Lao People's Democratic Republic

Ex-Post Evaluation of Japanese Technical Cooperation Project

"The Aquaculture Improvement and Extension Project Phase 2"

External Evaluator: Tomoo Mochida, OPMAC Corporation

0. Summary

The Project aimed to extend aquaculture techniques suitable for local conditions in the four target provinces (Oudomxai, Sayaboury, Savannakhet and Salavan) in the Northern, Central and Southern regions of Lao PDR. This was to be achieved by verifying and introducing adequate aquaculture methods according to the local conditions of pilot sites, improving the capacity of relevant people for aquaculture techniques and extensions, and strengthening the roles of relevant organizations and their collaboration mechanisms for aquaculture extension.

The Project matched the Laotian national development policy, its development needs as well as Japan's ODA policy, therefore its relevance is high. Generally speaking, all of the Outputs except the strengthening of the roles of relevant organizations and their collaboration mechanisms, were achieved by completion of the Project. In addition, an increase in fish production has been confirmed at both pilot and extension villages possibly thanks to the introduction of improved aquaculture methods and the quality improvement of fingerlings. However, although action plans for aquaculture development were worked out and basically agreed in the target provinces, the plans have yet to be approved by the relevant organizations for implementation. Furthermore, the consumption target of fisheries products as the Overall Goal was not achieved in the three provinces. Therefore, the effectiveness and impact of the Project are evaluated to be fair. While the efficiency of the Project is high because the Project cost and the period of cooperation were almost according to plan, the sustainability of the Project effects is fair as there are some minor problems in the policy and institutional aspects, the organization and in the financial conditions. In terms of the policy and institutional aspects, the Rural Aquaculture Promotion Package (hereinafter referred to as "RAPP"), a standard aquaculture promotion method, was approved by the Department of Livestock and Fisheries (hereinafter referred to as "DLF"), the Ministry of Agriculture and Forestry (hereinafter referred to as "MAF") but has yet to be put in practice. It is also considered that provincial and district offices are understaffed and operation and maintenance budgets are short.

In light of the above points, this Project is evaluated to be satisfactory.

1. Project Description

Project Locations

Fish pond in Oudomxai Province

1.1 Background

At the time of the ex-ante evaluation of the Project, fish and other aquatic organisms were the most important source of animal protein for the people of Lao PDR and the Government of Lao PDR was trying to increase production of fisheries products bearing in mind national food security. As the production of fisheries products through those caught in natural and man-made waters had already reached its maximum level, it was deemed indispensable to increase the provision of fisheries products through the development and extension of aquaculture. In Laotian rural areas, adequate aquaculture methods were yet to be disseminated and extensive fish farming was practiced so that productivity was low. This was due to insufficient fingerlings for aquaculture, the inadequate technical capability of extension staff for aquaculture technology and so on. Therefore, it was necessary to strengthen capacity in the aquaculture sector.

The Government of Japan conducted technical cooperation projects to assist in the establishment of appropriate techniques for aquaculture development and extension (including culture techniques, culture farm management techniques, as well as extension techniques), and capacity building for aquaculture extension. Under the Aquaculture Improvement and Extension Project Phase 1 (hereinafter referred to as “AQIP 1”), implemented from 2001 to 2004, facilities at the Namxouang Aquaculture Development Center (hereinafter called as NADC), which is under the DLF of MAF, were constructed and capacity building was carried out for the improvement of aquaculture techniques. Extension activities of NADC staff, and data collection regarding the situation of aquaculture throughout the country were also conducted. Consequently, a firm basis for aquaculture extension in rural areas was established. The Aquaculture Improvement and Extension Project Phase 2 (hereinafter referred to as “AQIP 2”) was a project that launched the extension of aquaculture in rural areas, making use of the cooperation outcomes attained during AQIP 1.

1.2 Project Outline

Overall Goal		Standard of living of rural fish farmers is improved through the dissemination of aquaculture suitable for local conditions in the 4 target provinces.
Project Purpose		Aquaculture suitable for local conditions is established in the 4 target provinces.
Outputs	Output 1	Adequate aquaculture methods are verified according to the local conditions of pilot sites.
	Output 2	The capacity of relevant persons such as target farmers, province/district extension staff and staff of PASs regarding aquaculture technology and extension is improved.
	Output 3	Fish farmers of the focal districts introduce improved aquaculture methods.
	Output 4	The roles of relevant organizations are clarified and their collaboration mechanism is developed regarding the aquaculture extension matched with the local conditions.
Inputs		Japanese Side: 1. Experts: 10 experts 0 for Long-Term, 10 for Short-Term 2. 18 Trainees received in Japan 3. 21 Trainees for the Third Country (21 for Thailand) 4. Equipment: 14 million Japanese Yen 5. Facilities: 18 million Japanese Yen 6. Local Cost: 64 million Japanese Yen <Laotian Side> 1. 36 Counterparts 2. Equipment: Truck, 4WD vehicles, Computers and etc. 3. Land and Facilities: 12 Ha of Land and Buildings 4. Local Cost: 645 million Kip[1] (=about 77 thousand US dollar) for operational cost
Total Cost		550 million Japanese Yen (JPY)
Period of Cooperation		April 2005 – April 2010
Implementing Agency		MAF/DLF
Cooperation Agency in Japan		Ministry of Agriculture, Forestry and Fisheries
Related Projects		AQIP 1 (Technical Cooperation), Livelihood Improvement Project for Southern Mountainous and Plateau Areas (hereinafter referred to as "LIPS") (Technical Cooperation), Dispatch of Japan Overseas Cooperation Volunteers, Provincial Aquaculture Development Program (Food and Agriculture Organization of the United Nations/ United Nations Development Programme, hereinafter referred to as FAO/UNDP), Provincial level Aquaculture Outreach project (Asian Institute of Technology, hereinafter referred to as "AIT")

[1] Kip is the unit of local currency in Lao PDR. The JICA exchange rate is 0.013Kip/JPY (January 2014).

1.3 Outline of the Terminal Evaluation

1.3.1 Achievement of the Overall Goal at the time of the Terminal Evaluation

It was estimated that approximately 1,000 fish farmers at pilot villages and extension villages had increased fish production by more than 40 % during the Project cooperation period. In addition, based on the ideas and directions of the RAPP[2], a Provincial Aquaculture Development Strategy (hereinafter referred to as "PADS") was prepared under the Project and the direction of aquaculture extension at province and district levels was discussed and agreed in principle by the organizations concerned. It was confirmed that the Project Purpose had been achieved by promoting group aquaculture in addition to individual aquaculture, which had been planned at the initial stage of the Project.

1.3.2 Achievement of the Project Purpose at the time of the Terminal Evaluation

The average annual rate of increase in fish production at the pilot villages was 30 %. It was confirmed that there was the possibility of increasing the per capita consumption volume of fish[3] in the four target provinces to 22 kg/person/year, which is an indicator for the Overall Goal, by continuing to promote aquaculture from the time of the terminal evaluation. Positive impacts of aquaculture in rural areas were also recognized, including increases in cash income, contributions to the empowerment of women in rural areas through group aquaculture by Women's Unions (hereinafter referred to "WU"), the formation of voluntary networks of individual fish farmers, collaboration among different ethnic groups and the enhancement of awareness of mutual help among villagers.

[2] The RAPP is a standard aquaculture promotion method, which was prepared by the Project and officially approved by DLF in October 2009. Presented in the RAPP are a system for aquaculture extension in rural mountainous areas by establishing one pilot village in one cluster and assigning two Village Aquaculture Development Workers (VADW) at each pilot village, an approach to establish a system in a cluster and so on.

[3] To be precise, fish should be interpreted as "fisheries products that include fish and other aquatic organisms".

1.3.3 Recommendations at the time of the Terminal Evaluation

Recommendations	Response
(1) Intensive Support for Seed Producing Farmers (Recommendation for the Project): It was found that seed demand had been increasing in the target areas. During the remaining period, the Project should intensify its technical support for these seed producing farmers and groups. It is also recommended, where applicable, that a network of Village Aquaculture Development Workers is built (hereinafter referred to as "VADW[4]"). In addition, it is recommended that seed producing farmers are facilitated in availing themselves of financial sources such as the Agriculture Promotion Bank and other donors for constructing/upgrading hatchery facilities and equipment.	Technical support for seed producing farmers was continued during the remaining cooperation period of the Project. Especially in the plain areas, where Nasomnyai Village in Phiang District of Sayaboury Province is located, aquaculture-related activities are active and a network of seed producing farmers, including VADW, was established. At the time of the ex-post evaluation, the activities of seed producing farmers were also observed.
(2) Monitoring and Documentation of VADW Activities (Recommendations for the Project) The Project should closely monitor and guide their extension activities and document successful cases of both passive and active aquaculture extension in order to scrutinize the effectiveness of the RAPP.	A database of VADW, certified in 2009, was developed. The database shows information such as contact addresses, measures for livelihoods, aquaculture activities and the relevant facilities of each VADW. In the process of development of the database, the monitoring of VADW was continued.
(3) Formulation of Provincial Action Plans (Recommendation for the Project) Based on the PADS, a detailed action plan should be prepared by each target province. The plan should be authorized by local authorities. To the extent possible, the Project should provide assistance to local authorities in its formulation.	Although action plans for provincial aquaculture extension were prepared, it could not be confirmed whether or not the plans were approved by the relevant authorities in order to ensure implementation.
(4) Implementation of RAPP in the Cluster Approach[5] (Recommendation for DLF) It is recommended that DLF promotes implementation of the RAPP in the Project extension sites in coordination with concerned offices after the termination of the Project.	The facilitation and implementation of the RAPP within the framework of the cluster approach could not be confirmed with DLF. It was considered difficult to implement the RAPP without having assistance from donors.
(5) Promotion of Integrated Farming and School Aquaculture (Recommendation for DLF) It is recommended that future similar aquaculture projects incorporate aquaculture integrated with animal husbandry and agriculture, and school aquaculture.	Regarding integrated aquaculture, a combination of upland irrigated agriculture with aquaculture was mentioned under the area-based approach in "Strategy for Agricultural Development 2011 to 2020" prepared by MAF.

