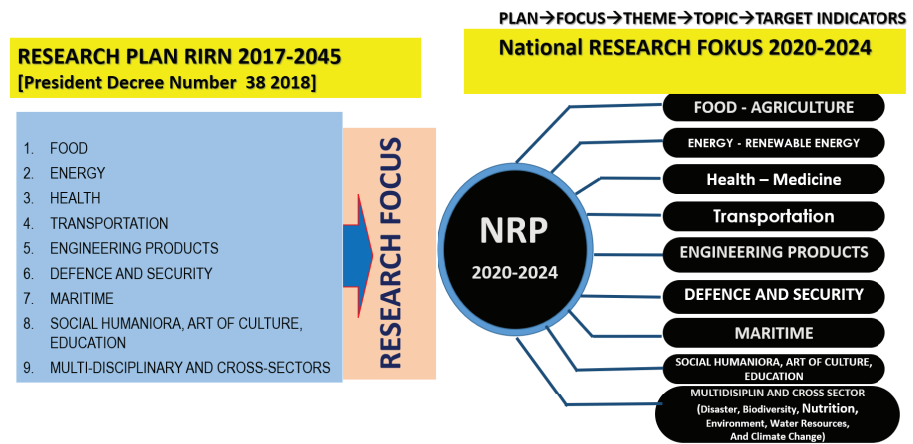


Figure 1: Indonesian National Research Theme and Topic 2020 – 2024. (Source: Ministry of Research, Technology, and Higher Education, Jakarta, 2019).

and non-terrestrial biodiversity as well as ecology, disaster mitigation, and very few have foreign research partners who are interested in the fields of engineering, new and renewable energy, transportation, advanced materials, information technology and computers, Defense & Security, industry, and Education. International research collaboration for the Indonesian side is still being implemented or defined as the arrival of international researchers who conduct research in Indonesia and are required to have local partners. This happens as a result of the very low bargaining position of Indonesian researchers collaborating with foreign researchers, considering that foreign researchers who are granted research permits come to Indonesia with their own research funds and research equipment and very few matching funds that the Indonesian government can provide.

TABLE 2: Foreign Researchers' Field of Studies (2010 – 2020) [10].

	Field studies/year of	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	Life Sciences	213	210	274	247	232	203	154	261	199	199	94
2	Earth Sciences	166	98	77	119	110	195	135	130	116	130	132
3	Socio Humanity	80	71	142	82	89	73	81	119	158	161	65
4	Agroforestry	15	6	22	47	54	47	56	29	31	38	16
5	Medical & Health and Medicine	17	5	15	27	7	13	39	14	16	17	17
6	Engineering	0	2	14	24	20	6	24	4	1	9	0
	Total number	491	392	544	546	512	537	489	557	521	554	324

1.1. Foreign Research Permit and International Collaboration

Indonesia is blessed with incredibly rich biodiversity and natural resources, various ethnicities and languages, and cultures. It makes Indonesia an attractive international partner to develop science and technology towards its uniqueness and blessings. For national security and foreign policy reasons, Indonesia regulates and controls the international research collaborators. It is weighed to protect from biopiracy, reduce intellectual property theft and espionage activity. Various collaborations require investigation e.g., funding system and to seek approval or permit. Application for approval is submitted to a designated body, nowadays is the Directorate of Management of Intellectual Property a Ministry of Research and Technology/BRIN (National Research & Innovation Agency Republic of Indonesia) and reviewed by TKPIPA (The coordinating team for the approval of foreign research permit).

TABLE 3: Top Ten Foreign Researchers by Country of Origin (2016-2020) [10].

	Country	2016	2017	2018	2019	2020	Total
1	USA	127	115	79	109	22	452
2	Japan	57	86	97	108	26	374
3	France	47	74	49	24	8	202
4	Germany	46	40	41	38	13	178
5	UK	43	42	37	52	20	194
6	Australia	41	41	40	51	17	190
7	Netherlands	19	10	22	18	14	83
8	China	17	50	20	38	10	135
9	Italy	11	13	14	17	0	55
10	Singapore	0	0	17	0	0	17

The Indonesian government implements a research permit policy for foreign R&D institutions, foreign universities, foreign business entities, and foreigners who will conduct research collaborations in Indonesia. This foreign research permit regulation has been implemented since 1993 with Presidential Decree Number 100 of 1993 [11]. In 2002, Law Number 18 of 2002 was promulgated on the National System for Research, Development and Application of Science and Technology which affirmed foreign research permit regulations as an absolute requirement for foreign R&D institutions, foreign universities, and foreign business entities that will conduct research partnerships with R&D institutions, universities, and Indonesian business entities [12]. Technical operation and mechanisms related to the permit are also further regulated by Government Regulation

Number 41 of 2006 concerning Permits to Conduct R&D Activities for Foreign Universities, Foreign R&D Institutions, Foreign Business Entities, and Foreigners [13]. Furthermore, related to the operational technical implementation of Government Regulation Number 41 of 2006 and further regulated by three Ministerial Regulations, namely 1) Regulation of the State Minister of Research and Technology Number 08/M/PER/IX/2007 concerning Reporting on the Results of the Implementation of Research and Development Activities by Foreign University, Foreign Research and Development Institute, Foreign Business Entity and Foreigner [14]; 2) Regulation of the State Minister for Research and Technology Number 09/M/PER/IX/2007 as has been revised into Regulation of the Minister of Research, Technology and Higher Education Number 01 of 2018 concerning the Coordination, Supervision, and Sanctions Team for the Implementation of Research and Development Activities by Foreign University, Foreign Research and Development Institute, Foreign Business Entity and Foreigner [15, 16]; 3) Regulation of the Minister of Research, Technology and Higher Education Number 14 of 2017 concerning List of Unrecommended Activities and Objects of Foreign Research Permit [17]. In addition, the following three Director-General Decrees were promulgated: 1) Decree of the Director-General of Strengthening Research and Development, Ministry of Research, Technology, and Higher Education Number 34/E/KPT/2019 concerning Amendments to the Decree of the Director-General of Strengthening Research and Development, Ministry of Research, Technology and Higher Education Number 52/E/KPT/2016 concerning Public Service Standards at the Directorate General of Research and Development Strengthening, Ministry of Research, Technology, and Higher Education [18]; 2) Decree of the Director-General of Strengthening Research and Development, KEMENRISTEKDIKTI Number 32/E/KPT/2018 concerning Guidelines for Assessment of Foreign Research Permit Proposals [19]; and 3) Decree of the Director-General of Strengthening Research and Development, Ministry of Research, Technology and Higher Education Number 37/E/KPT/2019 concerning Guidelines for Monitoring and Evaluation of the Implementation of Permit and Foreign Research Results.

