

Country Name	Project for Development of Internationally Standardized Microbial Resource Center to Promote Life Science Research and Biotechnology
Republic of Indonesia	

I. Project Outline

Background	<p>Although Indonesia is composed of many islands and has the second largest biodiversity in the world, there was an increasing sense of danger against the situation where the valuable biodiversity had been diminishing due to the environmental destruction. Under such a situation, the Government of Indonesia included bioresource management in the national strategy. In the fiscal year of 2003, a building for botany and microbiology was newly constructed in the Research Center for Biology (RCB) of the Indonesian Institute of Sciences (LIPI) by the grant aid from Japan. In addition, JICA supported to facilitate utilization of the RCB facilities and to establish their collections through the technical cooperation project of “the Project on Improvement of Collection Management and Biodiversity Research Capacity of RCB, LIPI” (2007-2009). After that, there was a plan to establish a microbiological resource center in a facility for culture collection to be constructed by the LIPI’s budget. However, LIPI did not have a system for sustainable culture collection and use in non-habitat area.</p>				
Project Objectives	<p>Through development of microbial resource center (Indonesia Culture Center: InaCC) in LIPI, isolation and identification of new microbial resources originated from Indonesia, characterization of soil microorganisms, and isolation, identification and selection of animal gut microbiota for probiotics, the project aimed at establishment of the internationally standardized microbial resource center, thereby contributing to utilization of microbial resources at InaCC for sustainable economic development of Indonesia and improvement of quality of life.</p> <ol style="list-style-type: none"> 1. Envisaged Overall Goal: Microbial resources at InaCC are utilized for sustainable economic development of Indonesia and improvement of quality of life globally in compliance with Convention on Biological Diversity (CBD) 2. Project Purpose: Internationally standardized microbial resource center (InaCC) as a core of Biological Resource Center in Indonesia to promote life science research and biotechnology is established. 				
Project Activities	<ol style="list-style-type: none"> 1. Project Site: InaCC (Cibinong, Bogor) 2. Main Activities: 1) Developing the organizational structure of InaCC and preparing the post project management plan, 2) Conducting chemotaxonomy analysis, molecular identification and preservation methods for microorganisms belonging to fungi, yeasts, bacteria, archaea, bacteriophages and microalgae, 3) Conducting functional gene analysis of the isolated enriched cultures involved in denitrification, phosphate solubilization and methane oxidation, 4) Analyzing effects of mycorrhizal fungi to enhance the growth of trees, 5) Conducting molecular ecological study of chicken intestine and cattle, and so on.. 3. Inputs (to carry out above activities) <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> Japanese Side 1) Experts: 33 persons 2) Trainees received: 69 persons 3) Trainees in the third country: 23 persons (1 in Australia, 4 in China, 4 in Korea, 6 in Malaysia, 5 in Thailand, and 3 in Vietnam) 4) Equipment: Seamless mass spectrometer, clean bench, deep freezer and computers, etc. 5) Local operation cost: Costs for the project operation, travel expenses, costs for meetings, etc. </td> <td style="width: 50%; vertical-align: top;"> Indonesian Side 1) Staff allocated: 67 persons 2) Facilities and land: Office space for the Japanese experts, 3) Local operation cost: Construction cost of building of InaCC </td> </tr> </table> 			Japanese Side 1) Experts: 33 persons 2) Trainees received: 69 persons 3) Trainees in the third country: 23 persons (1 in Australia, 4 in China, 4 in Korea, 6 in Malaysia, 5 in Thailand, and 3 in Vietnam) 4) Equipment: Seamless mass spectrometer, clean bench, deep freezer and computers, etc. 5) Local operation cost: Costs for the project operation, travel expenses, costs for meetings, etc.	Indonesian Side 1) Staff allocated: 67 persons 2) Facilities and land: Office space for the Japanese experts, 3) Local operation cost: Construction cost of building of InaCC
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Project Period	Ex-ante: April 2011- March 2016 Actual: April 2011 – April 2016	Project Cost	Ex-ante: 404 million yen Actual: 339 million yen		
Implementing Agencies	Research Center for Biology, Indonesian Institute of Sciences (Lembaga Ilmu Pengetahuan Indonesia) (RCB-LIPI),				
Cooperation Agency in Japan	National Institute of Technology and Evaluation (NITE), The University of Tokyo, RIKEN				

