Kingdom of Thailand

Ex-Post Evaluation of Japanese ODA Loan Project
Integrated Agriculture Development in Land Reform Areas

External Evaluators: Yuko Kishino and Mikayo Yamazaki, IC Net Limited

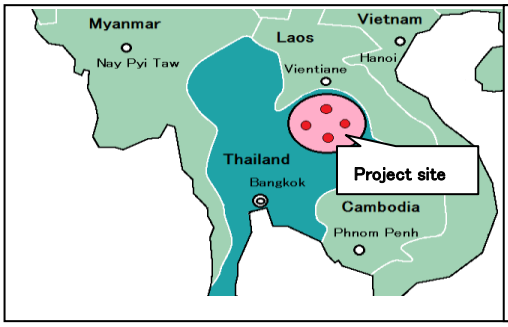
0. Summary

This Project was carried out by the Agricultural Land Reform Office (ALRO) with the objectives of enhancing agricultural productivity, raising incomes, and stabilizing livelihoods in Land Reform Areas of Northeast Thailand. The Project has helped develop farm ponds, farm roads and other basic agricultural infrastructure, and it has provided non-infrastructure assistance in the form of agricultural technical training and help with organization of farmers' groups and the sale and processing of agricultural products. Combined, such support has enabled farmers in the region to cultivate rice, vegetables and fruit and raise fish and livestock in the same area using water from the farm ponds. This method of mixed farming is called "integrated agriculture" in the Project. The agricultural development of Northeast Thailand, which has poor agricultural productivity and high rates of poverty, is consistent with Thailand's development policy and needs and is also in line with Japan's ODA policy. Therefore its relevance is high. Over 90% of beneficiaries adopted the integrated agriculture promoted by the Project, resulting in greater yields and profits and more stable livelihoods for farmers. Accordingly, the Project's effectiveness and impact is high. The Project fell considerably behind schedule because of construction delays and plan changes, but final expenses were around 70% of those initially planned; therefore efficiency of the Project is fair. The Project's development impact is attributable to its flexibility, with modifications made and activities added on over 12 years according to the needs of beneficiaries. There are no problems with maintenance of agricultural facilities such as farm ponds, which have been transferred to farmers. Some issues remain regarding maintenance of farm roads, which have been transferred to Tambon Administration Organizations (TAOs)[1], and irrigation facilities, which will be transferred in the future, but there are plans for continued aid from the Agricultural Land Reform Office, so the infrastructure should be managed sustainably. Therefore, sustainability of the Project effect is fair.

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

[1] Local government in Thailand is divided into provinces, districts, sub-districts (Tambons), and villages. Tambons are administrated by Tambon Administrative Organizations (TAOs).

1. Project Description



Project Location

Fish cultivation in a farm pond.
Fruit trees and vegetables are grown
in the surrounding area.

1.1 Background

In the 1990s, Thailand's economic policies focused on development of the Bangkok metropolitan area, which experienced robust growth as a result. However, little improvement came to rural and agricultural areas, where incomes remained low compared with urban areas. To address the worsening economic disparity, the Thai government refocused development efforts toward agricultural regions, trying to reduce poverty, spread economic activity to rural areas, and better protect natural resources and the environment.

The Thai economy had been centered on agriculture, but industrialization in the 1980s and '90s led to a drop in the share of GDP and exports made up by the agricultural, forestry and fisheries industries. Even so, when the Project was inspected in 1997, those industries employed 57.4% of the Thai workforce, and agriculture was still a principal industry with an essential role in the country's economy.[2]

Northeast Thailand suffers from water shortages[3] and has low soil fertility.[4] Agriculture is made difficult by the inhospitable natural environment; farmers are faced with low yields and limited to growing rice during the rainy season and drought-tolerant crops such as cassava and sugarcane. As a result, the Northeast is poorer than other areas[5]—the average income of a farmer in the Northeast in 1994 was around 65% of the national average.[6] The Land Reform Areas[7] where the Project was carried out were especially impoverished and undeveloped at the time of the Project's appraisal, with widespread degradation of forestland and inhospitable natural conditions for agriculture. Developing the Land Reform Areas and alleviating poverty were considered pressing issues.

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[2] Thailand's principal crops are rice, cassava, sugarcane, and fruit (bananas, mangos, pineapples, etc.). The tropical monsoon climate makes year-round growing possible, and rice paddies can be planted two or three times a year where irrigation is available. Thailand's rainy season is from May to October, and the dry season is from November to April. The mean annual rainfall is 1,500–1,600 mm.

[3] Annual rainfall, at 1,200–1,400 mm, is not much lower than the national average, but the rainy season is interrupted by unpredictable dry spells, and irrigation is scarce; the entire region suffers from a water shortage.

[4] Soil is mostly sandy, making for poor fertility and low moisture retention. Furthermore, salt rising from rock formations and accumulating on the surface causes high soil salinity that inhibits crop production.

[5] The poverty rate (annual household income under 48,000 baht) in 1992 was 13% nationwide, 22% in the Northeast Region, and 46% in the Land Reform Areas (JICA appraisal documents).

[6] JICA appraisal documents

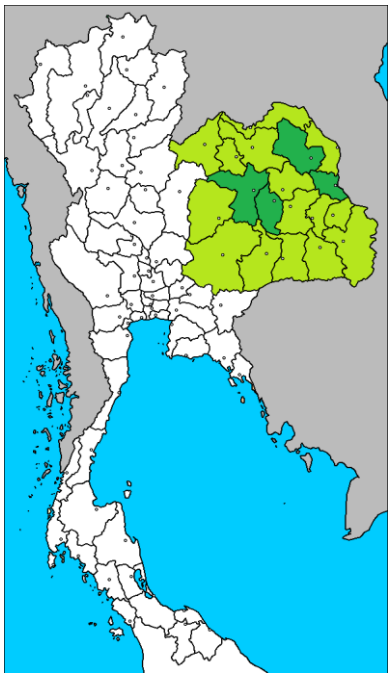
[7] Defined by the Agricultural Land Reform Act of 1975, 46% of these areas belongs to the Northeast Region.

Rural regions also became a focus of attention because of the Asian financial crisis; beginning in July 1997, the crisis resulted in a steep rise in urban unemployment, and people looked hopefully to the agricultural sector to absorb job losses. The Ministry of Agriculture and Cooperatives (MOAC) drafted a new set of economic policy measures to answer the need for agricultural and rural development, granting approval to 80 projects, including this one. The Cabinet approved the proposed measures in March 1998.