[4] Where staff and budgets of Governmental organizations for aquaculture extension were quite limited, it was necessary to encourage farmers to participate in aquaculture activities and set up an extension system with a Farmer to Farmer (FTF) approach in order to promote aquaculture extension in rural mountainous areas. Under pilot operations, well-motivated farmers were selected as farmers to carry out extension activities, out of which core farmers were screened and nurtured. Furthermore, in order to encourage core farmers to play more active roles in aquaculture extension, some core farmers were trained at NADC and certified as "VADW" by DLF after having been recognized that they had acquired sufficient capacity. Certification by the Central Government aimed to provide VADW with the status of official recognition.

[5] According to the terminal evaluation report, the Government of Lao PDR started adopting a cluster approach, which would group about 10 villages under one cluster, following the Prime Minister's decree in 2007. By putting villages in one cluster (a village group for development), the approach is regarded as a development method in which all development projects, including those in the fishery sector, are carried out in a cluster as a unit.

2. Outline of the Evaluation Study

2.1 External Evaluator

Tomoo Mochida, OPMAC Corporation

2.2 Duration of Evaluation Study

Duration of the Study: October 2013 – August 2014

Duration of the Field Study: January 7 – 31, 2014, March 22 – 29, 2014

2.3 Constraints during the Evaluation Study

The beneficiary survey was conducted through a sample survey at a total of nine villages, including both pilot and extension villages, in the target provinces. Statistics relating to aquaculture collected from different sources, information on production volume collected through the beneficiary survey and so on were found in part to be not consistent. This data, therefore, needs to be treated as a reference only.

3. Results of the Evaluation (Overall Rating: B[6])

3.1 Relevance (Rating: ③[7])

3.1.1 Relevance to the Development Plan of Lao PDR

At the beginning of the Project, it was planned that the Project would contribute to the achievement of "reduction of poverty by half" and "food security", among the main objectives set out in the "Fifth Social Economic Five Years Development Plan (2001-2005)". "Poverty reduction" and "food security" were continuously given priority in the "Sixth Social Economic Five Years Development Plan (2006-2010)" at the completion of the Project. Fish have been and are an important source of nutritious animal proteins for the people of Lao PDR . Also at the time of the ex-post evaluation, DLF set a target to increase the annual per capita consumption of fisheries products, including fish and other aquatic organisms, to 22 kg/person/year in rural areas by 2020 (24 kg/person/year on a nation-wide average including consumption in urban areas) in "the National Strategy for Fisheries from the present to 2020-Action Plan for 2006 to 2010" (Table 1).

Table 1: Consumption Target of Fisheries Products

Unit: Kg/person/Year

Urban/Rural	2005	2010	2020
Urban	14	16	27
Rural	9 (8-10)	13	22
Average	NA	14	24

Source: Targets in 2005 have been quoted from the Project completion report. Targets in 2010 and 2020 have been quoted from "The National Strategy for Fisheries from the present to 2020 - Action Plan for 2006 to 2010" prepared by DLF.

Prior to the implementation of AQIP 1 and 2, AIT started "Provincial level Aquaculture Outreach project" in 1993 and FAO/UNDP also implemented the "Provincial Aquaculture

[6] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[7] ③: High, ②: Fair, ①: Low.

Development Program (1997-2000)". For example, the Project, supported by AIT, utilized experience gained in northeastern Thailand with some suitable adjustments being made for the conditions in Lao PDR. The project aimed to form a network among fingerling producing farmers (capacity development of farmers who carry out intermediate culture), focusing on the production and distribution of fingerlings. Making use of experience from these preceding projects, AQIP 2 was implemented for aquaculture extension in rural areas.

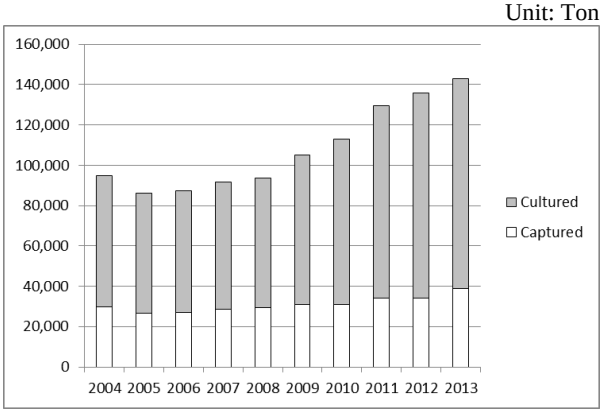
The relevance between the Project and the development policy of Lao PDR was high. The Project (AQIP 2) extended the results of AQIP 1, a preceding project, into rural areas in terms of fingerling production and appropriate aquaculture techniques and utilized experience from the projects assisted by other donors. The Project is also consistent with the development policies from a long-term viewpoint based on experience and approaches so far accumulated.

3.1.2 Relevance to the Development Needs of Lao PDR

At the beginning of the Project, the annual per capita fish consumption in Lao PDR was around 14 kg, the lowest level among countries in the Indochina region. Since mainly small scale farmers carried out aquaculture for home consumption in rural areas, the basic needs for low-cost aquaculture existed in the areas.

At the time of the terminal evaluation of the Project, the annual per capita fish consumption in Lao PDR still remained at the lowest level in the Indochina region. While consumption had exhibited a gradually-increasing trend, the supply volume from natural water was not expected to increase substantially for the trend of fisheries production, as shown in Figure 1. Therefore, there remained the basic need for aquaculture with low costs aiming at home consumption as well as at the generation of cash income. Thus, the Project is consistent with the development needs of Lao PDR.

Unit: Ton



Source: DLF

Figure 1: Trend of Fisheries Production in Lao PDR

3.1.3 Relevance to Japan's ODA Policy

According to "Japan's Official Development Assistance White Paper 2005", at the beginning of the Project, as the Association of Southeast Asian Nations (ASEAN) was working toward the formulation of an ASEAN community by 2020, the reduction of development disparities within the region and strengthening the unity of ASEAN were becoming some of the

most important issues. To rectify development disparities, Japan placed priority on the development of human resources and on the Mekong River Basin Development, which targeted the new ASEAN members (including Lao PDR) and Thailand.

In addition, four priority areas of assistance were identified in "JICA's Country Assistance Program for Lao PDR". These were: human resource development, basic human needs (hereinafter referred to as "BHN"), agriculture and forestry, and infrastructure and energy development). This Project matched three of the four priority areas, i.e., human resource development, BHN and agriculture. In particular, regarding agriculture, "sustainable agriculture and rural development in harmony with natural environments" was regarded as a priority area for assistance. The Project was found to be consistent with the assistance policy of the Japanese Government that made the regional development of Mekong a priority. The Project also acted under two cooperation programs (food security and the promotion of village development), which JICA was continuing under its priority areas. Thus, it matched the assistance policy of Japan and JICA towards Lao PDR.

3.1.4 Appropriateness of the Project Plan and Approaches

The four target provinces of the Project are located in the northern, central and southern regions of Lao PDR and are characterized by different climatic and living conditions. Instead of carrying out the Project at all the villages at once, activities of the Project were firstly verified at 12 pilot villages and then extended into 54 extension villages, based on the results at the pilot villages. This kind of phased approach, which verifies aquaculture methods suitable to various local conditions and extends the methods, was evaluated to be efficient and effective. However, the cooperation period for the extension phase was relatively short and the inputs were quite limited compared to those of the pilot operation phase. Furthermore, the four target provinces are geographically distant in both northern and southern regions of the country. This arrangement seems to have made it difficult to ensure broader as well as deeper dissemination of Project effects beyond the extension villages within the respective provinces.

In light of the above points, the Project is considered to have been highly relevant to development policy and development needs, as well as to Japan's ODA policy, although there is some room for improvement in terms of approach. In conclusion, its relevance is high.

3.2 Effectiveness and Impact[8] (Rating: ②)

3.2.1 Effectiveness

3.2.1.1 Project Output

1) Output 1: Adequate aquaculture methods are verified according to the local conditions of pilot sites.

