

Country Name	<b>Enhancing the Competitiveness of Fresh and Semi Processed Agricultural Product Through the Application on Appropriate and Sustainable Packaging Technology</b>
Republic of the Philippines	

**I. Project Outline**

Background	<p>In the Philippines, agriculture was one of the predominant industries. Although having lower productivity than other sectors, agriculture accommodated 35% of the total workforce in 2009, and its production comprised 13% of gross domestic product (GDP) in 2011. One of the challenges faced by agriculture was post-harvest losses which resulted in damaging 5 to 48% for fruits and 16 to 40% for vegetables. The main reasons for post-harvest losses were the insufficient environment to maintain freshness in the process of selling and transporting as well as damages from shocks, shaking and pressure during transportation. To improve the situation, JICA implemented a technical cooperation project entitled “Improvement of Packaging Technology for Philippine Food Products in the Regions” (2005-2009) with the Packaging Technology Division (PTD) of the Department of Science and Technology (DOST) which aimed at providing technical guidance about the improvement of consumer packaging for small and medium enterprises in the field of food processing. However, some problems remained unresolved for the reduction of post-harvest losses. Therefore, it was necessary to develop appropriate transport packaging technologies and enhance the capacity of PTD of DOST to introduce and disseminate such technologies.</p>												
Objectives of the Project	<p>Through the development of transport packaging technologies and corresponding training module/manuals and through the implementation of technology transfer and dissemination activities, the project aimed at decreasing the post-harvest losses of eight (8) target commodities, thereby contributing to the development and introduction of appropriate transport packaging technologies for other fresh and semi-processed agricultural products.</p> <ol style="list-style-type: none"> <li>Overall Goal: Based on the know-how to develop the technology through the project, the appropriate transport packaging technologies are developed and introduced for other fresh and semi-processed agricultural products.</li> <li>Project Purpose: The post-harvest losses of eight (8) target commodities will be decreased through the introduction of appropriate transport packaging technology.</li> </ol>												
Activities of the Project	<ol style="list-style-type: none"> <li>Project Site: Benguet province in Cordillera Administrative Region, Tarlac province and Bataan province in Central Luzon Region and Davao city in Davao Region</li> <li>Main Activities: 1) Development of transport packaging technologies and corresponding training module/manuals, 2) Implementation of technology transfer and dissemination activities on the technology, etc.</li> <li>Inputs (to carry out above activities) <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Japanese Side</td> <td style="width: 50%;">Philippine Side</td> </tr> <tr> <td>1) Experts: 8 persons</td> <td>1. Staff Allocated: 38 persons</td> </tr> <tr> <td>2) Trainees Received in Japan: 11 persons</td> <td>2. Land and facilities: a project office in PTD of the DOST and facilities for installation of equipment</td> </tr> <tr> <td>3) Equipment: vacuum packaging machine, quick freezing machine, temperature-controlled chamber, etc.</td> <td>3. Local expenses: Operation and maintenance cost of the facilities and the equipment, etc.</td> </tr> <tr> <td>4) Local expenses: cost for project activities</td> <td></td> </tr> </table> </li> </ol>			Japanese Side	Philippine Side	1) Experts: 8 persons	1. Staff Allocated: 38 persons	2) Trainees Received in Japan: 11 persons	2. Land and facilities: a project office in PTD of the DOST and facilities for installation of equipment	3) Equipment: vacuum packaging machine, quick freezing machine, temperature-controlled chamber, etc.	3. Local expenses: Operation and maintenance cost of the facilities and the equipment, etc.	4) Local expenses: cost for project activities	
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Project Period	(ex-ante) March 2013 – March 2017 (actual) March 2013 – March 2017	Project Cost	(ex-ante) 263 million yen, (actual) 264 million yen										
Implementing Agency	The Packaging Technology Division (PTD) of the Department of Science and Technology (DOST)												
Cooperation Agency in Japan	UNICO INTERNATIONAL CORPORATION												

**II. Result of the Evaluation**

## &lt;Constraints on Evaluation&gt;

- Due to the COVID-19 pandemic, face-to-face meetings with former project counterparts and onsite-interviews with project beneficiaries could not be carried out. For this reason, it took longer time than usual to collect information and data necessary for this ex-post evaluation. Also, some of the collected information and data may have inferior quality.