1.2 Project Outline

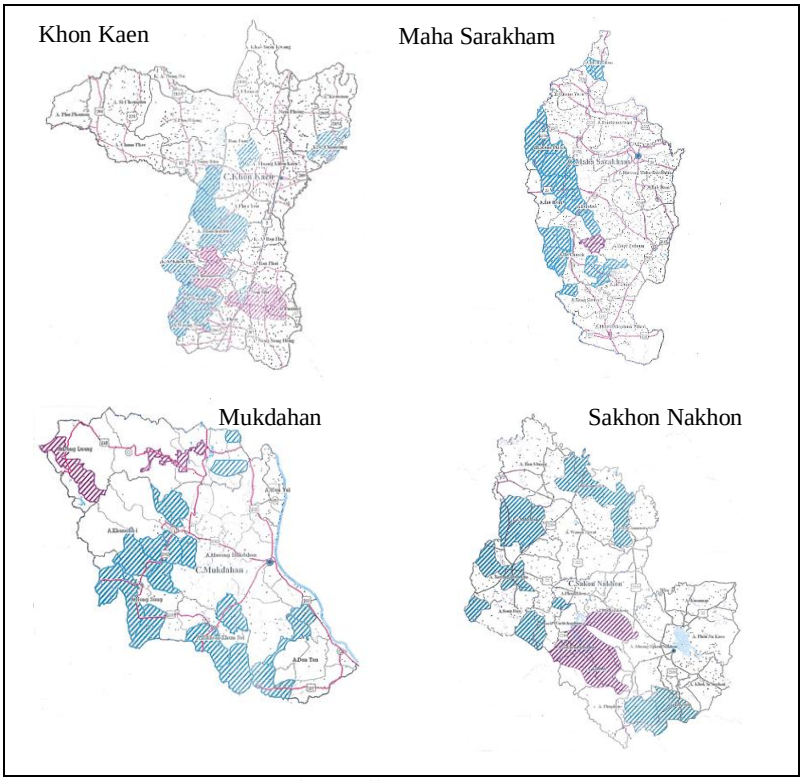
The objective of the Project was to improve agricultural productivity and yields and thereby raise incomes and help to stabilize the livelihoods of farmers in Land Reform Areas in four provinces of Thai's Northeast Region (Khon Kaen, Maha Sarakham, Mukdahan and Sakhon Nakhon), through infrastructure development and technical support for farmers who have received permission to cultivate farmland from the Agricultural Land Reform Office (ALRO).

Loan Approved Amount/ Disbursed Amount	3,617 million yen / 2,686 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	September 1998 / September 1998
Terms and Conditions	Civil works and procurement: Interest rate: 2.2%, Repayment period: 25 years (Grace period 7 years), General untied Consultant: Interest rate: 0.75%, Repayment period: 40 years (Grace period 10 years), General untied
Borrower / Executing Agency	Government of Thailand/ Agricultural Land Reform Office
Final Disbursement Date	November 2011
Main Contractors	None
Main Consultants	Sanyu Consultants Inc. (Japan), TEAM Consulting Engineering and Management Co., Ltd. (Thailand), A&R Consultants Co., Ltd. (Thailand), Sanyu Consultants (Thailand) Ltd. (Thailand) (Joint Venture)
Feasibility Studies, etc.	Feasibility Study on the Integrated Agricultural Development in the Agricultural Land Reform Areas in the Upper Northeastern Region (Sanyu Consultants Inc., 1998)
Related Projects (if any)	Dispatch of ALRO agricultural and civil engineering experts (before the start of the present project) Dispatch of ALRO experts (July 2011 – December 2012)



Source: Evaluators

Figure 1: Project Locations (the Northeast Region is in light green; in dark green, the four provinces where the Project was carried out)



Source: Agricultural Land Reform Office

Figure 2: Areas of Each of the Four Provinces Where the Project Was Carried Out (red denotes the Project sites, blue denotes planned sites for future projects as of the end of the Project)

2. Outline of the Evaluation Study

2.1 External Evaluators

Yuko Kishino and Mikayo Yamazaki, IC Net Limited

2.2 Duration of Evaluation Study

The External Evaluators performed an evaluation study as follows in the course of this ex-post evaluation:

Duration of the Study: August 2012 - July 2013

Duration of the Field Study: November 4–28, 2012 and February 6–9, 2013

2.3 Constraints during the Evaluation Study

The Project encompassed a wide range of activities, such as development of agricultural infrastructure, technical training, organization of farmers' groups, and the processing and sale of agricultural products. Furthermore, these activities were carried out in four different provinces with varying natural environments and socioeconomic conditions. The Project provided support to a large number of farmers, including development of basic agricultural infrastructure (farm ponds, farm roads, and irrigation, etc.) and assistance with technology, processing and sales. Because of the wide scope of the Project and large number of beneficiaries, field surveys performed for this evaluation focused on specific activities and areas.

To supplement field surveys and receive a variety of responses, a wide range of entities were interviewed, including the ALRO (the executing agency), the ALRO offices in each of the four provinces where the Project was carried out, beneficiaries, farmers' groups, Tambon Administration Organizations (TAOs), and other related organizations. The study attempted to understand and accurately evaluate the effect of Project activities from other angles as well; questionnaires were given to farmers who had received multiple types of support, such as agricultural water supply, technical training, and organizational help. The questionnaires included items regarding the state of agricultural production before and after the Project, and support received as part of and apart from the Project.

3. Results of the Evaluation (Overall Rating: B[8])

3.1 Relevance (Rating: ③[9])

3.1.1 Relevance with the Development Plan of Thailand

The Project was highly relevant to the development policy of Thailand at the time of the appraisal. The Project's plans for agricultural and rural development were based on the principle of the "Sufficiency Economy,"[10] which was advocated by the King of Thailand in 1974 and emphasized

[8] A: Highly satisfactory; B: Satisfactory; C: Partially satisfactory; D: Unsatisfactory

[9] ③: High; ②: Fair; ①: Low

[10] A philosophy based on "moderation," "reasonableness," and "self-immunity" for sufficient protection from impact arising from internal and external changes. (Tetsuro Oda, 2011, Rural Development Project Based on "Sufficiency Economy" Concept in Thailand, Journal of Rural Planning Association, Vol. 30, No. 1, 60–63.) Self-immunity means preparation for such impacts.

during the Asian financial crisis of 1997. By promoting development of integrated agriculture[11], the Project has aimed to increase farmers' food self-sufficiency, reduce expenditures on food and agricultural materials, and raise incomes from the sale of agricultural products. These goals are consistent with the philosophy of Sufficiency Economy.

The Project is also highly relevant to Thailand's development policy at the time of this ex-post evaluation. The Sufficiency Economy is the guiding principle of the Eleventh National Economic and Social Development Plan (2012–2016), and reinforcing the agricultural sector—with the goals of improving quality of life, raising incomes, and providing stable employment in rural areas—is part of the national strategy for growth.

By aiming to stabilize livelihoods and raise incomes of farmers in accordance with the principle of Sufficiency Economy, the Project has been relevant to Thailand's national development strategy from the time of appraisal to ex-post evaluation.

3.1.2 Relevance with the Development Needs of Thailand

The Project was highly relevant to development needs of Thailand at the time of the appraisal. In the areas of Northeast Thailand where the Project was to be carried out, harsh natural conditions, poor water resources, and low soil fertility made it difficult to significantly increase crop yields. Farmers were able to cultivate only a limited range of crops, such as rice, which is dependent on rainfall, and cassava; their living conditions suffered as a result. In order to improve their livelihoods, farmers needed to achieve food self-sufficiency and reduce expenses, which they could do if they were able to grow a greater variety of vegetables and fruits, as well as raise livestock and fish. They also needed to be able to increase yields beyond subsistence levels so they could sell the extra produce, make profits, and have stable incomes. The Thai government aimed to address these needs by developing integrated agriculture across the Northeast Region and drew up a scheme to implement it in certain districts, each with distinct natural environments and economic and cultural backdrops. The four sites selected for this project were indeed each distinct in several ways.[12]

The conditions on the ground have not affected relevance of the Project since its launch. As shown in Table 1, which ranks areas by average household income, the Northeast Region was still the poorest area of the country in 2010. Agriculture is the mainstay of the region's economy, and a strong need remains for assistance with water supply, agricultural technology, and organization of farmers' groups.

[11] A form of mixed farming in which farm ponds are dug and the water is used to grow vegetables and fruit in the surrounding area, raise animals such as chickens and pigs, and cultivate fish.