Based on Law Number 18 of 2002 and Government Regulation Number 41 of 2006, the policy of foreign research permit and international research collaboration is implemented with two approaches at once. The first approach is the scientific approach, while the second is the security approach [8, 9]. This is reflected in the formation of the TKPIPA (Coordination Team for Foreign Research Permits) as an ad hoc committee that helps provide decision recommendations on applications for foreign research permits to the Minister of Research and Technology. TKPIPA membership also very clearly reflects both approaches. TKPIPA membership consists of two major groups, namely members

from the Ministry and Governmental Institution groups whose duties and functions are in the field of research and development. They are functional researchers from LIPI, BPPT, LAPAN, BATAN, National Institute of Health Research & Development, Ministry of Health, Agency of Agriculture Research & Development, Ministry of Agriculture, Agency of Environment and Forestry Research & Development, Ministry of Environment and Forestry, Agency of Marine and Fisheries Research & Development, Ministry of Marine and Fisheries, and Eijkman Institute of Molecular Biology. The second group is officials from Ministries and Government Institutions who have duties and functions in the field of coordination and surveillance on the activities of foreigners, such as the National Intelligence Agency, Strategic Intelligence Agency, TNI, Directorate of Diplomatic Security, the Ministry of Foreign Affairs, Directorate of National Awareness, Ministry of Home Affairs, Directorate of Defense Areas of the Ministry of Defense, National Police, and Directorate General of Immigration.

The policy of foreign research permit by implementing two approaches is aimed at ensuring that the benefits obtained in international research collaboration with foreign researchers from various countries still take into account the calculation of risks and aspects of losses that can be caused. Potential risks and losses that can arise from international research collaboration include theft of artifacts and cultural heritage objects, theft of Genetic Resources and Natural Resources through smuggling and illegal trade of wild plants and animals (biopiracy), theft of Intellectual Property Rights through sample delivery which is not equipped by a Material Transfer Agreement or through a Research Collaborative Agreement document that is detrimental to the Indonesian side in international research collaborations. Although Law Number 18 of 2002 and Government Regulation Number 41 of 2006 considers it important to maintain and protect Genetic Resources, Natural Resources, Socio-cultural Diversity including traditional knowledge, traditional medicine (traditional healing), and Ethnobotany [8], the Material Transfer Agreement has not been regulated explicitly and clearly.

In international research collaborations, the protection of new plant varieties and Genetic Resources is regulated in Law Number 4 of 2006 concerning the Ratification of the International Treaty on Plant Genetic Resources for Food and Agriculture [20]; Law Number 5 of 1994 concerning the Ratification of the United Nations Convention on Biological Diversity [21]; Law Number 21 of 2004 concerning Ratification of the Cartagena Protocol on Biosafety to the Convention on Biological Diversity [22]; Law Number 11 of 2013 concerning Ratification of the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefit Arising from their Utilization to

the Convention on Biological Diversity from the use of its use against the Convention on Biological Diversity [23].

As a maritime country, the Government of Indonesia is aware of the importance of protecting the diversity of marine natural resources and the security of marine areas including the Exclusive Economic Zone (EEZ) so that the Government of the Republic of Indonesia has ratified the United Nations Convention on the Law of the Sea into Law Number 17 of 1985 concerning Ratification of United Nations Convention on the Law of the Sea as the basis for implementing international research collaborations in the field of marine scientific research [24].

Potential losses can also be in the form of negative campaigns or black campaigns against policy issues of the Government of the Republic of Indonesia carried out by groups of foreign Non-Governmental Organizations (NGOs) that utilize data and information on research results about Indonesia. Sensitive issues that are often targeted include environmental issues such as land conversion, oil palm plantation issues, issues of carbon release or exhaust emissions, and security issues in research areas, for example in the remote areas of Papua. The foreign research permit policy is very concerned about the negative impact of these blowing up sensitive issues. In outline, this policy is contained in Minister Regulation of Research, Technology and Higher Education Number 14 of 2017 concerning the List of Unrecommended Activities and Objects of Foreign Research Permit [17] and the Decree of the Director-General of Strengthening Research and Development, Number 32/E/KPT/2018 concerning Guidelines for Assessment of Foreign Research Permit Proposals [19].

Since 2019, international research collaboration and foreign research permit policies in Indonesia have been based on Law Number 11 of 2019 concerning the National System of Science and Technology. Law Number 11 of 2019 has laid a solid foundation and views the importance and strategic development of national science and technology through international science and technology cooperation. The law requires every national science and technology institution that conducts partnerships to develop an international science and technology network with the obligation to carry out technology transfer and be guided by a non-alignment foreign policy [1].

Law Number 11 of 2019 also regulates several obligations that must be carried out by every foreign science and technology institution that conducts research collaboration with national R&D institutions, including: 1) producing outputs that benefit the Indonesian nation; 2) involving Indonesian science and technology human resources with equivalent scientific capacity as working partners; 3) include the names of Indonesian science and technology human resources in each output produced in joint activities; 4) carry

out technology transfer; 5) submit primary data on research, development, assessment, and application activities; 6) provide proportional profit sharing in accordance with the agreement of the interested parties; and 7) make a written material transfer agreement in the context of transferring material in physical and/or digital form [1]. The mandate is a very strategic policy of international science and technology cooperation in order to encourage the performance of the intellectual property, especially scientific publications and patents, and to realize equal partnerships in international research partnerships with the principles of mutual respect, mutual trust, and benefit-sharing [1].