In the Project Activities, pilot villages were identified, operation and management plans for pilot sites were prepared and put in practice, and methods for seed production and grow-out culture were improved[9].

Indicator 1-1: Manuals on aquaculture techniques suitable to local conditions are prepared.

A total of six technical manuals for methods such as tilapia culture method and common carp culture method were prepared and an additional two manuals were in preparation at the time of the terminal evaluation of the Project[10]. At the survey of the ex-post evaluation, conducted three years after the completion of the Project, some manuals and guidelines were missing while the distribution of others was not confirmed. However, it is assumed that the manuals, or their drafts, were utilized to a certain extent in the process of achieving Output 1.

Indicator 1-2: Production of fish culture by target farmers in pilot villages increase by more than 40% on average.

During a three-year period from 2005 to 2008, it was estimated that the average production volume of fish at pilot villages had increased by 122 % at the time of the terminal evaluation. Nine out of 12 pilot villages achieved an increase in fish production of more than 40%. The beneficiary survey[11] conducted at the time of the ex-post evaluation revealed the trend of fish production per household as shown in Figure 2. At all the pilot villages, the average fish

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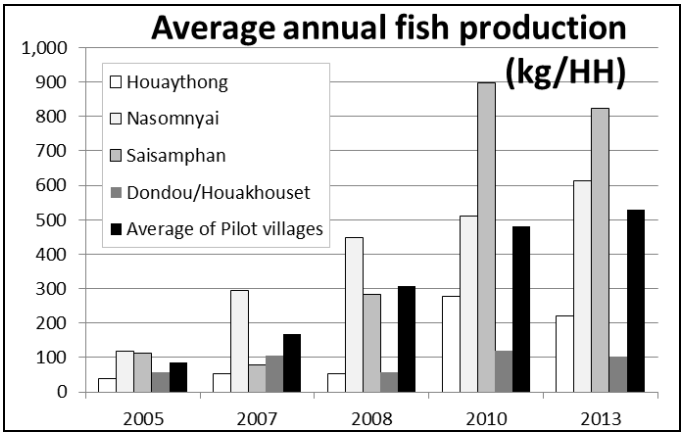
[8] Sub-rating for Effectiveness is to be included with consideration of Impact.

[9] According to former JICA experts, under the Project, joint experiments on aquaculture were carried out with Japanese universities (Tokai University and the University of Tokyo), the Japan International Research Center for Agricultural Sciences (JIRCAS) and FORCOM. Through these collaboration activities, the skills of counterparts at provincial and district levels were upgraded and the activities at NADC became widely known to donors and research institutes.

[10] According to the Project completion report and former JICA experts, two manuals (catfish and puntius), which had been under preparation at the time of the terminal evaluation, had been finalized as the "manual on seed production of catfish and puntius" by completion of the Project.

[11] During the ex-post evaluation, instead of surveying all the households at pilot and extension villages, a sample survey was conducted at two villages per province, one pilot village and one extension village, with the cooperation of PLFS in each province. During the monitoring survey carried out in 2009, 20 to 30 households were interviewed at each village. Out of the list of interviewees in 2009, 15 households, which were available for the interview on the day when enumerators visited the village, were chosen and their cooperation with the survey was requested. In cases where the number of interviewees did not reach 15 per village, farmers from another village where the Project was implemented were selected for the interview. As a result of the survey conducted in January 2014, 120 households were chosen from nine villages, five pilot villages and four extension villages. The average number of family members subject to the survey was 4.9 persons per household and the total number of family members was 586, out of which the number from Lao Loum was 398 (67.9%), that of Lao Theung 58 (9.9%), that of Lao Sung 63 (10.8%) and that of Hmong 67 (11.4%).

production volume per household in 2010 had increased by much more than 40%, if compared with that in 2005. Considering both the results at the terminal evaluation and the ex-post evaluation, it can be said that this indicator has been fulfilled.



Source: Data in 2005 from the terminal evaluation report. Data in 2007 and 2008 from the monitoring survey report of 2009. Data in 2010 and 2013 from the beneficiary survey at the time of the ex-post evaluation.
Note : The number of households that answered about fish production volume is different from year to year.

Figure 2: Average annual aquaculture production per household in the four pilot villages surveyed

There were some villages and fish farmers that experienced a decrease in fish production in some years. During the interview at the ex-post evaluation, a number of reasons for the decrease were pointed out. They were, among others, occurrences of floods and thefts, a decrease in the number of fingerlings released by aquaculture farmers in ponds, the practice of extensive aquaculture, a shortage of water and a switch to paddy fields from ponds and so on. Interviews with farmers revealed that some farmers had decided to grow commercial crops like tabacco, which would grow under less restricted conditions, in place of aquaculture which requires constant water management[12]. Meanwhile, there were some villages that recorded an increase in fish production. A number of reasons was pointed out. They were, among others, an application of new techniques, stocking of a larger number of fingerlings, stocking of better quality-fingerlings, improvement of ponds and so on. In addition, many farmers applied compound feeds for fisheries, which was considered to be the main factor behind the improvement of productivity.

Indicator 1-3: More than 60% of target farmers in pilot villages are well motivated to continue aquaculture at the time of termination of the pilot operation.

According to the monitoring survey[13] carried out in August 2009, at 10 out of 12 pilot villages, all the fish farmers showed their intention to continue aquaculture. Even at the remaining two villages, most of the farmers (76% - 89%) intended to continue aquaculture like the farmers at other villages. When asked if they would change the level of aquaculture production in the future in the beneficiary survey conducted at the ex-post evaluation, all of the 120 households surveyed said that they intended to “expand the level of production”.

[12] According to a former JICA expert, aquaculture used to be just one of the alternative economic activities in which farmers were engaged in rural areas of Lao PDR. If aquaculture was carried out as part of farmers’ economic optimization processes, fish production could be substituted for other economic activities in some years. In this case, fish production would not necessarily increase linearly every year.

[13] “Monitoring survey of the project” prepared under the Project in August 2009.

Considering both the results of the sample survey in 2009 and the survey results at the ex-post evaluation in 2014, it can be assumed that this indicator was fulfilled at the time of Project completion.

2) Output 2: The capacity of relevant persons such as target farmers, province / district extension staff and staff of Provincial Aquaculture Stations (hereinafter referred to as "PAS") regarding aquaculture technology and extension is improved.

In the Project Activities, training programs and materials were prepared taking into consideration the conditions of localities, trainings were conducted for technical and extension staff at provincial and district levels, and target farmers and the functions of PASs were strengthened.

Indicator 2-1: More than two staff members of each PAS can train district staff and farmers.

Indicator 2-2: More than two staff members of each Provincial Livestock and Fisheries Section (hereinafter referred to as "PLFS") can make provincial aquaculture plan and give necessary guidance for aquaculture extension to PAS and District Agriculture and Forestry Office (hereinafter referred to as "DAFO").

Indicator 2-3: More than two staff members of each DAFO can give guidance to farmers.

Indicator 2-4: At least one target farmer at each target village becomes the VADW well motivated to extend aquaculture to other farmers.

At the time of the terminal evaluation, it was confirmed that Output 2 had been accomplished based on the results of the self-evaluation for capacity improvement of the staff members concerned at each provincial and district office. In addition, DLF issued certifications to VADW after their completion of a series of training courses. At the time of the ex-post evaluation, it was found that some staff members continued to carry out activities at the same offices while others, who had improved their capacities under the Project, had moved to the extension section of Provincial Agriculture and Forestry Office (hereinafter referred to as "PAFO") or to other offices related to aquaculture development under PLFS. In some cases, they had been promoted to management of the concerned section and were supervising the operations of that section. In other cases, staff members of Local Government offices, who had upgraded their capacities during the cooperation period of the Project, were mobilized as instructors on other relevant projects. In consideration of the extension approach from Farmer to Farmer (hereinafter referred to as "FTF"), VADW were expected to play a role under the Project, which would complement the functions of Local Government offices. At the time of the ex-post evaluation, the number of VADW more or less remained unchanged (the number

slightly decreased)[14]. According to interviews with VADW, there were few cases where VADW were actively involved in technology transfer beyond their own villages. However, it was confirmed that they had provided technical advice mainly within their own villages in response to the needs of other fish farmers.

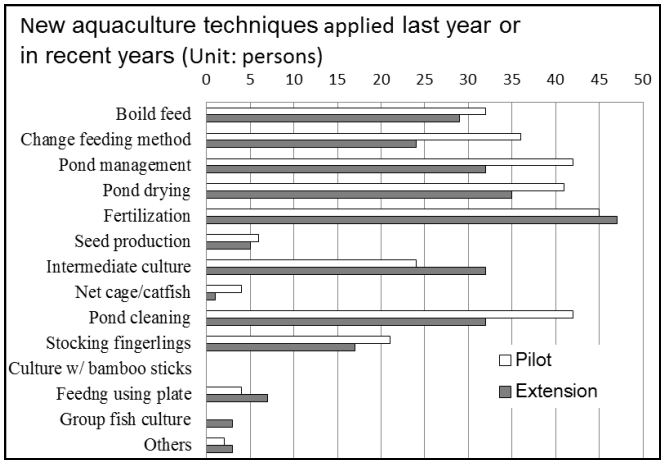
Since it is considered that the aquaculture techniques and extension capacity of concerned personnel have been utilized, it can be assumed that this indicator was fulfilled at the time of Project completion.