[12] Environment: Khon Kaen and Maha Sarakham are mainly flat, while Mukdahan and Sakhon Nakhon are mountainous. Economic and cultural backdrops: Khon Kaen is located close to urban areas and has a high level of agricultural development; Maha Sarakham does not have any farmers' groups; Mukdahan is home to some minority groups; Sakhon Nakon has an advanced network of farmers' groups.

Table 1: Average Household Income by Region (2010)

Unit: baht/year

Area	Income
Northeast	44,516
North	68,015
South	118,184
East	441,901
West	105,129
Central	218,088
Bangkok	412,887
National average	**160,556**

Source: Gross regional/provincial product 1995–2000,
Thai State Economic and Social Development Agency

3.1.3 Relevance of Objectives

The Project had the following three objectives at the time of the appraisal:

(1) Stabilize farmers' livelihoods in the Land Reform Areas.

(2) Reduce pressure on forestland from illegal development.

(3) Provide employment for people returning to rural areas from the city.

At the time of the project appraisal, many farmers in the Land Reform Areas, which suffered from soil degradation and water shortages, were unable to make a living by farming alone and were forced to either find employment away from home or go deep into debt. The first objective above was therefore relevant to these regions; it aimed to diversify crops, increase food self-sufficiency, raise incomes from the sale of agricultural products, and stabilize farmers' livelihoods through assistance with water supply, agricultural technology, and organization of farmers' groups.

On the other hand, there was no clear path toward achieving the second and third objectives above. The second objective mainly entailed encouraging environmentally friendly agriculture such as community forestry[13], tree planting, and farming methods that do not rely on chemical fertilizers or pesticides. The third objective promoted farming vegetables and other labor-intensive crops, which could be expected to lead to job creation as a side effect, but the Project did not include any activities with job creation as their primary goal because that goal's relevance changed over time. When the project was appraised in the midst of the Asian financial crisis occurred in 1997, job creation was seen as important because of the devastating social and economic effects of the crisis. Rural returnees needed work opportunities, and it was hoped that the agricultural sector could provide them. However, after the Project started, the country's economy began to recover and job creation became less relevant, so attention turned toward activities to expand agricultural production and raise farmers' incomes. The economic recovery allowed the Project to focus more on the development of rural areas through the spread of integrated agriculture.

3.1.4 Relevance with Japan's ODA Policy

Japan's ODA Annual Reports (1997 and 1998) regarding its country-by-country aid to Thailand

[13] A system of managing forests as a group and sharing profits among the group.

state Japan's commitment to actively collaborate toward alleviating poverty in Thailand's rural areas by contributing to the agricultural sector, which employs half the working population, as well as aiding the development of rural areas (especially impoverished areas such as the Northeast Region). The Project is therefore relevant with Japan's ODA policy.

In light of the above, this project has been highly relevant with Thailand's development plan, development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Effectiveness[14] (Rating: ③)

As stated in 3.1.3, the Project aimed to raise incomes and contribute to stable livelihoods by increasing crop yields, agricultural productivity and food self-sufficiency through assistance in the development of basic agricultural infrastructure and organization of farmers' groups. In this ex-post evaluation, the External Evaluators regarded helping farmers achieve stable livelihoods as the main objective of the Project. They investigated improvement of agricultural productivity and expansion of yields in terms of effectiveness and increase in incomes and stability of livelihoods in terms of impact. They viewed reduction of development pressure on forestland and job creation for rural returnees as desirable side effects that could occur as a result of activities related to the main objective.

At the time of the appraisal, the Project did not specify indicators or base/target figures by which to judge operation and effectiveness. In this ex-post evaluation, the External Evaluators judged operation—i.e., development of farm ponds, farm roads and other basic agricultural infrastructure—in terms of irrigation area and access to agricultural water supply. They evaluated effectiveness in terms of cropping area and yield volume. They used crop diversity and food self-sufficiency to determine the effectiveness of efforts to promote integrated agriculture.

The loan expiry date period of the Project was extended in 2005 and 2008, allowing revision of initial plans in order to better meet the needs of beneficiaries[15]. Normally, effectiveness is evaluated by comparing initial plans and actual results. However, when laying the groundwork to develop agricultural infrastructure, a mismatch became apparent between the initial plans and the situation on the ground.[16] Consequently, the Project was revised to better suit the actual situation when an extension of loan was requested in 2004. The revised plan, which was issued in 2005, was based on detailed field surveys and considered an appropriate standard for comparison. Therefore, that plan was used to compare results to indicators whose post-Project values were projectable based on plans, such as irrigation area. Items for which the 2005 plan did not provide numerical targets were evaluated based on beneficiaries' survey responses regarding change over the Project period.

[14] Effectiveness should be judged in consideration of impact to determine a rating.
[15] At the time of the appraisal, plans focused on the development of basic agricultural infrastructure such as farm ponds and farm roads. The 2005 revision provided more non-technical assistance, such as community market development. The 2008 version aimed to raise incomes by offering aid with processing and marketing.
[16] At the time of the appraisal, it was not clear how many farmers wanted farm ponds.

3.2.1 Quantitative Effects (Operation and Effect Indicators)

(1) Irrigation Area

The Project developed basic agricultural infrastructure to provide water access, including farm ponds and irrigation. An in-depth survey was conducted post-launch to understand the situation and needs of each of the Project locations in the four provinces. Based on the results of this survey, the number and scale of infrastructure projects were revised in 2005. As shown in Table 2, irrigation area at the time of the plan revision in 2005 was 7,797 rai (1,247 hectares), while irrigation area at the time of the ex-post evaluation in 2012 was 9,898 rai (1,583 hectares), an achievement rate of 127%.

Table 2: Increase in Irrigation Area[17]

Irrigation area: estimates of 2005 revised plan

Unit: rai (0.16 ha)

	KKN	MHS	MKD	SKN	Total
Farm ponds	1,275	303	73	197	1,847
Farm pond enlargement*	200	136	0	16	352
Community ponds**	10	40	20	80	150
Channels/irrigation	3,926	0	1,522	0	5,448
Total	5,411	479	1,615	293	7,797

Irrigation area: Achieved at time of evaluation

Unit: rai (0.16 ha)

	KKN	MHS	MKD	SKN	Total	Achievement rate
Farm ponds	1,453	337	77	204	2,071	112%
Farm pond enlargement*	140	206	1	23	370	105%
Community ponds**	10	40	10	80	140	93%
Channels	5,766	0	1,552	0	7,318	134%
Total	7,369	583	1,639	307	9,898	127%

*Irrigation area of farm pond enl **Some used for non-agricultural purposes; approximate estimate.

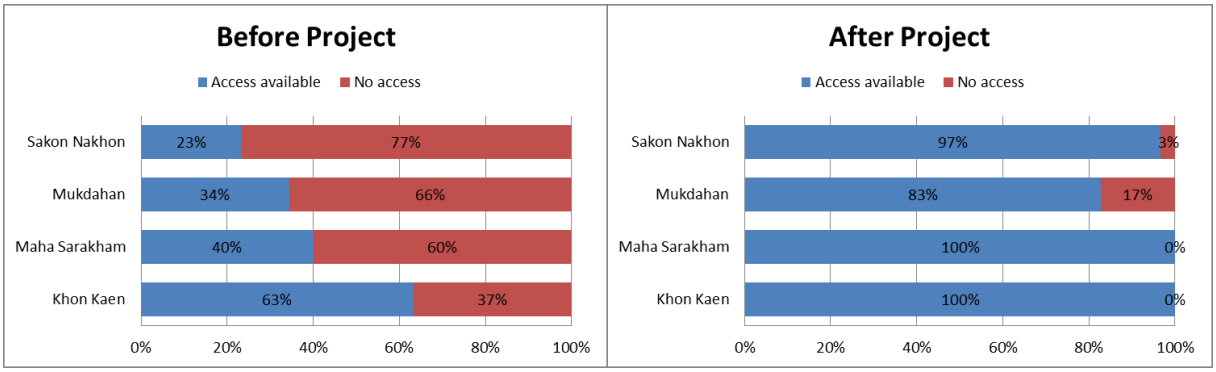
Source: Evaluators, based on interviews with the ALRO Provincial Office Coordinator. Figures from the ALRO Project Completion Report were used for the area of channels and irrigation in Khon Kaen and Mukdahan (Nong No, Nong Waeng, Huai Bang Sai) (2012).
Note: Information was provided by the ALRO regarding the area of farmland that benefitted from large-scale irrigation. The ALRO does not have information regarding land area utilizing farm ponds, farm pond enlargement, community ponds, micro irrigation, or group micro irrigation,[18] so these figures were estimated by the project coordinator in each province's ALRO office, based on their knowledge and experience.