Law Number 11 of 2019 has shifted the very fundamental policy of foreign research permit and international research collaboration. If Law Number 18 of 2002 and Government Regulation Number 41 of 2006 use a scientific approach and a relatively balanced security approach, the foreign research permit policy and international research collaboration shift towards a scientific approach and put more emphasis on the legal protection of Natural Resources and the potential for Intellectual Property Rights that will be generated in international research partnerships.

2. METHOD

Qualitative method was chosen as research base accentuate inductive approach by emphasizing the use of words rather than quantification in the process of data collection and analysis. As data collection methods, observation, interview, and documentation are conducted to fulfill the research objectives. The interview questionnaires are structurally made to fulfill the research purpose. Data analysis consists of data reduction, data presentation, and conclusion drawing/verification.

The data collection technic used in collecting data of joint scientific publications as the main research outcome is as follows: 1) tracking scientific publications through the Curriculum Vitae of foreign researchers and Indonesian partners; 2) Field Trip Monitoring & Evaluation, through visits to various research locations; 3) Tracking Joint Publications from leading sources such as Scopus, Google Scholar and DOAJ; 4) Focused Group Discussion with foreign researchers and local counterparts. The collection of scientific publication data and several indicators of strengthening the capacity building of partner institutions has been carried out in the 2016–2020 period. Primary data have been collected by interviews with selected key resource persons

Some parameters and indicators have been defined to measure research outcomes and benefits obtained in international research partnerships such as increasing the competence of human resources in science and technology, increasing institutional

capacity, obtaining intellectual property rights, and international science and technology networks as the main parameters. There are several indicators of outcomes and benefits achievement are measured by the parameters of increasing Human Resources competencies, namely the number of training, scholarships, research grants, and fellowships. Furthermore, the number of publications, is indicators measured by the parameters of intellectual property performance. The number of grants for laboratory equipment and research infrastructure is an indicator measured by the parameter of increasing institutional capacity, while the parameters of international science and technology networks are measured by achievement indicators such as increasing the number of participation in international seminars/conferences, increasing international staff and student exchanges, increasing the number of visiting fellows, increasing the number of research consortium, as well as increasing the number of reviewers for international journals, proceedings, and book chapters.

3. RESULTS AND DISCUSSION

3.1. Inefficiency of Multi Stakeholders Permit

A serious obstacle in conducting international research partnerships in Indonesia is permitting. There are five multi-sectoral permits that must be met if a foreign researcher will be conducting research after obtaining a research permit from the Ministry of Research and Technology and a Limited Stay Visa C315 from the Directorate General of Immigration, namely: 1) ITAS (Limited Stay Permit) from the Immigration Office; 2) SIMAKSI (Conservation Area Entry Permit) for foreign researchers who will conduct research in conservation areas such as national parks, wildlife sanctuaries or nature reserves; 3) Permit to take and transport/send samples of wild plants and animals from one area to another in the country known as Permit for Transport of Plants and Animals Domestically (SATSDN) and Permit for Transport of Wild Plants and Animals Abroad (SATSLN) issued by the Director-General of Natural Resources and Ecosystem Conservation of the Ministry of Environment and. SATDN and SATLN will be issued by the Directorate General of KSDAE KLHK after obtaining scientific recommendations from (Indonesian Institute of Sciences (LIPI); 4) Security Clearance & Security Officer is required for foreign researchers who will conduct research in the territorial sea and EEZ [25].

In addition to these permits, there is also an obligation to report through the mechanism for Traveling Permit (SKJ) issued by the Intelligence and Security Agency of

the Indonesian National Police (BAINTELMAN POLRI) and reporting mechanisms for foreigners through the issuance of Research Notification Letters (SPP) by the Directorate of National Awareness of the Ministry of Home Affairs [25]. Even the reporting mechanism in the context of foreigners' surveillance who will carry out this research continues to the National Unity and Political Agency (KESBANGPOL) both at the provincial and district/city levels although surveillance has also been carried out by the immigration office through the issuance of a Limited Stay Permit. Although the foreign research permit service at the Ministry of Research and Technology is relatively fast, which is 9 days for the proposal review process research permit approval and one hour for the issuance of a Research Permit (SIP), however, permitting services in various ministries and Institutions mentioned above still need about 2–4 weeks. Even for the issuance of SATLN it still takes a much longer time.

3.2. Research Permit, Outcomes, and Benefits

Based on the evaluation report of the Directorate of Intellectual Property Management, Ministry of Research and Technology/National Research and Innovation Agency conducted for the 2015–2020 period, in general, it shows that the productivity of scientific publications and institutional capacity building (capacity building) of Indonesian R&D institutions and universities that act as Indonesian counterparts in international research collaborations is still relatively low. The evaluation aims to measure the positive impact of granting foreign research permits by using several methodologies, parameters, and indicators.

3.3. Scientific Publication

Based on data from the Ministry of Research and Technology in the period 2010–2020, there are 2,192 co-authorships produced in research collaborations between foreign researchers and Indonesian counterparts. The publications have been published in various international scientific journals, book chapters, and proceedings. If we compare the number of international research partnerships (by using research permits as partnership indicator), we can conclude that the number of scientific publications produced by foreign researchers and Indonesian partners is still very low. Joint scientific publications as a result of collaborative research between foreign researchers and Indonesian researchers (Indonesian authors without co-authorship with foreign researchers or joint publications with foreign researchers) are 1,221 publications. The

number is only 50% of the total number of publications resulted. However, if we compare the number of international research partnerships and the number of Research Permits issued by the Ministry of Research and Technology/National Research and Innovation Agency (KEMRISTEK/BRIN), in general, the performance of international scientific publications, especially co-authorships between Indonesian researchers partnering with foreign researchers is still very low. Based on data from the Ministry of Research and Technology/BRIN for the period 2010–2020, 5,439 Research Permits have been issued, while the number of publications produced by foreign researchers who have received Research Permits is 2,192 but the number of scientific publications with Indonesia counterparts are only 1,221 publications that include the names of the authors of Mitra Kerja Indonesia. The number of publications includes both first authors and co-authors [9, 10].