3) Output 3: Fish farmers of the focal districts introduce improved aquaculture methods.

In the Project Activities, villages and farmer groups were selected for the introduction of the outputs of pilot operations and training. Expansion operations and monitoring activities were carried out.

Indicator 3: At least 600 target farmers (extension villages) apply improved methods in 8 focal districts.

At the time of the terminal evaluation, based on the monitoring survey results in 2009, it was reported that the number of fish farmers who had applied aquaculture techniques introduced by the Project, had reached more than 1,000 households in all the extension villages (it had been estimated that the number would be about 80% of fish farmers at the extension villages). In the beneficiary survey conducted at the time of the ex-post evaluation, farmers were asked whether or not they utilized improved aquaculture techniques. Out of 120 farmers at nine villages, more than 80% answered that they had utilized at least one of the new aquaculture techniques. The types of improved techniques depend on the areas and farmers: however, as shown in Figure 3, widely-utilized aquaculture methods include boiled feeds, improvement of the pond management, pond drying, fertilization, pond cleaning and so on, techniques which require a lower amount of investment, even among

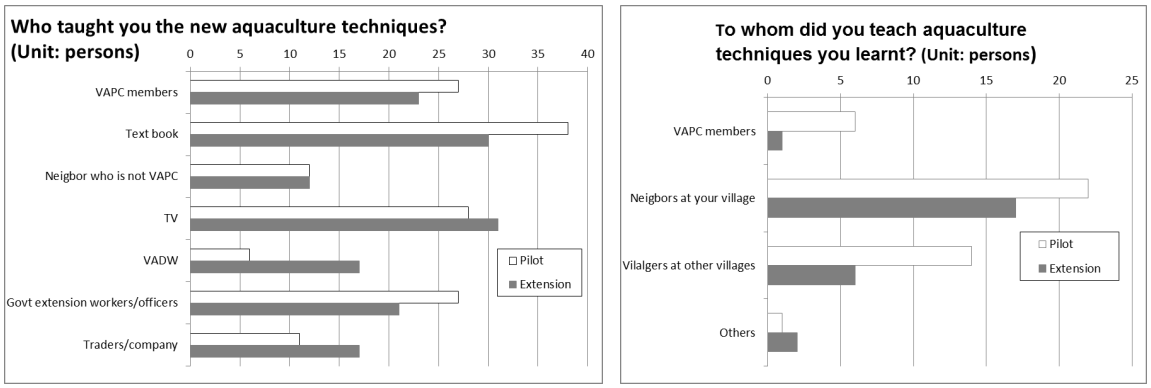


Source: Beneficiary Survey at the Ex-post Evaluation

Figure 3: Aquaculture techniques recently used

[14] However, there are provinces other than the target provinces of the Project where farmers have been newly certified as VADW. Two VADWs were certified in Vientiane province after the completion of the Project. In another JICA-assisted technical cooperation project called LIPS, 10 farmers were certified during the first half of LIPS. According to former JICA experts, these VADW were also trained at NADC and later certified by DLF. Furthermore, according to DLF, one Village Veterinarian Worker (VVW) was trained at each village. The accumulated number of VVW has reached 12,000. There is a plan to let VVW gain some experience and practice in aquaculture in the future.

low-cost techniques.



Source: Beneficiary Survey at the Ex-post Evaluation
Note: With regard to the question "who taught you the new aquaculture techniques?", the number of respondents who answered VADW was small. There is a possibility that they knew the VADW by their personal names but not by their title (i.e., VADW).

Figure 4: Channels of technology transfer

With regard to the channels of technology dissemination, the pilot villages and extension villages shared some similar characteristics (Figure 4). Channels through which techniques had been introduced were textbooks, members of Village Aquaculture Promotion Committees (hereinafter referred to as VAPC[15]), government officials and so on. Some farmers seemed to have adopted aquaculture practices by copying them from neighboring, progressive farmers. There were few cases where interviewees had taught other farmers, but technology transfers were also made to neighbors other than VAPC and to farmers at other villages.

In terms of the production volume of fish and productivity, a comparison was made between farmers who recently used aquaculture techniques and those who did not. Based on the results, it was inferred that the aquaculture techniques had made a contribution to a productivity increase. So far as the results of the beneficiary survey at the ex-post evaluation are concerned, it can be seen that aquaculture techniques introduced in the Project were utilized, contributing to a productivity increase. Therefore, coupled with the results of the terminal evaluation, it is clear that Output 3 had been accomplished at the time of Project completion.

[15] VAPC is a committee consisting of 10 to 20 members such as fish farmers, leaders of a village, members of WU aquaculture groups, etc. Their aim is to promote aquaculture as part of village activities as a whole. VAPC were established at all the pilot and extension villages. At the pilot villages, core farmers, after further screening, were certified as VADW. One of the requirements to becoming VADW is a recommendation by VAPC.

Column: Fish farmer at an extension village in Savannakhet province

Fish farmer A at Nonsa At village carries out aquaculture at two small fish ponds within a very short distance from his own house. When the external evaluator dropped by his house at the end of March 2014, a small amount of water remained at the bottom of a pond with an estimated surface area of 300 m^2 (Photo shown below). Meanwhile, there was no water in a second pond with an estimated surface area of 150m^2. Soil cracks were found on the dried bottom of the latter pond. Despite his age, 83 years old, the farmer vigorously responded to the interviews. There are five family members in his family. They cultivate paddy fields once a year, raise cows and chickens, and carry out small trade as well. For Family A with a daughter working at a government office, aquaculture is a small business for family consumption.

In June, when the rainy season starts and the volume of water increases, they start stocking fingerlings in the ponds. Around that time, trucks loaded with bags containing fingerlings from Savannakhet town travel from village to village with loud speakers, informing villagers of sales of fingerlings. Famer A stops the truck to purchase fingerlings. Prices depend on the size of fingerlings. A bag with 30 to 40 fingerlings costs 10,000 Kip, and they buy about 300,000 Kip worth of them. According to Farmer A, they enjoy fish over six to seven months from August, two months after fingerlings were released (considering their production volume, they cannot be eating fish every day; however, as they can catch fish at ponds nearby their house, they must have found this convenient especially during the busy agricultural season). Aside from the purchase cost of fingerlings, they spend 100,000 Kip on fish feeds. This means that they make a total cash investment of 400,000 Kip in their small aquaculture operation. If they purchased fish at the local market, 400,000 Kip would disappear within one week or so. However, if they invest the same in aquaculture and eat the outputs from the operation, the benefits last over several months, bringing them a sense that they are saving money.

Farmer A said he participated in a seminar organized by the Project in 2009 and learned how to prepare boiled feeds by using rice brans and vegetables. The fertilization of ponds by using buffalo dung, etc. was also taught by a farmer from another village. The fish seem to be healthier with boiled feeds and the production volume appears to have increased to 100 kg per year at present from 50 to 60 kg in the past.

4) Output 4: The roles of relevant organizations are clarified and their collaboration mechanism is developed regarding the aquaculture extension matched with the local conditions.

In the Project Activities, assistance was given for the preparation of aquaculture development strategies in the target provinces, as well as for action plans of the Project after its cooperation period. Seminars were also held on the action plans.

Indicator 4-1: Related organizations approve a collaboration agreement defining duties of each organization.

According to the terminal evaluation report, the Government of Lao PDR was promoting the introduction of the cluster approach in which about 10 villages were integrated into a village cluster. This was based on the Prime Minister's Decree of 2007. In line with the Government policy MAF was implementing to establish Agricultural and Forestry Technical Service Centers (hereinafter referred to as TSC) at provincial and district levels based on the Agricultural and Forestry Minister's Order of 2008. At the terminal evaluation, it was found that in this situation it was difficult to exchange any sort of written collaboration agreement under the leadership of

the Project since the TSC system was a new regime of the Government[16]. At the interviews during the ex-post evaluation, it was not confirmed to what extent this indicator had been fulfilled.

Indicator 4-2: The Project makes recommendations for sustainable development of aquaculture in Lao PDR.

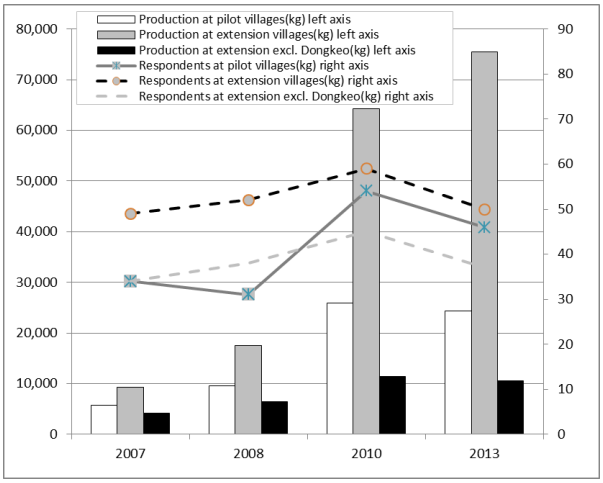
According to the terminal evaluation report, the Project had drafted the RAPP as a technical package for aquaculture extension in rural area in April 2009. It was then officially authorized by DLF after some necessary adjustments. Since the RAPP adopted the cluster approach with the idea of "One cluster, one pilot village" and "Two VADW at one pilot village", this indicator 4-2 has been fulfilled.