II. Result of the Evaluation

1 Relevance

<Consistency with the Development Policy of Indonesia at the Time of Ex-Ante Evaluation >

The Project was consistent with Indonesia’s development policies such as “Biodiversity Action Plan of Indonesia (BAPI)” (1994-2029), “Indonesian Biodiversity Strategy and Action Plan” (2003-2030), Medium-term National Development Plan (RPJMN) (2010-2014) aiming at wise protection and conservation of biodiversity and enhancement of resources to support application of science and technology as well as local wisdoms for conservation and sustainable use.

<Consistency with the Development Needs of Indonesia at the Time of Ex-Ante Evaluation>

The Project was consistent with Indonesia’s development needs for establishing a system for sustainable culture collection and use in

¹ SATREPS: Science and Technology Research Partnership for Sustainable Development

non-habitat area for the InaCC in LIPI to promote sustainable use of microbial resources.

<Consistency with Japan’s ODA Policy at the Time of Ex-Ante Evaluation>

The Project was consistent with Japan’s ODA Policy for Indonesia, the “Country Assistance Program for the Republic of Indonesia” (2004) focusing on “Assistance for the creation to create a democratic and fair society” covering environmental preservation” as one of the priority cooperation areas.

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

<Status of Achievement of the Project Purpose at the time of Project Completion>

The Project Purpose was achieved at the time of project completion. 2,600 strains, which exceeded the target of 2,000, were deposited in the InaCC collection (Indicator 1). After the establishment of procedure for application, authorization and distribution and the development of system of distribution for the public collection, the numerical target, at least 100 strains were ready for distribution (Indicator 2). The data entry was in the process and the procedure and manuals for the quality management of InaCC were prepared in hard copy for the users of the database, including researchers (Indicator 3). The database of the microbial resources was available for external users (Indicator 4). Internal and external audits were conducted in December, 2014. As a result of both audits, no violation against ISO was found (Indicator 5).

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

The project effects have continued since project completion. The key research outputs of the SATREPS project have been utilized by the government research institutions, including the Ministry of Agriculture, the Ministry of Marine Affairs and Fisheries, the Agency for the Assessment and Application of Technology (BPPT), and LIPI, and the Universities, including IPB University, Gajah Mada University and Padjajaran University. Also, PT. Petrokimia Kayaku; PT. Sinar Mas; PT Great Giant Food have used them. Strain has been kept is categorized as bacteria; fungus; actinobacteria; khamir; micro algae; bacteriophage; and archaea. 6,000 isolates were listed in online catalogue and can be accessed freely. Research on description candidate of new species has been continued. New species is included in taxon: Khamir; bacteria; and actinobacteria. New candidate for probiotic has been obtained and currently is under development.

InaCC was inaugurated as Center for Priority Science and Technology by the Ministry of Research and Technology in 2018. It became an opportunity to make collaboration with other institution including research center as mentioned above. InaCC obtained 2 licenses from private sector and conducted 2 joint research projects with private sectors. The latest cooperation with international partner is with a Japanese private company.

In addition, some research institutions have been conducting research related to the SATREPS project. The Center for Sweet Plants and Viber (BALITTAS) of Ministry of Agriculture has been engaged in research to make pectinase enzyme, fiber enzyme, and renewable energy. The Center for Fruit Research of Ministry of Agriculture has been carrying out research to make hydrolysis enzyme for bioethanol. The Center for Tropical Fruit (BALITJESTRO) has been conducting research to make bio-stimulant and pest bio-control. The Center for Environment Quality Research and Development has been developing bio-remediation and environment quality control.

The key research equipment installed by the SATREPS project have been continuously utilized. While seamless mass spectrometer has been used and maintained by LIPI, clean bench has been used by universities and deep freezer has been used by other government research institutions.