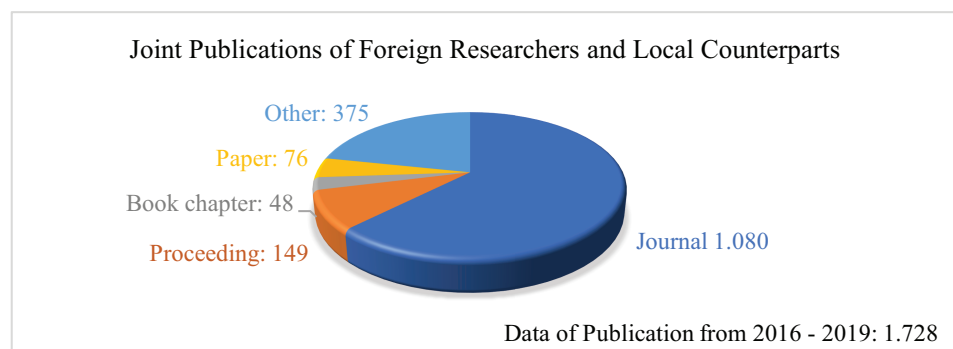


Figure 2: Types of Publication Papers Produced in The Indonesian Research Partnership [9].

TOP 30 FIRST AUTHORS

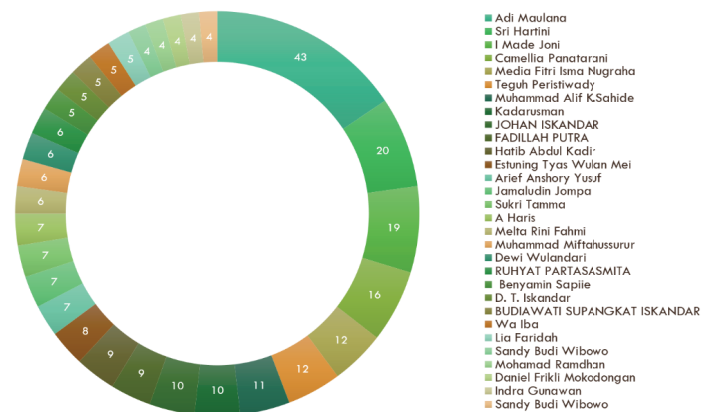


Figure 3: Top 30 Indonesian First Authors [10].

The benefits achieved by the Indonesian Partners in international research collaborations are still not optimal. Nevertheless, the productivity of scientific publications produced through a research consortium involving many research institutions

TOP 30 CO-AUTHORS



Figure 4: Top 30 Indonesian Co-authors [10].

TABLE 4: Top Ten Indonesian Counterpart First Authors by Institution 2020 [10].

Ranking	Indonesian R&D Institution	First Author Publications
1	LIPI	143
2	BPPT	81
3	Universitas Hasanuddin	64
4	Universitas Riau	41
5	KESDM	38
6	ITB	35
7	Akademi Perikanan Sorong	27
8	KKP	22
9	Universitas Nasional	21
10	Universitas Papua	20

TABLE 5: Top Ten Foreign Research Partners' First Authors [10].

Ranking	Foreign R&D Partner Institution	First Author Publications
1	JAMSTEC	65
2	IRD	63
3	Hokkaido University	42
4	Kyoto University	30
5	University of California	30
6	First Institute of Oceanography (FIO)	23
7	Boston University	13
8	The University of Tokyo	11
9	University of Essex	11
10	University of Bremen	10

and Indonesian universities with professional research management has proven to be successful in increasing the productivity of scientific publications very significantly.

TABLE 6: Comparison of Publication & Research Permit 2010 – 2020 [10].

Research Institution	Publications	Research Permit
LPT UNAIR	56	31
UGM	66	305
Balitbang ESDM	7	84
Badan Geologi ESDM	91	122
UNJA	104	101
UNTAD	10	71
IPB	318	514
ITB	116	181
LIPI	299	816
UNSYIAH	15	80
FKH UNUD	10	49
UNAS	45	182
ARKENAS	191	87
UI	141	242
UNRI	21	76
UNDIP	15	23
UPR	52	190

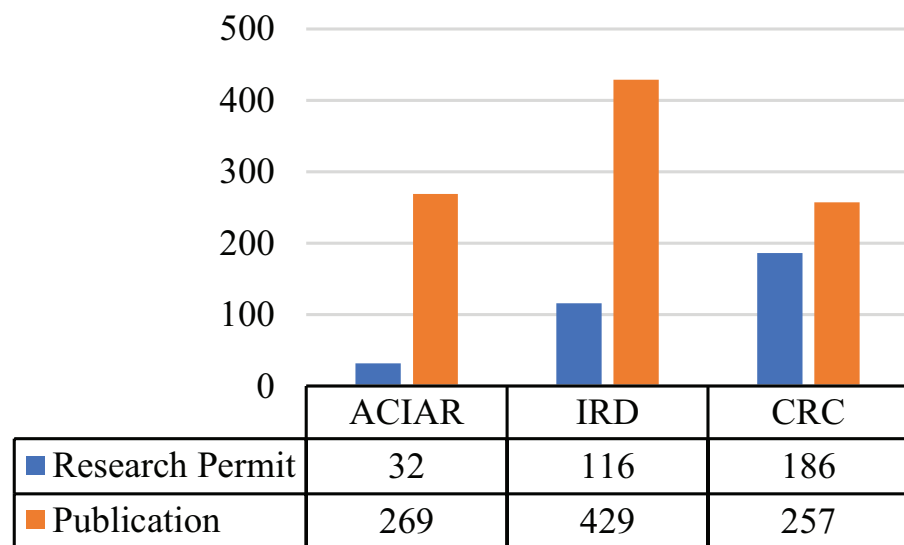


Figure 5: Comparison of Research Permit & Publications of Top 3 Consortia 2020 [10].

This has been proven by three international research consortia, namely ACIAR (Australian Center for International Agricultural Research), IRD (Institut de Recherche pour le Développement) France, and the Collaboration Research Center (CRC DFG 990) funded by DFG Germany.