## 1 Relevance

## &lt;Consistency with the Development Policy of the Philippines at the Time of Ex-Ante Evaluation &gt;

The project was consistent with the Philippines' development policies expressed through the “Philippine Development Plan” (2011-2016) which aimed at developing competitive and sustainable agriculture and fishery sectors. It was also consistent with the “PTD’s 3rd Roadmap” (2010-2015) that aimed at enhancing global competitiveness of products made in the country through the development of sustainable packaging technologies.

## &lt;Consistency with the Development Needs of the Philippines at the Time of Ex-Ante Evaluation &gt;

The project was consistent with the Philippines' development needs of developing appropriate transport packaging technologies and of enhancing the capacity of PTD of DOST to introduce and disseminate such technologies for the reduction of post-harvest losses.

## &lt;Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation&gt;

The project was consistent with the “Country Assistance Policy for the Republic of the Philippines” (2012) with “sustainable economic growth through the promotion of investment” set as one of its priority 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 partially achieved at the time of project completion. The project developed transport packaging technologies for 7 of the 8 target commodities, namely: durian, smoked fish, sweet potato, cut chrysanthemums, rose, broccoli, and cauliflower. Development of transport packaging technologies for mangosteen was not completed. In total, 21 transport packaging technologies were developed for 7 commodities, 18 of which were experimentally tested for the purpose of investigating their contributions to reductions in post-harvest losses. The result of the experiments showed that transport packaging technologies developed for -all the 7 commodities had reduced post-harvest losses. It should be noted that the project had developed and positively tested other non-transport packaging technologies, which focused on the extension of shelf life of the commodities including enhancement of marketability of products that may result in the reduction of post-harvest losses.

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

At the time of ex-post evaluation, 2 durian farmers were reported to have continuously used the transport packaging technologies developed at the least by the project, one of whom confirmed to have reduced post-harvest losses by 15 to 20%. Because of lack of post-harvest facilities, other transport packaging technologies were not used by intended beneficiaries. To address this issue, PTD-DOST developed and started implementing a project entitled “Upgrading the Capability of Existing Distribution Centers /Trading Posts in the Delivery of Fresh and Semi-Processed Vegetables in the Supply Chain: Focusing on Packaging Technology and Logistics” (2021-2023). PTD reported that they have been trying to promote and introduce the transport packaging technologies developed by the project through seminars and similar events, but due to lack of monitoring data, they could not ascertain if the participants practice the technologies after joining the seminars. Therefore, it can be inferred that at least two farmers are reported to adopt the developed transport packaging technologies and that there may be other technology users which were not taken into account in this report due to lack of monitoring data. In the implementation of PTD’s new project, monitoring for technology adoption and reduction of post-harvest losses are made regular activities for this project only.

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

The Overall Goal was achieved at the time of ex-post evaluation. After project completion, one transport packaging technology was developed respectively for four commodities (solo papaya, banana, okra, and leafy vegetable) by former project counterparts based on the knowledge and skills learned from the project. These technologies were introduced to farmers, local governments, and cooperatives. Moreover, 2 of the 4 technologies have seen reductions in post-harvest losses. For example, the transport packaging technology developed for solo papaya recorded a reduction of 23%. The knowledge and skills acquired from the project are continuously used by PTD staff in the conduct of packaging research, testing, and technology dissemination.