<Status of Achievement for Envisaged Overall Goal at the time of Ex-post Evaluation>

The envisaged Overall Goal has been achieved at the time of ex-post evaluation. Microbial resources kept in InaCC have been used/utilized to support business activities related to fertilizer industry, animal feed, medicine; and for the scientific purposes including other research in taxonomy and bioprospecting (Indicator 1). Technologies, such as metagenomics, have been under development for economic and social purposes in InaCC based on the microbial resources. The technology has been blooming in the bioprocess industry. The driving force is the skill of InaCC researchers in new technologies.

For the utilization of the research outcomes by the SATREPS, InaCC has been announced as PUI (Center of Excellence in Science and Technology) in Indonesia. There are so many microorganisms that have been utilized by related stakeholders such as the Center for Viber Research; the Center for Fruit Research; BALITJESTRO; Ministry of Environment and Forestry and those microorganisms have also been utilized for identification services conducted by foreign private sector including Japan.

<Other Impacts at the time of Ex-Post Evaluation>

There are some positive impacts of the Project confirmed at the time of the ex-post evaluation. The researchers of InaCC, who are most female researchers, have gained more confidence and knowledge/skills on a par with other researchers from developed countries through the research activities with other international researchers under the SATREPS project. Also, they have been getting used to collaborating on the joint research work designed by the SATREPS project.

Scientific literacy has been enhanced by the Government of Indonesia by scholarship programs and international cooperation with Australia, Japan, Germany, and USA.

No negative impact by the SATREPS project was confirmed at the time of ex-post evaluation.

<Evaluation Result>

Therefore, both the effectiveness and impact of the project is high.

Achievement of Project Purpose

Aim	Indicators	Results	Source
(Project Purpose) Internationally standardized microbial resource center (InaCC)	(Indicator 1) At least 2,000 strains of valuable Indonesian microbial resources are	Achievement Status: Achieved (Continued) (Project Completion) ● 2,600 strains were deposited in InaCC collection by the time of project completion.	Terminal Evaluation Report JST Terminal Report Questionnaire

as a core of Biological Resource Center in Indonesia to promote life science research and biotechnology is established.	preserved in proper condition in microbial resource center (InaCC) in LIPI.	(Ex-Post Evaluation) ● Strain has been categorized as bacteria; fungus; actinobacteria; khamir; micro algae; bacteriophage; and archaea and they have been appropriately preserved.	Survey with InaCC InaCC website
	(Indicator 2) At least 100 strains are ready to be distributed to following the approved procedure of InaCC.	Achievement Status: Achieved (Continued) (Project Completion) ● The establishment of procedure for application, authorization and distribution was completed. ● The system of distribution was developed for the public collection. ● The numerical target, at least 100 strains was ready for distribution. (Ex-Post Evaluation) ● 6,000 isolates were listed in online catalogue and can be accessed freely.	
	(Indicator 3) The database of microbial resources is used for internal management of InaCC.	Achievement Status: Partially achieved (Not verified) (Project Completion) ● The data entry was in the process. ● Procedure and manuals for the quality management of InaCC were prepared in hard copy for the use by the researchers and technicians whenever necessary. (Ex-Post Evaluation) Information about the database was not available.	
	(Indicator 4) The database of microbial resources is made available and actually used for research and development by public.	Achievement Status: Achieved (Continued) (Project Completion) ● The database of the microbial resources was available for external users. (Ex-Post Evaluation) ● The online catalog is opened to the public on the website of InaCC. Distribution of the isolates can be requested through the e-service of LIPI.	
	(Indicator 5) The internal audit reports show the compliance of the management system to ISO9001.	Achievement Status: Achieved (Continued) (Project Completion) ● InaCC became ISO 9001:2008 certified before construction of the building for InaCC was completed. Internal and external audits were conducted in December 2014. As a result of both audits, no violation against ISO was found. (Ex-Post Evaluation) ● InaCC has sustained ISO9001:2008 certification.	
(Envisaged Overall Goal) Microbial resources at InaCC are utilized for sustainable economic development of Indonesia and improvement of quality of life globally in compliance with Convention on Biological Diversity (CBD)	(Indicator 1) Microbial resources are distributed for economic development and scientific purposes.	Achievement Status: Achieved (Ex-Post Evaluation) ● Microbial resources kept in InaCC have been distributed to support business activities related to fertilizer industry; animal feed; medicine. ● For the scientific purposes, the microbial resources have been used for other research in taxonomy and bioprospecting.	Questionnaire survey with InaCC
	(Indicator 2) Technologies are developed for economic and social development purposes based on the microbial resources at InaCC.	Achievement Status: Achieved (Ex-Post Evaluation) ● New technology which is recently developed in InaCC called metagenomics, and recent blooms in bioprocess industry.	