3.4. Building Capacity for Indonesian Counterparts

Based on the parameters and indicators that have been set, the benefits obtained from international research collaboration can be calculated for institutional capacity building. Based on data collected from the Ministry of Research and Technology/BRIN 2020, institutional capacity strengthening achieved by several Indonesian partner institutions are research funds, training facilities, and scholarships for graduate and postgraduate programs.

TABLE 7: Top Ten Research Funding by Country 2017 – 2020 (USD) [10].

Rank	Country	2020	2019	2018	2017
1	Germany	722.639.264	53.143.764,00	2.186.479,00	2.266.964,00
2	Japan	31.801.893	27.385.895,83	7.665.584,00	5.919.835,00
3	USA	26.206.051	20.352.892,47	8.550.182,00	8.738.107,00
4	Australia	22.562.451	18.333.846,33	6.816.582,00	5.273.008,67
5	UK	2.154.047.742	5.723.775,71	3.844.932,00	2.556.548,00
6	Russia	7.479.704	7.479.704,00	0,00	0,00
7	China	6.230.993	0,00	3.751.085,00	2.510.468,00
8	France	0,00	0,00	4.896.518,00	1.156.029,00
9	Switzerland	50.000.000	6.000.000,00	0,00	0,00
10	Canada	852.282.500	4.012.500,00	0,00	0,00

TABLE 8: Research Funding by Country 2019 [10].

Ranking	Country	Research Funding (US\$)
1	Germany	53.143.764,00
2	Japan	27.385.895,83
3	United States	20.352.892,47
4	Australia	18.333.846,33
5	Russia	7.479.704,00
6	Switzerland	6.000.000,00
7	England	5.723.775,71
8	Canada	4.012.500,00
9	South Korea	2.264.050,00
10	Netherlands	1.263.280,00

3.5. Indonesian Missing Link

The low performance of scientific publications produced by Indonesian researchers as working partners of foreign researchers has a correlation with the low national budgets allocated for Research and Development (R&D) institutions and universities. Indonesian

TABLE 9: Top Ten Research Funding by Field of Studies 2019 [9, 10].

Ranking	Field of Studies	Research Funding (USD)
1	Biology	65.301.659,00
2	Fisheries	16.065.904,00
3	Public Health	15.933.151,00
4	Social economic	9.111.003,00
5	Agriculture	8.980.982,00
6	Oceanography	6.433.247,14
7	Ecology	5.570.473,79
8	Aquaculture	4.000.000,00
9	Anthropology	3.730.026,66
10	Archaeology	3.021.116,17

TABLE 10: Research Outcomes and Benefits for Indonesian Counterparts [9, 10].

	Research Consortium	Joint Publication	Human Resources Capacity Building	Institutional Capacity Building
1.	France institutions (2009-2019) IRD (MNHN, Univ. Montpellier, Univ. Paul Sabatier Toulouse, CENOTE, IPGP, OPGP, Univ. Clermont-Ferrand, Univ. Otago (NZ), Univ. Grenoble, MfN, CIRAD, INGV Palermo, CNRS Indonesian Institutions BRSDM-KP, PVMBG, LIPI Biologi, LIPI Oseanografi, Arkenas, Polinela, IPB, ITB, UGM, UNUD, Poltek Sorong, Kabupaten Kaimana, Unpatti, Unhas, Unja, Univ. Riau, Univ. Syiah Kuala, Univ. Lambung Mangkurat, Univ. Tanjungpura, UN Padang Field of studies Biodiversity, Aquaculture, Archeology, Volcanology, Oceanography	429 papers	16 Ph.D. 26 Master 53 Non-degree	Infrastructure: € 114.000 Equipment: € 277.800 Research funding: \$ 5.700.000
	Australian institutions (2015-2021) ACIAR (Australia Center for International Agricultural Research) Indonesian institutions Balitbangtan Kementan, Badan Riset Kelautan Perikanan KKP, Balitbang Inovasi KLHK, IPB, UGM, UNRAM, UPR, UNHAS, UNILA, UB, ULM, UNSYIAH Field of studies Agriculture, Fisheries, Forestry (14 Research Projects)	Publications: 269 (233 Indonesian Co-authorship)	43 Ph.D. 26 Master 27 (John Dillon Fellowship JDF - 4-6 weeks; Leadership and Research Management Training since 2003-2019); 43 Workshops with 10.554 Participants in 2015 – 2020	Research funding: AUD\$ 26.609.932

partners in carrying out international research partnerships so far still rely more on contributions in the form of Indonesian natural laboratories such as tropical rain forests, the

territorial sea and the Exclusive Economic Zone (EEZ), various types of tropical disease outbreaks, natural disasters such as volcanic eruptions, earthquakes, liquefaction and tsunami, global phenomena of climate change as well as global warming and socio-cultural life.

Indonesian partner institutions still rely on the contribution of natural resources as primary data (in-kind contribution). On the other hand, their foreign research partners, mostly from R&D institutions and universities in developed countries such as the United States, Japan, and European Union countries that are more proficient in high technology, are equipped with very adequate research equipment and financed with research funds (in-cash contribution) is very large. Based on data from the Ministry of Research, Technology and Higher Education in 2019, as many as 557 foreign researchers from various countries in 2017 brought research funds and contributed IDR 443,533,347,594.67; in 2018, 521 foreign researchers contributed IDR 623,448,631,646.16; and in 2019 as many as 554 foreign researchers contributed IDR 2,169,523.256.51 [9, 10, 26].

How much is the assistance fund as a financial contribution (in-cash contribution) provided by the Indonesian government for researchers who have research partnerships with foreign researchers? The amount of matching funds provided from the National Budget through the Ministry of Research, Technology, and Higher Education is still very small. Budget allocation for matching funds is IDR 460.920.000 in 2017 [27]; IDR 663,000,000 in 2018 [28]; IDR 1,000,000,000 in 2019 [29]; and IDR 683,198,000 in 2020 [30].