Based on the above points, the evaluation is that achievements of Output 4 were limited.

3.2.1.2 Achievement of Project Purpose

1) Indicator 1: 720 fish farmers (120: pilot villages, 600: extension villages) increase their fish production by more than 40% on average by applying improved aquaculture methods in 4 target provinces.

According to the Project completion report of March 2010, at the pilot villages, more than 511 fish farmers applied at least some improved aquaculture techniques/methods and more than 337 (61%) of them improved fish production by more than 40%. Aquaculture techniques/methods which had been improved through the pilot operations, were introduced at 54 extension villages. More than 1,004 fish farmers applied these techniques/methods in these villages and more than 653 (65%) of the farmers improved fish production by more than 40%.



Source: Monitoring survey report in 2009 and beneficiary survey at the ex-post evaluation

Figure 5: Annual Fish Production at Pilot Villages and Extension Villages
(Number of interviewees, *n*=120)

[16] The reason why the collaboration agreement could not be made was not known. For aquaculture extension, DLF and NADC are involved in aquaculture extension at the national level, PAFO and PAS are engaged at the provincial level, and VAPC collaborate at the village level. A collaboration agreement is expected to clarify the duties and roles of each organization. However, as the cluster approach that grouped about 10 villages in one cluster was being introduced, it is assumed that the content of the collaboration agreement might have been seen as not necessarily consistent with the cluster-based development method.

In the beneficiary survey at the ex-post evaluation, volumes of fish production at fish farmer households were examined at nine villages, five pilot and four extension villages, in the four provinces. As shown in Figure 5, the production volume in 2010 at the nine villages was 6.0 times as large as that in 2007, 3.8 times as large if the production volume at Dongkeo village is excluded. The survey results can thus be treated as evidence that fish production had increased at the time of Project completion although it was a sample survey at selected pilot and extension villages. In any case, it can be seen that indicator 1 was fulfilled.

Column: Trial classification of villages surveyed

The speed and extent of aquaculture extension vary among the pilot and extension villages as found at the time of the ex-post evaluation. On the one hand, at Dongkeo village (Lao Loum) in Oudomxai Province, at a location in the center of the town, the size of ponds is comparatively large and irrigation facilities are relatively well-developed, although it is still difficult to cultivate paddies twice a year. On the other hand, Houayxam-O village (mainly Lao Sung) is located in a highland area and the size of ponds is comparatively small. The reasons for the differences in levels of fish production are floods, thefts, methods of feeding, the number of fingerlings being released, input volumes of compound feeds for fisheries and so on. Moreover, other things that can affect the differences are the differences between ethnic groups (Lao Loum, Lao Theung, Lao Sung), the sizes of aquaculture ponds being affected by the amount of investment and accessibility to water sources, and the number of households that sell fish, which is also related to accessibility to markets. Although there are some villages where large variances in fish production volume are found, even within the village, the villages surveyed could be categorized into the three types: "the commercial aquaculture type", "the home consumption with diversification of cash income sources type" and "the home consumption type" as shown in Table 2 below. At the villages classified into "the commercial aquaculture type", the average size of aquaculture ponds and the production volumes are large and the ratio of fish farmers who sell fish is high. In the villages classified into "the home consumption type", the average size of aquaculture ponds and the fish production volume are small and the ratio of fish farmers who sell fish is low.

Table 2: Characteristics of Villages where the Beneficiary Survey was conducted

Type and Province	Village	2010			2013			Production and Change	Characteristics		
		No. of Respo-ndents	Ave. Area, (m^2)	Ave. Produc-tion (kg)	No. of Respo-ndents	Ave. Area, (m^2)	Ave. Product, (kg)		Ethnic Group	Size of Ponds	No. of farmers who sell fish
Commercial aquaculture											
Oudomxai	Dongkeo	14	4,060	3,779	13	4,569	4,992	Large Increase	Loum	Big	Many
Home consumption with diversification of cash income sources											
Sayaboury	Nasomnyai	15	3,560	510	15	3,627	612	Moderate Increase	Loum	Big	Many
Savannakhet	Saisamphan	15	4,160	897	15	3,320	823	Moderate Decrease	Loum	Big	Mid.
Salavan	Phao	18	2,317	322	10	2,424	483	Slight Increase	Loum	Mid.	Mid.
Home consumption											
Oudomxai	Houaythong	12	1,833	279	10	1,000	221	Slight Decrease	Theung	Small	Less
Sayaboury	Houayxam-O	13	939	232	13	1,062	239	Slight Increase	Sung & others	Small	Less
Savannakhet	Nosa At	15	1,937	171	14	1,261	186	Slight Increase	Loum	Small	Less
Salavan	Dondou/ Houakhouset	12	1,477	121	6	908	102	Slight Decrease	Loum	Small	Less

Source: Beneficiary Survey at the Ex-post Evaluation
Note: Many ethnic minorities live in Houaythong and Houayxam-O villages.

The average and median values of fish sales and the cost of the main inputs such as fingerlings, feeds and medicines for fish production are compared in Table 3 below, in accordance with the classified types in Table 2 above,. In "the commercial aquaculture type", investment was made in many inputs, as evidenced from the costs of fingerlings and feeds. In both "the commercial aquaculture type" and "the home consumption with diversification of cash income sources type", large gaps between average and median values were observed, implying that inputs by some farmers were quite large. On the other hand, in "the home consumption type", both sales and costs were limited.

Table 3: Sales and Cost of Fish Production by Type in 2010 and 2013

Unit: Million Kip

Type	Average/ Median	Fish Sales		Cost of Fingerlings		Cost of Feeds		Cost of Medicines	
		2010	2013	2010	2013	2010	2013	2010	2013
Commercial aquaculture	Average	55.9	79.0	5.4	8.3	18.6	33.7	0.5	0.9
	Median	18.0	25.2	3.0	6.5	2.5	5.0	0.1	0.2
Home consumption with diversification of cash income sources	Average	9.6	10.7	1.2	1.0	2.9	2.7	0.2	0.2
	Median	3.0	3.6	0.5	0.4	0.2	0.3	0.0	0.0
Home consumption	Average	1.3	0.5	0.3	0.2	0.1	0.1	0.0	0.0
	Median	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.0

Source: Beneficiary Survey at the Ex-post Evaluation

Based on what is described in the above column, it can be inferred that the rapid increase in fish production in recent years resulted largely from an increase in inputs (including improvements in the quality of fingerlings[17]) as well as an expansion of fish ponds, which made it possible to increase the inputs[18]. Accordingly, in order to verify the relation between improvements in aquaculture techniques and productivity increase, responses made by those in the "the home consumption type" were examined for comparison, as the volume of inputs was limited in this type. As shown in Table 4 below, differences in the average productivity between farmers using aquaculture techniques and farmers not using the techniques can be inferred. Based on the above points, it was considered that a causal relationship between the application of aquaculture techniques and increases in fish production, which is the Project Purpose, could be assumed.

[17] According to the beneficiary survey, out of 120 respondents, 114 answered that they would feed Tilapia. 111 persons common carp, and 102 persons puntius or golden carp. When the external evaluator visited pilot villages, it was learned from VADW that they used compound feeds made in the People's Republic of China and Thailand.

[18] Former JICA experts explained the background to the wide dissemination of aquaculture, pointing out factors such as: (1) the utilization of compound feeds, (2) the utilization of vacant land for aquaculture ponds after soil was excavated for the construction of roads; (3) the wide recognition by farmers that aquaculture could become a good business; and (4) the high demand for fish.

Table 4: Comparison between farmers using aquaculture techniques and farmers not using the techniques

	Respondents (persons)		Average Production (kg/household)		Average Area of Pond (m^2/household)		Average Productivity (Kg/m^2)	
	2010	**2013**	**2010**	**2013**	**2010**	**2013**	**2010**	**2013**
Farmers who used aquaculture techniques	36	33	234	225	1,608	1,189	0.23 (0.029)	0.23 (0.021)
Farmers who did NOT use aquaculture techniques	16	10	122	111	1,413	711	0.15 (0.024)	0.17 (0.037)

Source: Beneficiary Survey at the Ex-post Evaluation

Note: Values in parentheses are standard errors. Assuming that a random sampling was conducted, the differences in average productivity between farmers who used aquaculture techniques and farmers who did not use aquaculture techniques in 2013 was not statistically significant, at a level of 0.1 (10%) (z value = 1.518). However, the differences in average productivity in 2010 was statistically significant, at a level of 0.01 (1%) (z value = 2.185). The number of farmers who did not use aquaculture techniques but produced fish decreased from 16 in 2010 to 10 in 2013. Accordingly, the standard errors in 2013 increased.