(2) Access to Agricultural Water

In order to evaluate improvement to water access, interviews were conducted with 119 beneficiaries in four provinces (30 in Khon Kaen, 30 in Maha Sarakham, 29 in Mukdahan, 30 in Sakhon Nakhon). Interviewees were randomly selected from ALRO provincial office lists of over 50 beneficiaries in communities that received multiple types of assistance, including water supply aid.

Interviews revealed that prior to the Project, an average 40% of households had access to agricultural water, but an average 95% had access after the Project (Figure 3). The main reason for the dramatic rise in water access was the development of farm ponds. Farm pond water was used to cultivate vegetables and fruit and raise livestock and fish; that is integrated agriculture, which the Project promoted. Farm ponds are seen as essential to this type of farming.

[17] KKN stands for Khon Kaen, MHS for Maha Sarakham, MKD for Mukdahan, and SKN for Sakhon Nakhon.
[18] Micro irrigation and group micro irrigation utilize the same equipment (pipes and sprinklers); the former refers to use by a single household, and the latter refers to shared use by a farmers' group.



Source: Surveys of beneficiaries

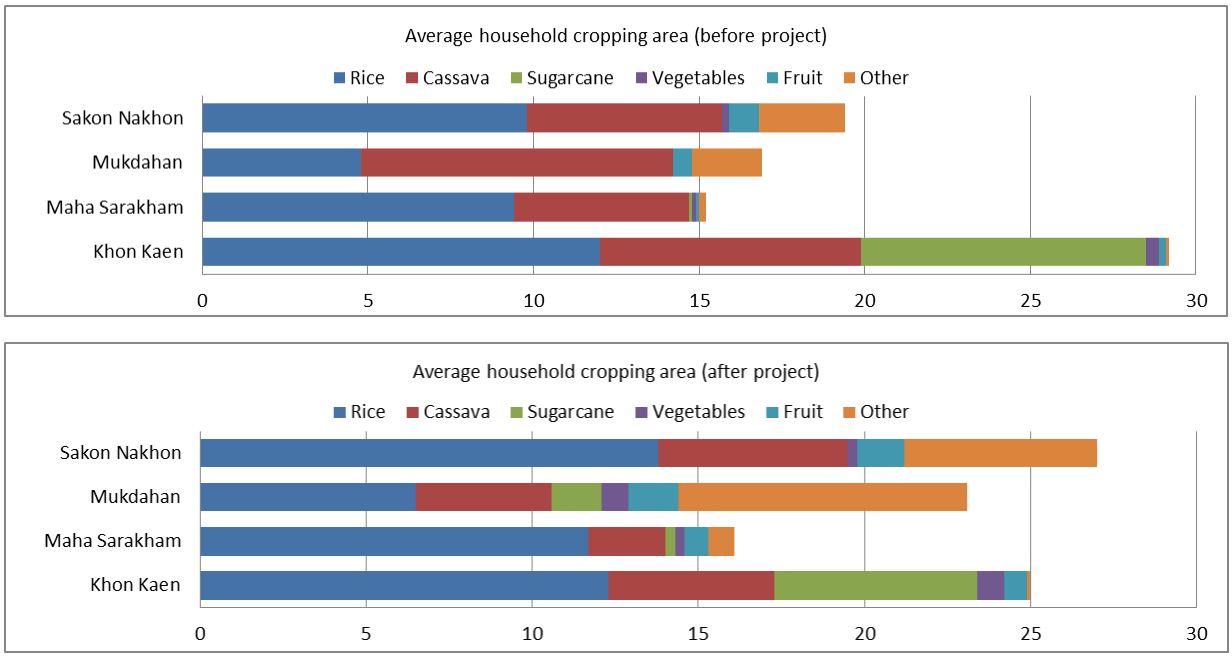
Figure 3: State of Access to Irrigation Water Before and After the Project

(3) Cropping Area

Farmers in the Northeast Region primarily grow commodity crops such as cassava and sugarcane, which are easily affected by yearly weather patterns and market prices. The Project encouraged farmers to grow other types of crops, such as rice, vegetables, and fruit. The goal was to help farmers and their households to grow what they consumed, thereby saving money and achieving food security, and raise their incomes from the sale of extra produce other than commodity crops. Rice cultivation was common before the start of the Project, but few farmers grew vegetables or fruit or had any experience growing them. To help farmers also grow vegetables and fruit in small steps, the Project provided study tours of areas with advanced cultivation techniques, held training sessions, and provided seeds and seedlings.

The survey of beneficiaries investigated average cropping by households in the four provinces and found that cultivation of cassava and sugarcane has declined, while rice, vegetables and fruit have become more widespread (Figure 4). Thus it is fair to say that the Project has succeeded in promoting a shift from monoculture crops such as cassava and sugarcane toward integrated agriculture including rice, vegetables, and fruit. The ALRO's cropping area estimates by province also show that cassava cultivation has decreased and vegetable cultivation has grown significantly (Table 3).

Unit: rai (0.16 ha)



Source: Surveys of beneficiaries

Figure 4: Average Household Cropping Area

Table 3: Cropping Area by Province, Crop

Cropping area (2001)

Unit: rai (0.16 ha)

	KKN	MHS	MKD	SKN	Total
Rice	8,099	8,410	8,099	53,600	78,208
Fruit	1,111	0	1,111	0	2,222
Vegetables	913	0	913	0	1,826
Other agriculture	0	0	0	0	0
Oil palm	0	0	0	0	0
Cassava	29,783	9,466	29,783	38,593	107,625
Replanted forest	25	0	25	694	744
Rubber	347	0	347	325	1,019
Longan	0	0	0	0	0
Eucalyptus	2,037	0	2,037	457	4,531
Sugarcane	3,299	0	3,299	2,719	9,317

Cropping area (2008)

Unit: rai (0.16 ha)

	KKN	MHS	MKD	SKN	Total
Rice	43,693	7,075	7,429	39,468	97,665
Fruit	386	19	833	776	2,014
Vegetables	12,994	0	9	757	13,760
Other agriculture	0	0	0	133	133
Oil palm	0	0	0	103	103
Cassava	18,248	3,503	30,082	14,902	66,735
Replanted forest	0	39	95	598	732
Rubber	24	14	2,235	10,950	13,223
Longan	0	0	0	91	91
Eucalyptus	2,565	221	3,362	2,504	8,652
Sugarcane	11,106	84	1,758	4,494	17,442

Source: Agricultural Land Reform Office

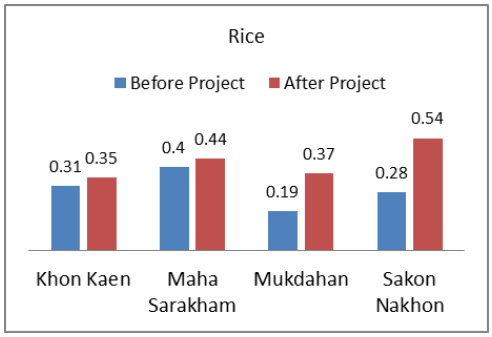
Note: GIS section, through the analysis of satellite images, estimated the area devoted to each crop. The years with available data closest to the start and completion dates of the project were 2001 and 2008, respectively.