In 2015, an Indonesian researcher from a leading national R&D institution who became a collaborator of two Japanese researchers complained that two foreign research partners had left before they paid for his transportation, accommodation, and daily allowance for 30 days of fieldwork in East Kalimantan. It seems that it has become a tradition that almost all joint fieldwork costs for Indonesian researchers who collaborate with foreign researchers are financed by foreign research and development institutions or universities. Almost all Indonesian partner institutions that have signed research cooperation agreements (Memorandum of Understanding) which were then followed by the signing of the Implementing Arrangement for Long-term Cooperation (multiyear) with various foreign R&D institutions, have never or seldom allocate matching funds for their researchers.

Limited assistance funds allocated by Ministry of Research, Technology, and Higher Education in 2017, 2018, and 2019 were very in demanded by Indonesian counterparts. They said that the funds were very helpful for conducting joint fieldwork. On other side,

one of Germany research partners was very welcome to the funds allocation for his local partners.

International research cooperation Policy which is not implemented seriously and synergized with budget policies has impacted on low participation in joint fieldwork of Indonesian researchers who conduct research partnerships with foreign researchers. In fact, the joint. They said that the funds fieldwork phase is a very important stage in research collaboration and the research phase which will determine the quality of the output to be produced. The field research stage is the process of collecting and collecting primary data and is an opportunity for mentoring and transfer of knowledge for the application of scientific methodologies. This stage is also the process of supervising material transfer activities such as samples or research specimens taken in the field and sent to other areas and abroad which must be equipped by a Material Transfer Agreement.

Implementing research collaborations are also exacerbated when field research also demands not only the total dedication of a researcher who has to stay for months in the field but also requires modern and expensive research equipment, such as observing wildlife in the forest which requires hundreds of camera traps that must be monitored at all times or marine scientific research that must use research vessels with very expensive operational costs. Due to research budget constrain, the procurement of modern research equipment is also very limited. Even a leading R&D institution like LIPI, which owns the Baruna Jaya VIII Research Vessel, is only able to conduct marine scientific research within several days if it only relies on research budgets sourced from the national budget. Therefore, research collaboration is absolutely needed by Indonesia since the limited research budget.

The problem faced by national R&D institutions in international research collaborations is also exacerbated by the low laboratory capacity of most Indonesian R&D institutions. This is proven by the fact that there are still many research samples sent or taken abroad to be analyzed and tested in certified laboratories. Material testing is not only faster and cheaper in the foreign researchers' home country, it also guarantees the validity of the data generated from sample analysis because the laboratory has been internationally certified so that the manuscripts of scientific publications produced can also be accepted by publishers of international scientific journals for publication.

The limited training and scientific publications facilities that can be accessed by researchers working with foreign researchers are also another obstacle that causes the low performance of international scientific publications produced. This can be seen from the budget of the Ministry of Research and Technology/BRIN in 2021 which is

allocated to facilitate scientific publications such as scientific articles with a target of 120 products of IDR 2,524,593,000 and access to a scientific publication database with a target of 24,000 Access of IDR 3,765,989,000. The budget in the same year allocated by the Ministry of Education and Culture for Higher Education Scientific Journals with a target of 320 institutions is amounting to IDR 4,750,000,000. Higher Education Scientific Articles with a target of 1,250 Products is amounting to IDR 4,750,000,000. Access to Scientific Publication Database with a target of 1,400,000 Access is amounting to IDR 5.250,000,000. The limited budget for the facilitation of scientific publications has also caused the relatively low skill in writing international scientific publications. This directly also causes the low productivity of joint scientific publications (co-authorship) with foreign researchers. Data sourced from SCOPUS proves that the performance of scientific publications of Indonesian authors' journal articles at the ASEAN (Association of Southeast Asian Nations) countries level is still below Malaysia even though the number of S&T human resources and the number of R&D institutions and universities in Indonesia is far higher than Malaysia.

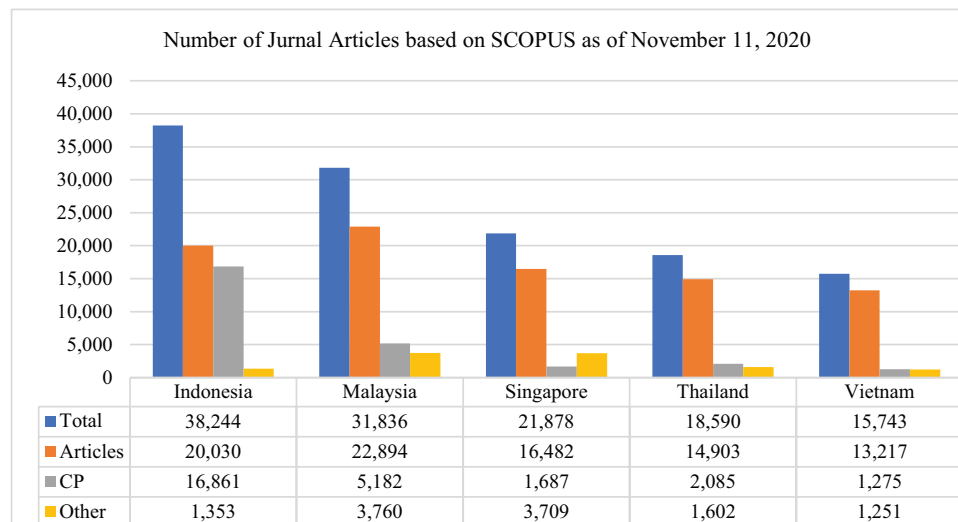


Figure 6: Total Aggregate of Scientific Publication of 5 ASEAN.

Problem complications faced by Indonesian counterparts have in the end contributed to the low bargaining position in dealing with foreign research partners to fight for fair and equitable benefits sharing because the Indonesian researchers' contribution and participation in the research collaboration are very limited.