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

Two positive impacts were confirmed at the time of ex-post evaluation. The above-mentioned at least 2 durian farmers started exporting frozen durian products to Japan, China, and the United States in 2019 with their markets created through the product display exhibitions conducted by the project. Additionally, through the project, former project counterparts of PTD realized that there is a need for a testing laboratory for packaging technologies. This prompted PTD to prepare and submit a project proposal to DOST with the aim of establishing two laboratories for packaging technologies and expanding the pilot packaging plant owned by PTD. The proposal was approved in November 2016, and the implementation of the project, named “Upgrading and Enhancing the Capacity of PTD in Packaging Research and Innovation” (2016-2021), is ongoing at the time of ex-post evaluation.

<Evaluation Result>

With the Project Purpose partially achieved at project completion, but with the Overall Goal achieved and other positive impacts observed, the effectiveness/impact of the project is evaluated fair.

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results	Source		
(Project Purpose) The post-harvest losses of eight (8) target commodities will be decreased through the introduction of appropriate transport packaging technology.	Indicator: Reduction rate of post-harvest losses to be verified experimentally for the eight (8) target commodities.	Status of the Achievement: Partially Achieved (Not verified) (Project Completion)	Project Completion Report, Survey Questionnaire		
		<ul style="list-style-type: none"> <li>21 transport packaging technologies in total were developed by the project for 7 of 8 target commodities as shown in the table below.</li> <li>18 out of the above 21 technologies were tested to investigate if they could contribute to the reduction in post-harvest losses. As a result, all 7 target commodities saw reductions in their post-harvest losses.</li> </ul>			
		[Transport packaging technologies developed by the project]			
		Target commodity		No. of transport packaging technologies developed by the project	Reduction rate of post-harvest losses (Unit: %)
		1. Durian		4	20
		2. Smoked fish		3	8
		3. Sweet potato		4	100
		4. Cut chrysanthemums		3	21
		5. Rose		3	100
		6. Broccoli		2	20
7. Cauliflower	2	20			
8. Mangosteen	0	-			

		Total	21	-																
		<p>(Ex-post Evaluation)</p> <ul style="list-style-type: none"> <li>At least 2 durian farmers were confirmed to have been using the transport packaging technologies developed by the project at the time of ex-post evaluation. One of the durian farmers reported that the technologies reduced post-harvest losses by 15% to 20%.</li> </ul> <p>According to PTD, seminars and similar events are regularly held to promote and introduce the transport packaging technologies developed by the project. There may be other technology users from the participants of these seminars but PTD could not ascertain this because of lack of monitoring data. [No. of farmers/companies/“others” which received” introductions about the transport packaging technologies after project completion]</p> <table border="1"> <thead> <tr> <th>Target commodity</th> <th>No. of farmers/companies/others* which received introductions about the transport packaging technologies developed by the project during seminars and similar events conducted after project completion</th> </tr> </thead> <tbody> <tr> <td>Durian</td> <td>145 (farmers: 100, companies: 20, others: 25)</td> </tr> <tr> <td>Smoked fish</td> <td>100 (companies: 70, others: 30)</td> </tr> <tr> <td>Sweet potato</td> <td>200 (farmers: 72, companies: 4, others: 124)</td> </tr> <tr> <td>Cut chrysanthemums</td> <td>40 (farmers: 30, others: 10)</td> </tr> <tr> <td>Rose</td> <td>40 (farmers: 30, others: 10)</td> </tr> <tr> <td>Broccoli</td> <td>60 (farmers: 60)</td> </tr> <tr> <td>Cauliflower</td> <td>100 (farmers: 60, companies: 20, others: 20)</td> </tr> </tbody> </table> <p>Note: “others” means local government units, non-governmental organizations, and universities.</p> <ul style="list-style-type: none"> <li>According to the Project Completion Report, the project produced three different materials for target commodities, PTD however confirmed that the project had produced only one material titled “Technical Guideline for Packaging Development and Post-Harvest Practice Improvement of Fresh and Semi-Processed Agricultural Products”. PTD reported that they have been using the material as guideline and reference in conducting seminars, trainings, and workshops and in conducting packaging research and studies.</li> </ul>			Target commodity	No. of farmers/companies/others* which received introductions about the transport packaging technologies developed by the project during seminars and similar events conducted after project completion	Durian	145 (farmers: 100, companies: 20, others: 25)	Smoked fish	100 (companies: 70, others: 30)	Sweet potato	200 (farmers: 72, companies: 4, others: 124)	Cut chrysanthemums	40 (farmers: 30, others: 10)	Rose	40 (farmers: 30, others: 10)	Broccoli	60 (farmers: 60)	Cauliflower	100 (farmers: 60, companies: 20, others: 20)
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<p>(Overall Goal) Based on the know-how to develop the technology through the project, the appropriate transport packaging technologies are developed and introduced for other fresh and semi-processed agricultural products.</p>	<p>Indicator: Transport packaging developed at least for three (3) commodities aside from eight (8) target commodities covered by the project.</p>	<p>(Ex-post Evaluation) Achieved</p> <ul style="list-style-type: none"> <li>After project completion, one transport packaging technology was developed respectively for four commodities (solo papaya, banana, okra and leafy vegetable) by former project counterparts based on the knowledge and skills learned from the project and introduced to farmers, local governments, and cooperatives.</li> </ul>																		
<p>Source : Project Completion Report, interviews and questionnaires to PTD-DOST and beneficiaries including farmers</p>																				