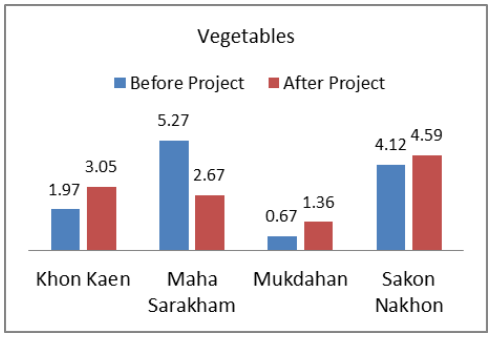
(4) Per-Rai Crop Yields

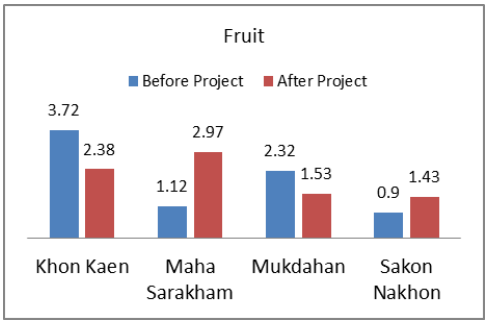
The survey found that per-rai yields of each crop have modestly increased in each province since the Project began (Figure 5). Rice yields grew dramatically, by an average of 43% across the four provinces. Factors that likely contributed to the rise in yields include the use of farm ponds for paddy irrigation (also preventing yield loss during droughts) and the adoption of compost to fertilize paddies, as recommended in project training sessions. Droughts were especially severe in 2012, but this survey found that some farmers were able to alleviate the damage by bringing in water from

farm ponds.

Unit: ton/rai (1 rai=0.16 ha)







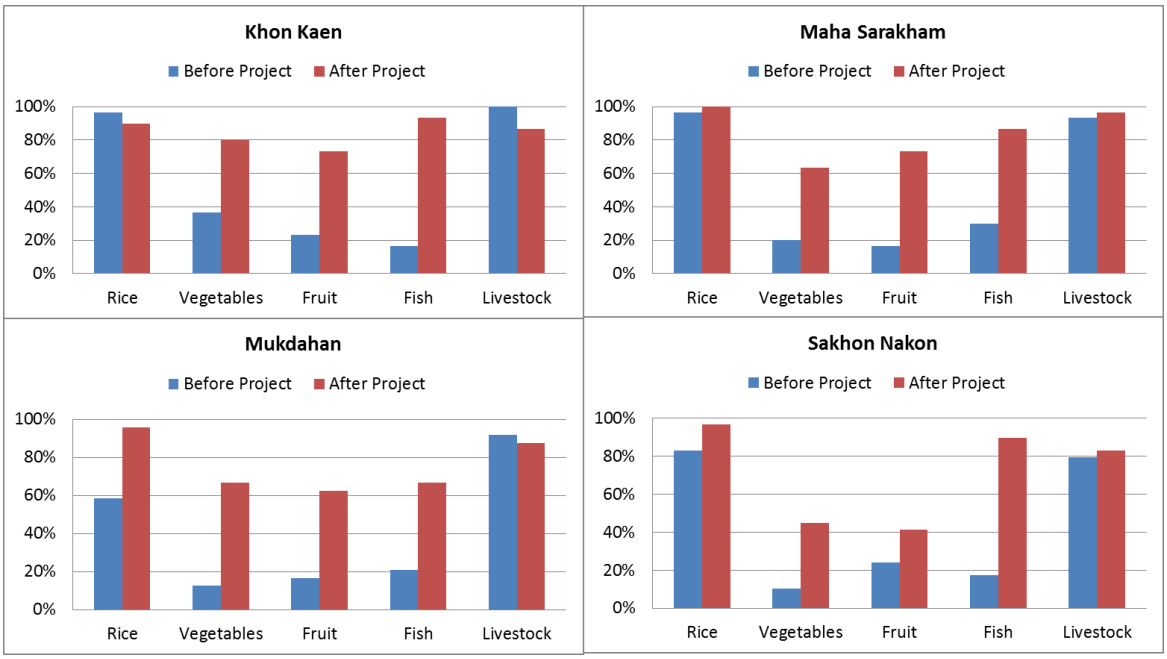
Source: Surveys of beneficiaries

Note: As many farmers grow various kinds of vegetables and fruit in small quantities, it is difficult to estimate overall yields. The figures above may not be precise.

Figure 5: Average Household Yield, Before and After the Project

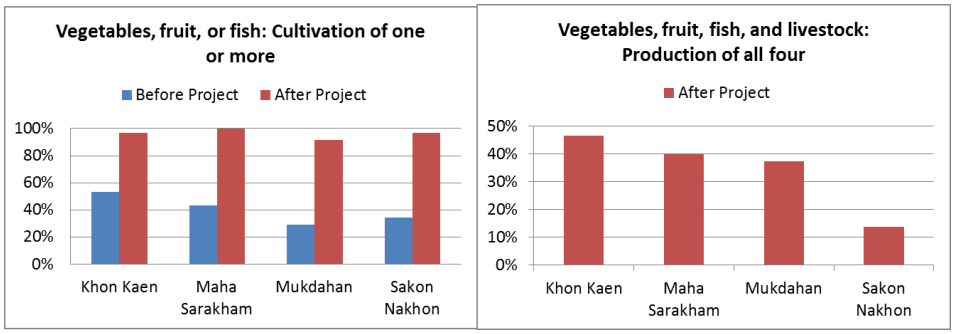
(5) Crop Diversification

Farmers were asked about the number of kinds of crops they grew before and after the Project: on average across the four provinces, 87% answered that they grew more kinds after the Project, while just 5% said they grew fewer kinds. As shown in Figure 6, more than 80% of the 113 farmers who had water access after the Project (95% of all farmers surveyed), cultivated rice and raised livestock before the start of the Project. After the Project, both rice cultivation and raising of livestock had each increased by 10%. Prior to the Project, vegetables, fruit, and fish were each cultivated by around 20% of beneficiaries, but that figure went up dramatically post-Project to 40–90%. This increase in production of vegetables, fruit and rice is attributable to the provision of farm ponds and agricultural training. According to beneficiaries and provincial officials, the farm ponds enabled farmers to cultivate vegetables in rice paddies during the dry season, during which the paddies had not been utilized in the past. Before the Project, 41% of farmers cultivated either vegetable, fruit, or fish, compared to 96% after; this increase signifies the advancement of beneficiaries' efforts to perform integrated agriculture. Furthermore, of 113 households in the four provinces, 39 households (35%) now conduct every type of farming—rice, vegetables, fruit, livestock, and fish—with Khon Kaen the highest at 47% and Sakhon Nakhon the lowest at 14% (Figure 7). The high figure for Khon Kaen is attributable to lower resistance toward growing vegetables because some farmers already grew them before the Project, as well as the close proximity to urban areas where there is a large market for fruit and vegetables.