Lack of management skills in international research collaboration is the root of the problems faced by almost of Indonesian partner institutions. Many Research Cooperation Agreements signed by R&D national institutions and universities with foreign partners are not supported by a high commitment, for example by allocating a special

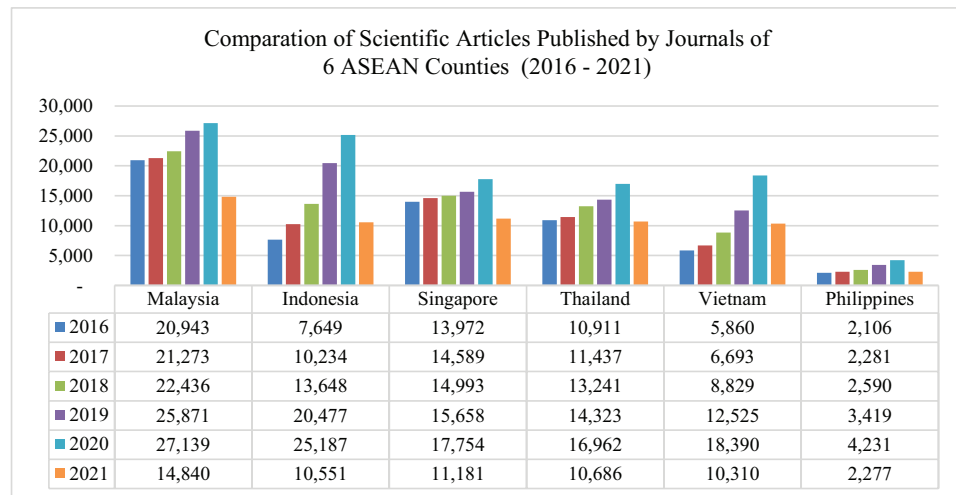


Figure 7: Scientific Articles published by Journals of 6 ASEAN Countries Source: SCOPUS.

budget for field research and sample analysis costs. Often, partner institutions that have signed multi-year Cooperation Agreements do not prepare a road map and exit strategy after the Cooperation project ends and the joint research facilitation is stopped by its international partners.

3.6. The Best Practice for Indonesian Counterparts

Collaboration Research Center (CRC DFG), a bilateral University to University Research consortium funded by Germany Research Foundation (DFG) is one of the best international research partnerships in Indonesia that the partnership has already been existing for 20 years, able to achieve optimal benefit-sharing such as co-authorship, co-supervision, mobility of student and staff, and strengthening Indonesian scientists and institutional capacity building.

Management skill advantage of Research collaboration has been proven by a research consortium conducted by George August Universitat Goettingen Germany with 3 Indonesian state universities Institut Pertanian Bogor (IPB), Universitas Tadulako (UNTAD), and Universitas Jambi (UNJA) in the STORMA and EFFORT research projects that have carved success story with the achievement of the output and outcome. CRC 990 EFFORTS funded by DFG has achieved the following very significant outputs and outcomes:

1. Based on CRC data (2012-2019), the number of Research Permits received from the Ministry of Research and Technology is 186, resulted in 257 international scientific publications (78% peer-reviewed);

2. The number of interdisciplinary publications is 58;
3. The number of papers involves Indonesian counterparts is 80%;
4. The number of Indonesian researchers as the first author are 34 publications;
5. 94 lectures, 28 laboratory trainings, 24 workshops in Indonesia;
6. Policy brief, cartoon book;
7. Dissemination, training of farmers and the local community;
8. Identification key (free download).

The key management advantages of the CRC research consortium are as follows:

1. The highest management is held by the Speaker (team leader) and Deputy Speaker (deputy team leader);
2. The Indonesian side formed a consortium where UNJA, IPB, and UNTAD resonated in one consortium (University Consortium for CRC 990-EFForTS) and IPB as the Chair while the accompanying Speaker from Goettingen was the Vice-Rector III IPB;
3. Joint Management Board (JMB) consists of representatives from IPB, UNJA, UNTAD, and Goettingen (3 people each per university);
4. Coordinators are assigned to each member of the consortium (one in Goettingen, one in IPB, one in UNJA), and one supervisor for the coordinators;
5. The task of JMB is to ensure that the management standards are implemented properly by the coordinators. JMB holds meetings and decides on various matters; examples of deciding financial management standards, managing access to benefit sharing, discussing publications, data management, and so on;
6. The task emphasis of the coordinator at IPB is on finance, while at UNJA is more on technical arrangements for field activities and administration of permits and so on;
7. Coordinator duties in Goettingen take care of the interests of Goettingen, and together with the Indonesian coordinator complete various administration and reporting.

CRC management implements the CRC 990-EFForTS publication policy as follows:

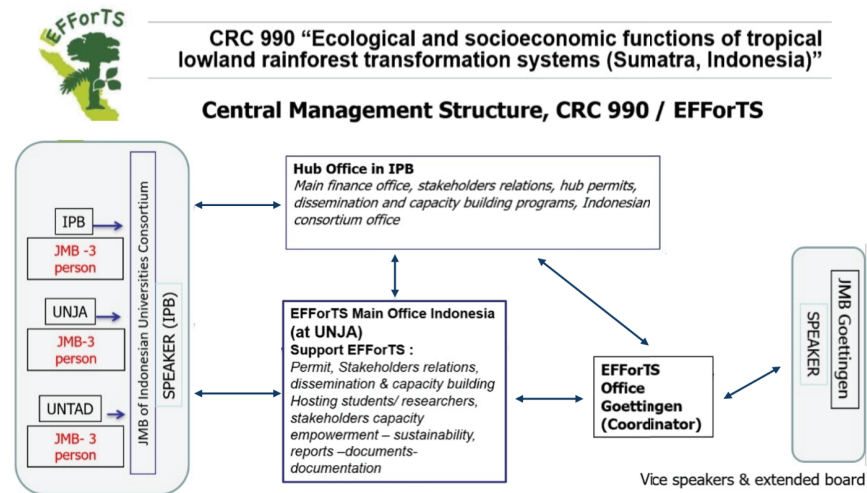


Figure 8: The Management Structure of Central CRC 990 Efforts.

1. Announcement of the abstract, the main author is circulated to researchers involved in the research project including potential main authors and co-authors who have been identified;
2. Interested scientists/researchers in co-publishing have the opportunity to contribute;
3. Interested scientists have the chance to contribute;
4. The final draft must be announced latest 3 weeks before submission;
5. All scientists/researchers have the opportunity to carefully check the content, used data, references, and acknowledgment;
6. In case of a dispute, the Publication Board mediates and may take decisions.