2) Indicator 2: Aquaculture development plans are prepared at province and district levels.

According to the Project completion report, DLF examined the draft RAPP prepared under AQIP 2 in light of the Fisheries Law enacted in July 2009 and in October of that year approved the RAPP as a standard method for aquaculture extension and promotion in rural and mountainous areas. Based on the RAPP, provincial aquaculture development plans were prepared for the four target provinces, through collaboration between DLF, NADC, PAFO, PLFS and DAFO, at workshops conducted in February 2009, the third year of the Project. It is not known whether or not district-level aquaculture development plans were prepared. Since DAFO staff also participated in the workshops, it can be presumed that district-level plans were also prepared. Moreover, PLFS of each target province and DAFO in each prioritized district also prepared detailed two-year action plans for activity plans after the Project completion. However, it has not been confirmed whether the action plans had been approved by relevant authorities.

In light of the above, it can be considered that indicator 1 of the Project Purpose was fulfilled with the target values set for both pilot and extension villages being reached. However, indicator 2 was only partly fulfilled. Although the provincial aquaculture action plans as well as PADS based on the RAPP had been prepared and agreed in principle by the relevant organizations by the time of the terminal evaluation, the approval of such plans by the relevant authorities, which was needed in order to put the plans in practice, had not been confirmed

3.2.2 Impact

3.2.2.1 Achievement of Overall Goal

1) Indicator 1: Fish consumption[19] of 22 kg/person/year by rural people in 4 target provinces.

The consumption data for fisheries products obtained from PLFS in each province is shown in Table 5. The data shows that the target consumption volume set for the Overall Goal, i.e., 22 kg/person/year, was not achieved in some provinces although there is room for improvement in the reliability of the data. On the other hand, the consumption volume of fisheries products was monitored at the pilot villages and an increasing trend of consumption was confirmed, as in Table 6. The monitoring results of 2009 and those at the time of the ex-post evaluation in 2014, which were obtained by applying similar methods as used in 2009, were those at the pilot villages. Therefore, they cannot be compared simply with the provincial average of consumption volume. However, it can be assumed that consumption volume in 2014 had been generally increased compared with that of 2009.

Table 5: Per capita consumption of fisheries products including fish and other aquatic organisms in the target provinces

Unit: kg/person/year

Province	2008	2009	2010	2011	2012	2013
Oudomxai	-	-	-	-	13.5	14
Sayaboury	-	24.2	22.2	27.0	17.0	12.9
Savannakhet	15.7	16.5	16.9	16.7	18.5	17.3
Salavan	18.0	19.0	19.0	23.0	23.0	25.3

Source: PLFS in each Province
Note 1: "-" means no answer.
Note 2: Reasons behind decreased productions in Sayaboury are not known.

Table 6: Monitoring results for consumption of fisheries products

Unit: kg/person/month

Province where the pilot villages are located	Monitoring results from October to November 2009				Monitoring results from January to February 2014			
	No. of Samples	Average		Median consumption of fisheries products	No. of Samples	Average		Median consumption of fisheries products
		Consumption of fisheries products	Consumption of fish only			Consumption of fisheries products	Consumption of fish only	
Oudomxai	7	2.7	2.1	2.3	6	5.4	5.1	4.2
Sayaboury	6	2.8	2.3	2.4	6	3.3	2.7	3.3
Savannakhet	6	2.7	2.2	2.5	6	5.8	4.5	4.1
Salavan	6	3.6	3.3	3.2	6	5.6	3.9	5.1
Average in the target villages	25	3.0	2.5	2.5	24	5.0	4.0	3.9

[19] To be precise, fish should be interpreted as "fisheries products that include fish and other aquatic organisms".

Province where the pilot villages are located	Monitoring results from October to November 2009				Monitoring results from January to February 2014			
	No. of Samples	Average		Median consumption of fisheries products	No. of Samples	Average		Median consumption of fisheries products
		Consumption of fisheries products	Consumption of fish only			Consumption of fisheries products	Consumption of fish only	
Aquaculture famers	16	3.3	2.9		22	5.2	4.2	
Non-aquaculture famers	9	2.3	1.7		2	3.3	2.5	

Source: 2009 data from the Project completion report 2014 data from the monitoring results at the time of the ex-post evaluation.

Note: At the time of the ex-post evaluation, farmers whose consumption volume of fishery products had been monitored in 2009 were requested to record their daily consumption volume of fishery products over one month from January to February 2014. The total number of farmers monitored was 24 from 12 pilot villages. Based on the monitoring data, a monthly consumption volume was calculated in the same manner in which the consumption volume had been calculated in 2009 [20].

2) Contribution of the Outputs and the Project Purpose to the Overall Goal

At the time of the ex-post evaluation, it was confirmed that the two-step extension approach for Outputs 1 to 3 had been carried out in an effective and efficient manner as evaluated in the terminal evaluation. It is thought that these activities had contributed to an improvement in the living conditions of small-scale aquaculture farmers (especially the afore-mentioned “home consumption type”), which was the Overall Goal of the Project. This was manifested in increases in fish production thanks to the extension of aquaculture techniques, as seen from indicator 1, which examined the extent to which the Project Purpose had been achieved.

However, regarding Output 4, although the Project proposed the RAPP for sustainable aquaculture development in Lao PDR and DLF approved this as a standard aquaculture extension and promotion method in rural and mountainous villages, it was considered that the consent to the RAPP among the relevant organizations had not been accompanied by sufficient human and financial resources to back up the broader extension of aquaculture techniques beyond the target districts and villages of the Project. Likewise, this can be also applied to indicator 2 of the Project Purpose. Although the aquaculture development action plans were prepared and agreed in principle among the relevant organizations, it was not confirmed whether or not the plans had been approved by the relevant authorities for implementation. In the four target provinces, an institutional set-up has yet to be worked out to ensure an extension

[20] Although the time schedule from stocking of seed fish to harvesting of fish varies from area to area, seed fish are generally stocked in June. The capture and consumption of cultured fish then start from October and continue over several months thereafter. Accordingly, during the period from June to September, farmers tend to consume purchased fish. In and after October, the consumption of cultured fish tends to increase since the harvesting time for agricultural products starts and farmers can save time required for catching fish. Since the acquired channels and consumption patterns of fish are different according to the season, it is not possible to annualize for comparison monthly consumption data which has been obtained through monitoring the volume in a specific month. However, since the measure of acquiring fish from October to November is found to be more or less similar to that from January to February, it is considered that a comparison of the monitoring results of the two periods on a monthly basis will be possible.

of the Project results.

3.2.2.2 Other Impacts

1) Gender mainstreaming

The terminal evaluation report pointed out that the Project had proactively tried to involve rural women in various aquaculture-related activities through training, field guidance and monitoring activities. At the ex-post evaluation, it was found that group aquaculture activities by WU had been suspended at the two villages visited by the external evaluator[21]. Although the WU aquaculture groups rented aquaculture ponds during the Project cooperation period, the groups had to suspend aquaculture activities after the completion of the Project as the aquaculture ponds had to be returned. The impact of the Project has therefore been found to be somewhat limited.

2) Formulation of a network of progressive farmers

The Project has fostered the development of a network of progressive aquaculture farmers with shared use of seed fish and brood stock, joint procurement of machines and information-sharing. At the time of the ex-post evaluation, it was confirmed that seven seed producers had formed and maintained a group with support from the Project in Sayaboury province. The advantages of forming such a group were pointed out as: (i) price-setting for sales; (ii) exchange of information on technology; (iii) enhancement of sales capacity; (iv) having body to receive support from the Project; and so on.

Photo 1: Seed production by a seed producers' group in Phiang district of Sayaboury province supported by the Project. For example, the group raises seed fish of Indian Carp for three months and sells them at 400 Kip/fingerling (equivalent to about 5 Japanese Yen).

Photo 2: A carp captured at a VADW aquaculture pond in Xai district of Oudomxai province. It weighted 2.5 kg after having been fed for about two years. The carp was sold at the farm-gate price of 25,000Kip/Kg to a visiting trader.

[21] During the ex-post evaluation, questionnaire-based or interview surveys were conducted to VAPC at 12 pilot and 53 extension villages. Out of 65 villages which responded to the surveys, there were two villages where WU maintained group aquaculture activities.

Group activities, including WU activities, continue as long as the minimum conditions for forming a group, such as the securement of aquaculture ponds by the group, are satisfied or while the benefits/incentives for forming a group, such as the activities of seed producers, are shared. In this regard, group activities have contributed to the sharing of information on technology, the enhancement of women's self-reliance, and so on.