Source: Surveys of beneficiaries

Figure 6: Production of Rice, Vegetables, Fruit, Fish, and Livestock by Farmers with Access to Agricultural Water



Source: Surveys of beneficiaries

Figure 7: Farmers Cultivating More than One (L) or All (R) of Vegetables, Fruit and Fish

A major reason for the success of efforts to introduce integrated agriculture to regions where farmers mainly grow commodity crops is that the Project provided fine-tuned assistance over the long term that was tailored to the farming-related needs of beneficiaries. First, groups of farmers who had never before grown vegetables were brought on study tours to regions with advanced cultivation techniques, raising their motivation and giving them a goal to aim for. Then, the farmers acquired knowledge and skills for vegetable cultivation by going through training sessions. Simultaneously, the foundation was built for regional collaboration by assisting with the organization of farmers' groups. The combination and continued provision of these programs is seen to have been effective.

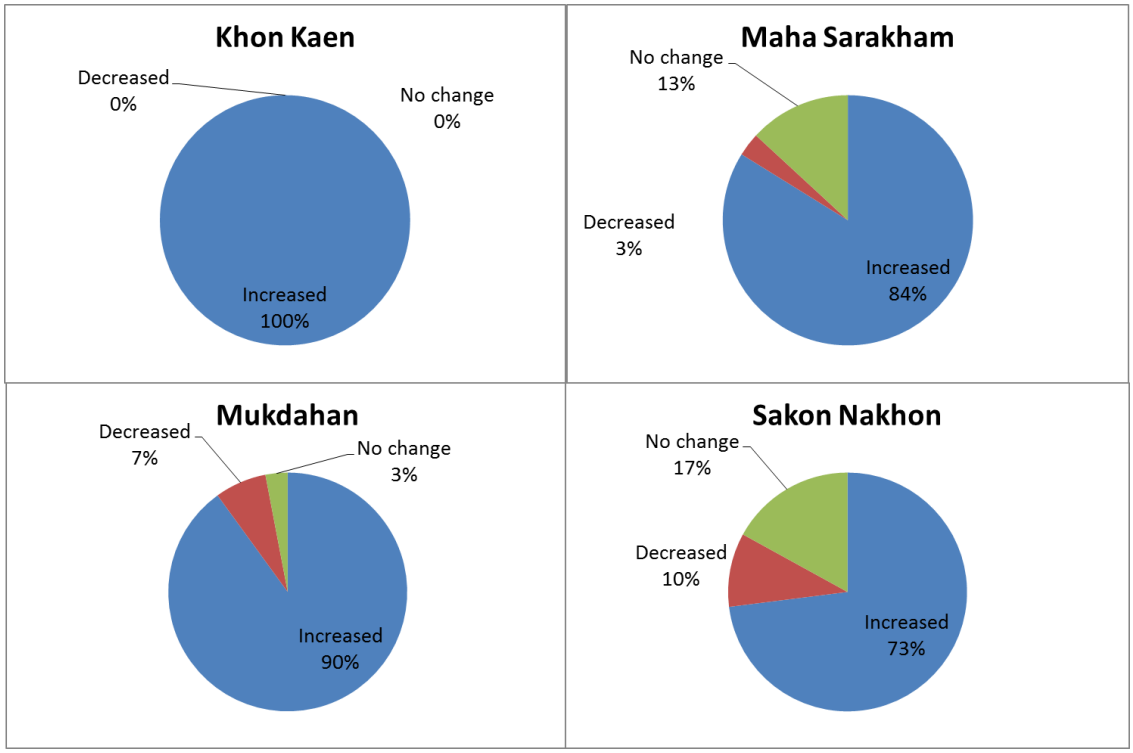
Below is an example of organizational assistance provided by the Project to a farmers' group in Maha Sarakham (Noan Tham Noan Thong Integrated Agriculture Group):

The farmers' group, after frequent communication with the ALRO provincial office, received

permission to use farmland to grow vegetables. The TAO then purchased electronic pumps to draw water, and the Project provided group micro-irrigation kits (sets of pipes and sprinklers to water vegetable fields and fruit trees). Members of the farmers' group individually purchased electric lines and water pipes and set up the irrigation system, completing the infrastructure side of the plan. The farmers voluntarily participated in agricultural training sessions provided by the Project, learning techniques for vegetable cultivation and compost production. The Project also provided assistance with selling the vegetables that farmers had produced: first, the farmers' groups participated in study tours of green markets[19] in Chiang Mai and Surin, and then, they sold their produce in these two locations. According to district records of produce shipped to the green market, 10 to 18 farmers shipped vegetables and fruit every week with monthly sales of 14,000 to 26,000 baht. A member of the Project team also contacted One Tambon One Product (OTOP), area hospitals and other markets in the province and found new sales channels for vegetables and processed goods.

(6) Food Self-Sufficiency

The Project aimed to raise farmers' food self-sufficiency by helping them grow and raise their own rice, vegetables, fruit, fish, and livestock. When beneficiaries were asked whether they had become more self-sufficient over the course of the Project, an average of 87% across the four provinces answered affirmatively (Figure 8). Many farmers who had previously purchased vegetables, fruit and fish are now able to live off what they grow themselves.



Source: Surveys of beneficiaries

Figure 8: Food Self-Sufficiency

[19] In the Project, "green market" refers to markets in urban areas of the district or province for vegetables and fruit grown without use of chemical fertilizer or pesticides.

Figure 9: A Meal Made from Food Produced through Integrated Agriculture (Khon Kaen Farmer)

3.3 Impact

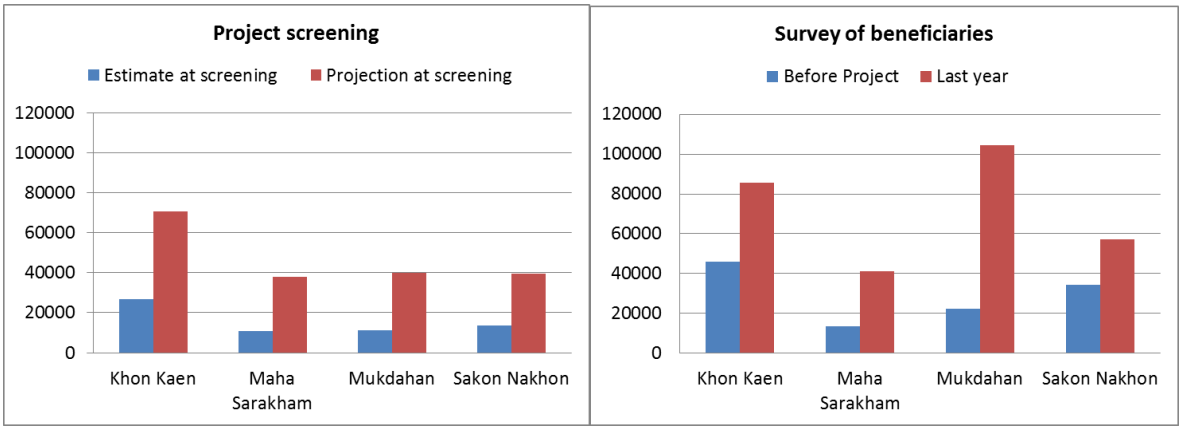
3.3.1 Intended Impacts

(1) Agricultural Income

Over the course of two loan expiry date extensions, the focus of Project assistance gradually shifted from diversifying crops and raising food self-sufficiency toward raising agricultural incomes. Efforts in this area were more successful than had been expected; as shown in Figure 10, at the time of the appraisal, it was projected that beneficiaries' average annual household income from farming would increase by 31,425 baht, but the survey of beneficiaries reported a gain of 43,059 baht or 37% more than had been projected. A major contributor to the gain in income was profits from production of vegetables, fruit, and fish, which had been almost non-existent before the Project.