### 3 Efficiency

The project cost and period were within the plan (ratio against the plan: 100%, respectively). All the outputs were produced as planned. Therefore, the efficiency of the project is high.

### 4 Sustainability

#### <Policy Aspect>

Although the “PTD’s 5th Road Map” (2020-2024) promotes packaging research, technology development, and application to fresh and semi-processed agricultural products, there is no specific policy that mandates the promotion and dissemination of the transport packaging technologies developed by the project, which is also the case for other technologies developed by PTD through other projects. On the other hand, the “DOST Intellectual Property” policy (2015) requires all developed and verified technologies supported by DOST to be patented for the purpose of intellectual property rights management and technology transfer. .

#### <Institutional/Organizational Aspect>

There has been no change in the institutional/organizational set up for the promotion and dissemination of the transport packaging technologies developed by the project. PTD, which operates under the Industrial Technology Development Institute (ITDI) of DOST, is the primary organization tasked responsible for conducting, testing, designing, training and disseminating of packaging research. PTD has 24 technical staff, 8 of whom were engaged in the project. According to PTD, the number of staff assigned for the continued promotion and dissemination of the transport packaging technologies developed by the project is sufficient. However, as described in the section of “Continuation Status of Project Effects at the time of Ex-post Evaluation”, monitoring for technology adoption and reduction of post-harvest losses are made regular activities in the implementation of PTD’s new project.

<Technical Aspect>

PTD staff have sustained the knowledge and skills necessary for the promotion and dissemination of the transport packaging technologies developed by the project. To keep the knowledge and skills updated, PTD sends their staff as participants or lecturers to packaging technology-related seminars or conferences conducted nationally or internationally. Additionally, PTD staff conducts presentations and lectures to staff of DOST regional offices to disseminate knowledge and skills on packaging technology development. Moreover, PTD staff joins national and international food exhibitions from time to time and conducts consultations to their clients (micro, small and medium enterprises).

<Financial Aspect>

PTD is a regular office under the ITDI of the DOST, so the budget for its activities, including the promotion and dissemination of the transport packaging technologies developed by the project, is regularly allocated from the budget of ITDI of DOST. Although the budget of ITDI for 2021 decreased by 22% compared to 2020, according to PTD, enough budget has been secured every year. This can be confirmed by the fact that PTD has sufficient number of staff and provides enough training opportunities to its staff as mentioned in the <Institutional/Organizational Aspect> and <Technical Aspect>. In addition, since 2017, PTD has received grants for 2 on-going projects, which amounts to 267 million Philippine pesos, from DOST. The healthy financial condition of PTD is expected to continue in the future.