3) Enhancement of friendship and mutual help among villagers

Collaboration among different ethnic groups and an enhancement in the sense of mutual help among villagers were confirmed at the time of the terminal evaluation. The Project supported the establishment of VAPC at the target villages. VAPC were established in order to prevent aquaculture development from undermining the economic balance within a community and triggering potential conflicts in society[22]. The aim was to implement activities (for example, technical guidance of VAPC to the group aquaculture of WU and low-income groups of farmers) that would benefit a village as a whole, including non-aquaculture farmers, without limiting support only for the benefit of aquaculture farmers. However, at the target villages visited by the external evaluator at the time of the ex-post evaluation, the group activities of VAPC and WU were found to be in low gear[23].

As described above, through the implementation of the Project Activities, Output 1 (verification of adequate aquaculture methods), Output 2 (capacity improvement of relevant people for aquaculture technology and extension) and Output 3 (introduction/use of improved aquaculture methods by fish farmers) have been achieved, but there has only been limited achievement of Output 4 (development of a collaboration mechanism among relevant organizations for aquaculture extension). With regard to the Project Purpose, the achievement of indicator 2 (preparation of aquaculture development plans at provincial and district levels) has been partially realized, while indicator 1 (increase in fish production by fish farmers at pilot and extension villages) is considered to have been fulfilled. The achievement of the Overall Goal is only partial as some provinces have not yet reached the target. In terms of impact, networking between progressive aquaculture farmers has developed in Sayaboury province, but group aquaculture activities were less active so that impacts were found to be limited. The Project has somewhat achieved its Objectives, and therefore its effectiveness is fair.

[22] Based on interviews with a former JICA expert.

[23] On the other hand, there were some VAPC that were engaged in such activities as sharing information on technology and experience, and using project-assisted equipment together. According to answers to the interviews and the questionnaire, about half of VAPC provide technical supports to their members and about one-fourth of VAPC jointly use equipment such as pumps.

3.3 Efficiency (Rating: ③)

3.3.1 Inputs

Inputs	Plan	Actual Performance [Note]
(1) Experts	➢ Resident-type 3 persons 3 resident-type experts: chief advisor/aquaculture techniques, extension/training, rural development/coordinator ➢ Short-term experts: brood stock management, seed production, participatory development, gender mainstreaming, improvement of agriculture system and others including experts from a third county	10 short-term experts: 10 fields such as training/brood stock management/seed production, aquaculture technique 1/extension, aquaculture technique 2/rural development/market survey, chief advisor, gender mainstreaming/life improvement, participatory development, early level development, planning of aquaculture facility, improvement of agriculture systems, strengthening regional networks. Out of 10 short-term experts, 3 experts (i.e., training/brood stock management/seed production, aquaculture technique 1/extension, and aquaculture technique 2/rural development/market survey) repeated their short-term assignments throughout the cooperation period of the Project. It is considered that their assignments correspond to resident-type experts of the plan. Total number of men-months: 150 MM
(2) Trainees received	Fields of training:	Fields of training: fresh water aquaculture, gender mainstreaming and others. One to six trainees were received per training session and a total of six training sessions were implemented. Gender mainstreaming in the fishery sector was also taken up as a topic aside from fresh water aquaculture, fish disease prevention and the hygienic handling of cultured fish. No. of Trainees: 18 trainees
(3) Third-Country Training Programs	Fields of training: Third country training in Thailand	Fields of training: fresh water aquaculture Third country training in Thailand: 21 trainees
(4) Equipment	Equipment: Vehicles for training and monitoring, equipment for seed production, equipment for aquaculture and others	Equipment: Minibus, motorcycles, computers and others Total: 14 million Japanese Yen
(5) Provision of Facilities	Equipment for seed production, facilities at PAS	Facilities relevant to aquaculture in NADC, PAS, etc.: 18 million Japanese Yen
(6) Local Operational Cost	Supplement for operational costs	Costs for training and seminars, costs for routine technical guidance, costs for the preparation of textbooks for extension and others: 64 million yen (support for local costs)
Total Project Cost	Around 550 million yen	Around 550 million yen
Inputs from the Government of Lao PDR	Assignment of C/Ps, staff in charge at province/district levels, assignment of provincial technical staff and district extension staff, allocation of budgets, facilities for the Project Total Cost: Unknown	Assignment of 36 C/Ps, other equipment, etc. (1 truck, 3 units of 4WDs, 1 minibus, 2 motorcycles, 3 personal computers, 1 printer and others), land (12 Ha), building, operational cost 645 million Kip (equivalent to about 77,000 US$) Total Cost: Unknown

Note: Actual performances are based on the terminal evaluation report in 2010.

3.3.1.1 Elements of Inputs

1) Dispatch of experts

One short-term expert was dispatched from a third country, Thailand, for fishery extension and the development of feeds in addition to Japanese experts.

2) Domestic training

Domestic training sessions were carried out for aquaculture technology at NADC and PAS, as well as site visits at pilot villages and field training at PAS and DAFO. By the time of the terminal evaluation, a total of 58 Local Government staff members, 260 farmers at pilot villages and 718 farmers at extension villages[24] had participated in such training.

3) Provision of machinery, equipment and facilities

Experimental ponds and facilities, etc. were also constructed and/or rehabilitated at NADC.

Photo 3: Training facility at an aquaculture station in Salavan province

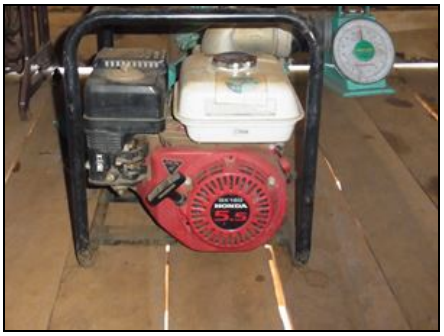


Photo 4: A pump provided by the Project (Dondou village in Savannakhet Province). It is being utilized jointly by members of VAPC. Farmers other than VAPC members are also able to use it on a fee paying basis.

4) Points for improvement with regard to the Inputs

At the time of the preparatory study, it was recognized that most adequate aquaculture methods needed to be extended with consideration to regional characteristics when a nation-wide extension of aquaculture technologies was to be undertaken. This was because local geographical and climate conditions were found to differ greatly depending on the area. Accordingly, as the first step before moving on to a country-wide scale, technology transfer was conducted in the four provinces where the local conditions were found to be different. While the routine technical guidance by Project staff was highly appreciated, both time and money were required for travel among the different target provinces, which were distantly located in both the north and south regions of the country. Based on the results of the interviews conducted during the ex-post evaluation, it would be considered efficient as well as effective if technology transfer were conducted with consideration to the different characteristics of the localities within further selected province(s) instead of four provinces located far apart in the north and south regions. Areas with different local conditions could be identified even within a smaller number of target province(s). Moreover, by narrowing down the number of target provinces, the number of relevant people participating in training within an area would increase. It would be also easier to set up networks among those concerned. Compared with the inputs for the pilot villages,

[24] The training period was one day for 415 out of 718 farmers.

those for the extension villages, such as the number of training opportunities and support for equipment and seed fish, were quite limited and the cooperation period was also shorter. These points could be somewhat improved if the number of target provinces were decreased.

3.3.1.2 Project Cost

The planned cost of the Project on the Japanese side was about 550 million Japanese Yen. The actual Project cost was about 550 million Japanese Yen. The Project cost therefore was as planned (100% if compared with the planned cost).

3.3.1.3 Period of Cooperation

The planned period of cooperation was five years from March 2005 to March 2010 and the actual period was five years. The period of cooperation was therefore as planned.

As for pilot operations relating to Output 1, the duration was extended by one year in order to strengthen the functions of pilot villages, although it was originally planned that completion would be made by the third year of the cooperation period[25]. Other activities were implemented almost according to plan.

Both the Project cost and the period of cooperation were as planned. Therefore, the efficiency of the Project is high.

3.4 Sustainability (Rating: ②)

3.4.1 Related Policy towards the Project

In "the Seventh Five-year National Socio-Economic Development Plan (2011-2015)" (hereinafter referred to as "the Seventh NSEDP"), the accomplishment of the Millennium Development Goals (MDGs) including poverty reduction is listed as one of the overall goals while support to rural development is mentioned as a measure for poverty reduction. In the Seventh NSEDP, the target volumes were set for meat and fish production as part of economic development in the agriculture and forestry sector. Therefore, the Project is consistent with the Seventh NSEDP.

On the other hand, under the Project, the RAPP including a certification system of VADW, was prepared in consideration of the cluster approach, part of the rural development policy of the Government of Lao PDR[26]. However, as mentioned before, the actual implementation of the

[25] According to the former JICA experts, while fish raising activities will go through one cycle per year, it is necessary to conduct experimental tests at least three times in order to verify the appropriateness of techniques to be introduced. Accordingly, such verification usually takes a period of three years. At the same time, in order to further examine the suitability, it is also necessary to use several aquaculture ponds in different conditions. These experimental tests are considered to have required a longer time for the pilot operations.

[26] The cluster approach aims to improve people's access to public services by setting up a cluster, consisting of several villages, within a district and by establishing TSCs at the respective clusters (Mid-term evaluation report in January 2008). According to the mid-term evaluation report, in order to disseminate the results of the Project

RAPP, as expected under the Project, had not been confirmed at the time of the ex-post evaluation. Thus, sustainability from the institutional aspect is limited.