Many fruits and vegetables have growing cycles of several months to a year, so it takes a long time to learn from experience and grow the crop more efficiently on the next attempt. Therefore, it often takes several years from the start of growing a new crop before farmers can make stable returns. Consequently, the extension of the Project to several years longer than had been initially planned is seen to have had a positive effect on outcomes, as it permitted thorough and sustained follow-up support over a period of ten years. Because the Project was extended, it was also possible to provide assistance with marketing and processing of farm products, which contributed to an increase in farmers' income.

Unit: baht



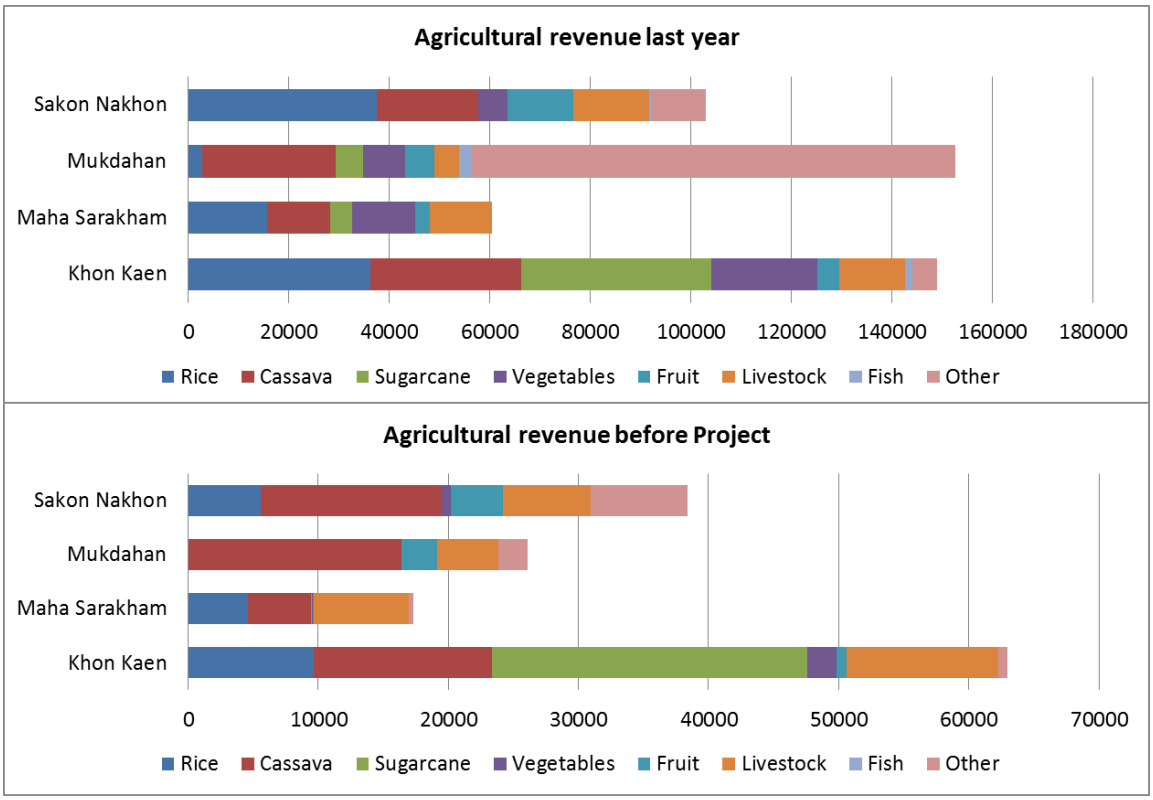
Source: Left - Appraisal materials; Right – Survey of Beneficiaries

Note: The figures above may differ somewhat from the actual averages because the survey only obtained responses from 30 beneficiaries in each province.

Figure 10: Agricultural Revenue

Figure 11 shows the agricultural income per household (before expenses are subtracted), according to the survey of beneficiaries. Vegetables, fruit and fish made up only 7% of total agricultural income before the Project, but by 2012, that ratio had risen to 17%. However, the importance of income from these sources is greater than just the ratio and amount. Commodity crops like cassava and sugarcane are produced and marketed only once a year, so a poor harvest or drop in prices can cause a significant loss of revenue. Vegetables, fruit, and fish, on the other hand, bring in frequent cash revenue, even if each sale is small. That income can offset daily expenses, and growing a diverse range of crops with different harvesting periods also leaves farmers less exposed to the risks associated with monoculture production. Households that cultivate their own vegetables, fruit and fish can save money on food as well. Some households were able to further reduce expenditures by replacing chemical fertilizer with organic compost after receiving training on methods of compost production. The Project also helped some farmers raise new income from the sale of processed food goods by building new facilities and assisting processing groups.

Unit: baht



Source: Surveys of beneficiaries

Figure 11: Agricultural Income per Household, by Province and Crop

Figure 12: Selling Produce at a Green Market (Khon Kaen)

Box 1: Analysis on Value Chain Development

One reason beneficiaries' incomes increased as a result of the Project was the development of a value chain for agricultural products. It was observed that some farmers began cultivating crops for their own consumption and then gradually stepped up production and started selling the produce in or outside their area. The Project is seen to have contributed to the development of a value chain for fruit and vegetables via the following types of assistance.

(1) Careful monitoring and flexible assistance suited to each stage of development

When considering development of value chains for vegetables and fruit, necessary conditions and contributors and constraints differ for achievement of each stage of development, from self-sufficiency to sale of produce outside the area, and continuation of production at each stage. The Project supported the development of value chains by closely monitoring them at each stage and providing the assistance needed in a timely and appropriate manner.

(2) Diverse range of assistance suited to local needs

In order to implement the flexible type of assistance described in section (1), a diverse range of support suited to local needs must be provided. The Project included development of basic agricultural infrastructure, agricultural training, organizational development, and help with processing/marketing, which enabled assistance suited to the characteristics of each area and the issues faced by farmers' groups.

(3) Sufficient time for Project to bear fruit

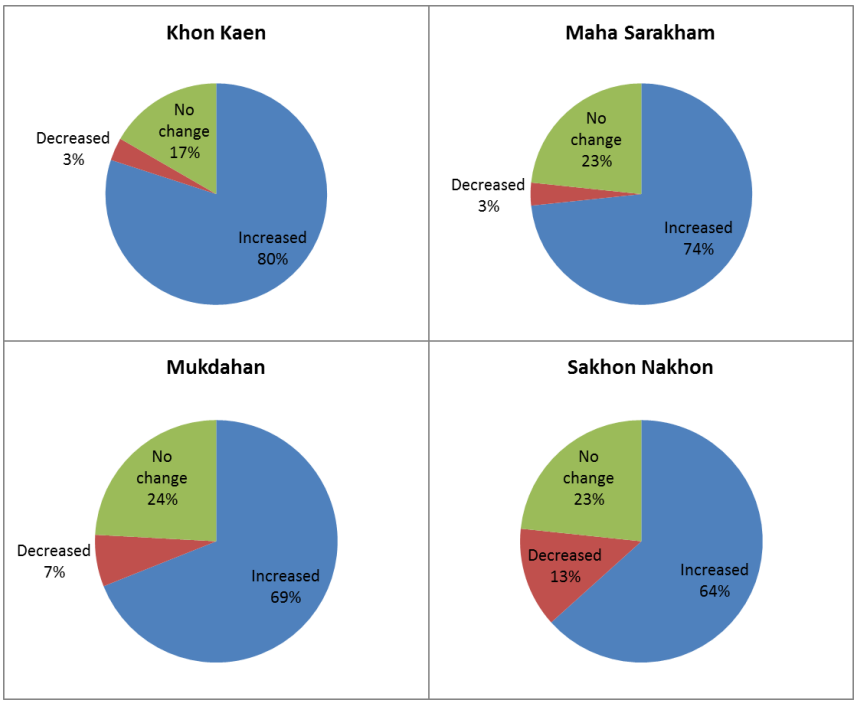
Many fruits and vegetables have growing cycles of several months to a year, so it takes a long time to learn from experience and grow the crop more efficiently on the next attempt. Thus it can take several years from the start of growing a new crop before farmers can make stable returns. Farmers therefore benefitted from the extension of the Project period to 10 years. That beneficiaries could receive the support they needed, when they needed it, is thought to have contributed to the development of value chains.