Budget for ITDI of DOST

(Unit: 1,000 Philippine peso)

2017	2018	2019	2020	2021 (Plan)
763,245	552,969	529,981	540,332	421,074

<Evaluation Result>

There is no specific policy or guideline to promote and disseminate the transport packaging technologies developed by the project, but the institutional/organizational and technical aspects of the project are firmly established while the financial aspect is firmly secured. Therefore, the sustainability of the project is evaluated fair.

5 Summary of the Evaluation

The project partially achieved the Project Purpose which was aimed at decreasing the post-harvest losses of eight (8) target commodities through the introduction of appropriate transport packaging technologies, but fully achieved the Overall Goal that aimed to develop and introduce appropriate transport packaging technologies for at least three other fresh and semi-processed agricultural products by the enhancement of PTD’s capacity on packaging technology. As for sustainability, it was confirmed that there is no specific policy to back up the dissemination of the transport packaging technologies developed by the project; however, it can be considered that there are no problems in the institutional/organizational, technical, and financial aspects.

Considering all the above points, this project is evaluated to be satisfactory.

**III. Recommendations & Lessons Learned**

Recommendations for Implementing Agency:

- Research and development of appropriate transport packaging technologies for mangosteen have been continued by PTD even after project completion, but, because of COVID-19 pandemic, this has not been completed yet. It is, therefore, recommended that PTD continue those activities for mangosteen as well as other new commodities.
- After project completion, the transport packaging technologies developed by the project were tried to be introduced to various micro, small and medium enterprises through several seminars, forums, exhibitions, and other similar events. However, there was no monitoring data collected and analyzed for technology users and actual reduction of post-harvest losses. Thus, it is recommended that PTD regularly monitor the technology adoption rate as well as the reduction rates of post-harvest losses resulting from the continuous use of transport packaging technologies developed by the project.
- Among the transport packaging technologies developed by the project, it was found out that only those developed for durian commodity have been continuously used even at the time of ex-post evaluation. Therefore, it is recommended that PTD conduct further research on utilization of other technologies, and upon necessity, conduct development activities to modify the unused technologies according to the current situation and available facilities.
- It is recommended that PTD coordinate with Technical Working Groups of the project which include DOST regional offices, Department of Agriculture, and local government units to encourage more farmers to adopt the transport packaging technologies developed by the project using several approaches, such as information posting on DOST’s official website and development of related materials and manuals.

Lessons Learned for JICA:

- The project developed and introduced packaging technologies other than transport packaging technologies. However, this activity was not part of the original project scope, and such deviation and modification were not reflected in the project design, activities and indicators for Outputs and Project Purpose. Further, such changes were not subjected to discussions and concurrence among members of the project’s Joint Coordination Committee (JCC), which was the decision-making body for the technical cooperation project supported by JICA. Because modifications in the project design resulting from the project’s actual activities is vital for conducting ex-post evaluation, such modifications should be discussed at the JCC and reflected on the project’s documents as official modifications. Such project’s documents also serve as reference and guide of the implementing agency in implementing activities that sustain project’s

effects after project completion.

- To achieve the set Overall Goal and Project Purpose, the implementing agency is not obligated to establish a monitoring activity after project completion which is important to verify the project effects such as the adoption rates of transport packaging technologies and the reduction rates of post-harvest losses. Post-project monitoring activity is important for grasping and improving the continuous status of project effects. Therefore, for similar projects in the future, it is important to consider the inclusion of a monitoring activity to understand the continuous status of project effects resulting from the project activities, by correspondingly setting more specific indicators for overall goal and project purpose.



Plastic crates: Transport packaging for durian commodity recommended by the project



Corrugated carton box: Transport packaging for fresh durian developed by the project