4. CONCLUSION

The nature of multi-sectoral foreign research permit authority has caused the permit services very complicated and difficult. It has been bureaucratic constraints for foreign researchers and Indonesian partners who intend to conduct international research partnerships in Indonesia. Permitting is a serious constraint that must be overcome by international research collaborators in Indonesia. To overcome this, the solution that can be offered is to collaborate between ministries and government agencies that have the authority related to foreign research permits and maximizing the use of Information Technology through the establishment of a virtual office & Online Single Submission

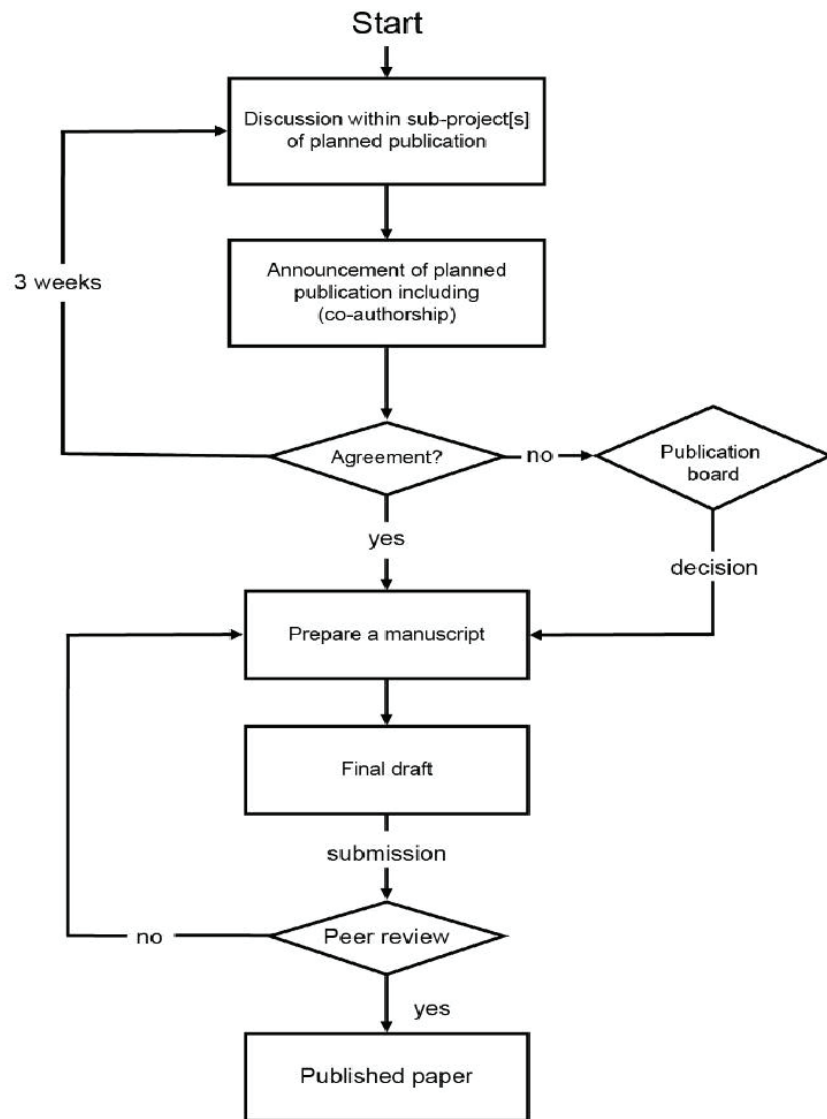


Figure 9: Flow Chart of CRC Publication Policy.

with the concept of Once Stop Service. Integrated Virtual Office will be able to speed up permitting services in five agencies (BRIN, National Police, Ministry of Home Affairs, Immigration Office, and Ministry of Environment & Forestry). The Integrated Virtual Office will reduce the permitting service process from 15 working days to be just one working day.

Appropriate policies and consistently implemented in international research collaborations will produce expected benefits, even though Indonesian partner institutions working with foreign researchers still have limited institutional capacity and a very low research budget. Strengthening the management of research collaboration is a very feasible and implementable policy alternative to overcome various constraints on institutional and budgetary capacities.

The solution to overcome the problem of Indonesian R&D institutional capacity, several alternative policy recommendations can be formulated and implemented so that Indonesian partners can achieve optimal benefits and outcomes with some measurable indicators. Some indicators include 1) increased productivity of Intellectual Property Rights, especially scientific publications and patents; 2) strengthening institutional capacity (capacity building) of partner institutions such as increasing the competence of S&T human resources through the provision of master's and doctoral scholarships and training facilities and 3) research grants and research equipment grants. Another benefit that is no less important is the transfer of technology. For increasing the advantages and benefits of the research collaboration, several alternatives or policy recommendations that can be selected are as follows:

1. Strengthening the management of partner institutions for international research collaboration;
2. Increasing research assistance funds (matching funds) for researchers who partner with foreign researchers;
3. Increasing laboratory capacity;
4. Improving training facilities for researchers;
5. Increasing the budget of the Partner Institution as an incentive if it reaches the set performance target;
6. Providing incentives and rewards to foreign researchers who comply with regulations and produce significant research outcomes.

The six alternative policies, if implemented simultaneously and comprehensively, are expected to overcome the complications of the problems faced by Indonesian partner institutions in conducting research collaborations with foreign R&D institutions. However, if the six alternative policies cannot be implemented simultaneously and comprehensively, then based on the scoring matrix analysis, the alternative policy in the form of strengthening management of Indonesian partner institutions is the most realistic and feasible policy alternative to be implemented based on the level of efficiency, effectiveness, and acceptability.

ACKNOWLEDGMENT

1) Aiyen Tjoa, CRC EFFORTS 990 Coordinator and Researcher of Faculty of Agriculture, Tadulako University; 2) Nadya Warih Nur Hidayah, Universitas Gadjah Mada; 3) Entin

Laelasari 4) Deden Sumirat Hidayat,; 5) Wahyu Widiarto; 6) Agustinus Hadi; 7) Meylisa Raharjeng; 8) Estin Diah Kristianti, 9) Satrianti Ekaputri, 10) Raden Dwi Artho, National Research and Innovation Agency.

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