3.4.2 Institutional and Operational Aspects of the Counterparts

At the time of the terminal evaluation, some concerns were raised on the stability of future extension activities at provincial and district levels due to a chronic shortage of human resources. At the time of the ex-post evaluation, substantial improvement in the situations observed during the terminal evaluation[27] had not been seen. Some VADW continued to produce fish seeds and carry out intermediate culture after the termination of the Project while others temporarily suspended seed production, for example due to increasing competition with other retailers of fish seeds and so on. As far as the Project areas are concerned, no fish farmers were newly promoted to VADW. Some problems have been observed in the institutional and organizational aspects of the extension activities.

3.4.3 Technical Aspects of the Counterparts

It was found that many respondents to the beneficiary survey conducted during the ex-post evaluation had been utilizing the aquaculture methods improved by the Project. The aquaculture methods extended by the Project were found to be easily adopted by farmers and, therefore, technical sustainability is considered to be high.

3.4.4 Financial Aspects of the Counterparts

The ex-post evaluation confirmed that the budgetary allocation for the extension activities of aquaculture was quite low, especially at the provincial and district levels. The external evaluator found the maintenance of the facilities to be inadequate at the PAS he visited. Some problems were observed in the allocation of maintenance budgets. The financial conditions of the counterpart agencies were considered to be limited for ensuring the extension of aquaculture. Meanwhile, even at the time of the terminal evaluation, it was also pointed out that provincial and district offices faced chronic shortages of financial resources and that it was possible that there would be a negative impact on the stability of extension activities by extension workers. Under such circumstances, the FTF approach by core farmers and VADW was expected to complement the extension activities of Local Government offices.

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efficiently, it was found necessary to take into account the cluster. For instance, the report cites a possible case in which VADW disseminates aquaculture techniques within a cluster through TSC. Meanwhile, at the time of the ex-post evaluation, a development policy called Sam Sang was introduced. Under the Sam Sang policy (three build-scheme), the Government promotes development by building up villages as development units, districts as strong integration units and provinces as strategic units.

[27] DLF established the Department of Fisheries (DOF) in 2012, but the number of staff members working at the department is limited. On the other hand, organizational reform was going on at the time of the ex-post evaluation, including that of institutional arrangements such as the new establishment of the Department of Agriculture Extension and Cooperatives (DAEC) under MAF. (Sufficient information on the contents of reform had not been obtained at the time of the ex-post evaluation.)

In conclusion, some problems were observed in the policy and institutional aspects, and the organizational and financial aspects of counterparts. In order to ensure an extension of aquaculture techniques despite chronic shortages of human, as well as financial, resources at Local Government offices, capacity development for core fish farmers, VADW and fish seed producers was carried out under the Project with the FTF approach. During the ex-post evaluation, it was found that the extent of technology transfer by VADW had been limited. However, VADW and seed producers played a complementary role in the extension activities of the Government and many fish farmers continued to make use of low-cost and low-risk aquaculture techniques, which contributed to an enhancement of productivity. It has been seen that the effects of the Project are sustained through incorporation of measures, based on the incentive mechanism for farmers, which are expected to play a complementary role in Government services. Thus, the sustainability of effects generated by the Project is evaluated to be fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The Project aimed to extend aquaculture techniques suitable for local conditions in the four target provinces (Oudomxai, Sayaboury, Savannakhet and Salavan) in the Northern, Central and Southern regions of Lao PDR. This was to be achieved by verifying and introducing adequate aquaculture methods according to the local conditions of pilot sites, improving the capacity of relevant people for aquaculture techniques and extensions, and strengthening the roles of relevant organizations and their collaboration mechanisms for aquaculture extension.

The Project matched the Laotian national development policy, its development needs as well as Japan's ODA policy, therefore its relevance is high. Generally speaking, all of the Outputs except the strengthening of the roles of relevant organizations and their collaboration mechanisms, were achieved by completion of the Project. In addition, an increase in fish production has been confirmed at both pilot and extension villages possibly thanks to the introduction of improved aquaculture methods and the quality improvement of fingerlings. However, although action plans for aquaculture development were worked out and basically agreed in the target provinces, the plans have yet to be approved by the relevant organizations for implementation. Furthermore, the consumption target of fisheries products as the Overall Goal was not achieved in the three provinces. Therefore, the effectiveness and impact of the Project are evaluated to be fair. While the efficiency of the Project is high because the Project cost and the period of cooperation were almost according to plan, the sustainability of the Project effects is fair as there are some minor problems in the policy and institutional aspects, the organization and in the financial conditions. In terms of the policy and institutional aspects, the RAPP was approved by DLF but has yet to be put in practice. It is also considered that provincial and district offices are understaffed and operation and maintenance budgets are short.

In the light of the above points, this Project is evaluated to be satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

1) Support for group aquaculture

As there were concerns about a possible enlargement of economic disparity between aquaculture farmers and non-aquaculture farmers due to implementation of the Project, attention was paid under the Project to social aspects through the promotion of group aquaculture. However, group aquaculture by WU and low-income farmers' groups, both of which were assisted by the Project, produced only limited results. In supporting group activities, the implementing agency should study the requirements for and the conditions in which group activities operate before judging both whether or not support should be extended and the ways in which support should be provided. For example, regarding the promotion of aquaculture activities by WU, user rights for aquaculture ponds which will form a basis of group activities, and the qualification of group leaders are two important factors for the enhancement of sustainability. Therefore, prior to the commencement of assistance, it is necessary that the implementing agency examine critical aspects such as whether or not a group in question has been provided with continuing user rights for aquaculture ponds and whether or not group leaders are equipped with the sufficient leadership capacity to carry out group activities.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

1) Targeting based on the categorization of aquaculture farmers

Right after the commencement of the Project, a baseline survey was conducted at candidate pilot villages in order to examine the appropriateness of the villages as pilot sites. At candidate extension villages also, a survey was carried out in order to study their adequacy as extension villages. Pilot and extension villages, which were targeted under the Project, were placed in various social as well as natural environments. It is understood that these aspects would influence factors such as the scale of aquaculture, production volumes, and sales volumes at markets. Among the aquaculture farmers supported, some farmers carry out relatively larger-scale commercial operations while others implement small-scale aquaculture practice for home consumption. While aquaculture activities will possibly spread rapidly amid changes in socio-economic conditions, it is thought that support can be more effective if targets for assistance are narrowed down and consensus is formed in advance with regard to which category of villagers or villages are targeted under the Project (for example, the placement of priority on villagers or villages characterized as "home consumption type").

2) Confirmation of the economic incentives of farmers who are expected to transfer technology under the Project

Under the Project, demonstration was made of the effectiveness of the FTF approach, which was intended to transfer technology from farmer to farmer, for example like technology transfer from VADW/core aquaculture farmers to aquaculture farmers. For sustainable operation of the FTF approach, the existence and scale of the economic incentives with which farmers transfer technology are important factors to consider. For example, if VADWs are engaged in fish seed production and intermediate culture, it is expected that they will actively transfer aquaculture technology to nearby farmers in order to expand their sales channels for fish seeds. In this case, it is necessary to know whether or not the competitiveness of VADW against other retailers of fish seeds might be comparatively altered in response to changes in the surrounding environmental conditions including communication methods such as use of mobile phones among farmers, and transport infrastructure such as access to roads. It is also necessary to confirm the operating environment of aquaculture at farm households where the technology is to be transferred, taking into account the possibility of enlarging aquaculture ponds and ensuring continuous water access.

3) Narrowing-down of target provinces and the establishment of Project offices in rural areas:

The technical cooperation Project was implemented in broad areas located in the north and south of the country while the Project office was set up at a training, research and development institute in the nation's capital. During the cooperation period of the Project, Project staff frequently visited the target areas, monitored the Project Activities and transferred technology. As a result, the duration of activities per visit to rural areas had to be shortened. Although the outcomes of the research of the institute could be utilized effectively by establishing the Project office at the institute, activities in rural areas, including capacity improvement for Local Government staff working closer with farmers, would be enhanced by selecting target areas for the Project and establishing Project offices in the target rural provinces (alternatively, shifting the functions of the Project office to the rural provinces gradually during the cooperation period of the Project). In addition, by geographically bundling areas closer together for the Project, it would be easier to formulate a network among relevant people and organizations within the same areas.

4) Selection of appropriate indicators that adequately reflect the characteristics of the Project in the Project Design Matrix (hereinafter referred to as "PDM"):

It was intended that the Project would mitigate the enlargement of economic disparities within a village by promoting group aquaculture based on the experiences gained through the activities of the first half of the cooperation period. However, indicators such as an increase in

fish production volume were simply selected for the PDM and new indicators, which would make this concept of the Project more concrete, were not incorporated as indicators corresponding to the Outputs and the Project Purpose. Therefore, it is necessary to choose indicators that match the Outputs and the Project Purpose which were aimed to be achieved through the Project. For instance, the number of non-aquaculture farmers who participate in the group aquaculture and changes in the fish production volume through group aquaculture could be considered as candidates for such indicators.