3 Efficiency

Although the project cost exceeded the plan (the ratio against the plan 119%) due to combined factors, the project period was as planned (the ratio against the plan: 100%). The project outputs were produced as planned.

Therefore, the efficiency of the project is fair.

4 Sustainability

<Policy Aspects>

The research activities related to the SATREPS project for sustainable use of microbial resources at InaCC have been backed up by the government policies. The National Priority Project (PRN) is the national program from Ministry of Research and Technology; and BAPPENAS and InaCC has been involved as coordinator in biodiversity sector. There were increasing in literacy which utilized the results of the SATREPS project for scholarship program called as LPDP (the scholarship program by Agency of Education Fund Management under Ministry of Finance).

<Institutional/Organizational Aspects>

There has been no change in the organizational setting to conduct the research for sustainable use of microbial resources at InaCC. For promoting utilization of microbial resource, the Center for Utilization and Innovation of Science and Technology of LIPI (PPII) has been establishing a network with the private sectors to utilize the technology, and also cooperating with foreign entities in microorganism

identification technology. The Department of PPII and the General Bureau are responsible to maintain facilities and renew or upgrade the tools/equipment for research purpose. PPII has conducted utilization management on anonline basis to ease the researchers to access.

<Technical Aspects>

Researchers have taken initiatives to take part in their own capacity and skill development in every research, for instance from isolation training and microbial cultivation and mushroom (for food) production. Also, they have been improving their skills and knowledge to increase the number of collections of microbial resources. Each research group/team is expected to make a scientific discussion in a journal club or webinar to obtain new information and knowledge in taxonomy, ecology, bioprospecting and research needs.

For proper maintenance of the research equipment installed by the SATREPS project, trainings on the current tools/equipment and learning have been delivered by LIPI to researchers.

<Financial Aspects>

Research funding comes from the Center for Priority Research and Technology, National Microbial Research (PUI) the (Research Innovation Development (LPDP), SATREPS, Japan Society for the Promotion of Science Fellowship (JSPS) and other sources of funding. Currently, InaCC has 12 on-going microbial application research projects. The Department of PPII and General Bureau are assigned to maintain the research facilities and to renew equipment. The program of “Competitiveness Research LPDP” can be another financial resource for the research activities.

<Evaluation Result>

In the light above, there has been no problem in any aspects. Therefore, the sustainability of the effects through the Project is high.

5 Summary of the Evaluation

The project was achieved the Project Purpose for the establishment of InaCC as a core of biological resource center in Indonesia and the Overall Goal for promoting sustainable use of microbial resources for socioeconomic development in the country. As for efficiency, the project cost exceeded the plan. Considering all of the above points, this project is evaluated to be highly satisfactory.

III. Recommendations & Lessons Learnt

Recommendations for Implementing Agency:

- InaCC has been providing good services and cooperation to many research institutes and private sector. It would be effectively appealed for the stakeholder of the both countries of Indonesia and Japan if LIPI could share bulletins of magazine about the cooperation and successful research in microbiology especially for those utilizing the equipment provided from the SATREPS project.

Lessons Learnt for JICA:

- The result of the evaluation showed that InaCC, the facility established by the SATREPS project has been well maintained and utilized not only by LIPI but also the private sector who cooperate with LIPI. In particular, the database and the online catalogue of the microbial resources preserved in InaCC have facilitated wide utilization of the research outputs by various stakeholders. Therefore, in case where the SATREPS project aims at basic research without highly confidential issues, a project component to establish a platform or a center enabling the external stakeholders to access may be effective to promote efforts for utilization of the project outcome.