(4) Motivation connected to technical advancement

The Project attempted to raise and maintain farmers' motivation by introducing successful businesses on study tours, which gave farmers goals to work toward. The Project also contributed to maintaining farmers' motivation by organizing groups of beneficiaries in each area with a skilled and motivated farmer as the leader; the leader assisted members, who also helped one another and learned cultivation techniques via this system.

(2) Achieving Stable Livelihoods

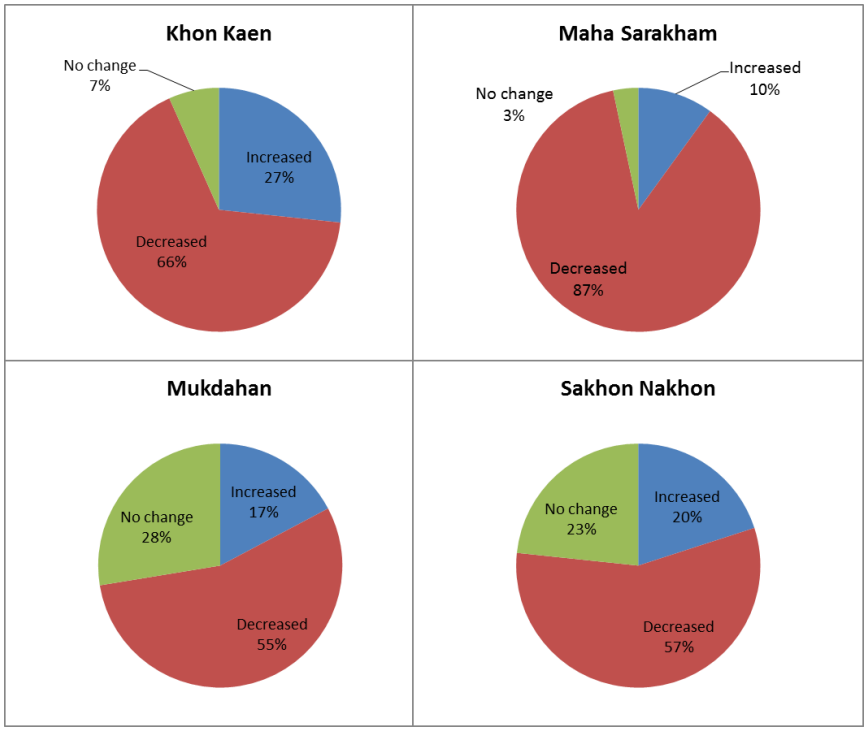
The External Evaluators used the difference in farmers' household savings before and after the Project and the change in yield volatility to evaluate the stability of their livelihoods. The beneficiary survey revealed that 71% of farmers (averaged across the four provinces) had more in savings at the end of the Project compared to the start (Figure 13). The External Evaluators believe that farmers built up a sufficient financial cushion to deal with setbacks such as poor harvests of commodity crops, drops in farm price and unexpected expenditures from sudden events such as family illness, without having to sell off part of their land or other assets.



Source: Surveys of beneficiaries

Figure 13: Increase/Decrease in Savings

A reduction in yield volatility was reported by 66% of beneficiaries, averaged across the four provinces (Figure 14). This is attributable to crop diversification, which lessens the effect of poor harvests for specific crops, as well as the use of water from farm ponds for fruit and vegetable cultivation, which is more stable than relying on rainwater to grow cassava or sugarcane.



Source: Surveys of beneficiaries

Figure 14: Yield Volatility

(3) Environmental Impact

One of the objectives of the Project at the time of the appraisal was to reduce pressure on forestland from illegal development. The 2005 revision added on activities directly related to this goal: assistance with community forestry and distribution of seedlings. Field surveys found that as a result of these efforts, community forests became better conserved, and beneficiaries planted and raised seedlings on their land.

Figure 15: A Community Forest (Maha Sarakham)

Many activities had contributed to environmental protection. Specifically, the Project trained farmers to produce and use compost instead of chemical fertilizer as much as possible and assisted in developing a market for organic vegetables with higher sales prices than non-organic produce. Training in compost production helped farmers reduce expenses by making organic fertilizer from materials available nearby. In Maha Sarakham, assistance was provided toward cultivation, processing, distribution and sale of organic rice. The Project also encouraged farmers to plant fruit and other trees around farm ponds.

These efforts resulted in a number of positive effects on the environment. Before the Project, chemical fertilizer and pesticides were widely used for cultivation of cassava and sugarcane; after the project, many farmers said using organic fertilizer to grow vegetables, fruit and rice had led to improved soil quality. In the survey of beneficiaries, 54% of farmers (averaged across four provinces) reported an improvement in soil. A majority of respondents also said that the Project had a positive environmental impact, with some from each province citing the increase in greenery as a specific example, which is attributable to efforts to promote the planting of fruit and other trees around farm ponds and plots. Interviews also indicated that more respondents saw it as important to care for natural resources as a result of Project activities. The change in farmers' attitude toward the environment is seen as a significant positive impact.

Figure 16: Liquid Compost, Being Aged in a Plastic Bucket (Khon Kaen)

(4) Creating work opportunities

Farmers were asked in the survey of beneficiaries whether they employed more, fewer, or the same number of laborers; overall, 28% answered “more,” 24% answered “fewer,” and 48% answered “the same number,” indicating no significant trend in either direction, although there were slight differences between provinces. Reasons for increase included the need for more hands for farm work and the engagement of more families in farming. A common reason for decrease was children growing up and leaving the house to take up employment elsewhere or pursue schooling.

Looking at the results according to the rainy and dry seasons, previously, many farmers were unable to grow crops during the dry season because of lack of water access, so they had to find short-term jobs in urban areas. Now, many farmers report that the availability of water from farm ponds enables them to cultivate in the dry season as well. Some farmers also say that, because their incomes have grown from producing vegetables and fruit, family members have been able to quit jobs in cities and return to help on the farm and more children are staying to work in agriculture and help their parents after graduating from high school. Cultivation in the dry season is seen to have had a significant positive impact on farmers’ lives, as they can stay with their families rather than having to find work elsewhere.

3.3.2 Other Impacts

The implementation of the Project has not entailed any resettlement of residents or land acquisition.

In light of the above, the Project has largely achieved its objectives; therefore its effectiveness and impact is high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

(1) Plan Revisions (Project Component)

As shown in Table 4, the plan at the time of the Project appraisal in 1998 was revised significantly in 2005 and 2008 when the loan expiry date was extended. These changes are described in further detail in (3).

The initial plan called for the promotion of integrated agriculture as soon as ponds had been provided to beneficiary farmers. Focused primarily on the establishment of agricultural infrastructure, it did not place much importance on support efforts to popularize agricultural technologies or organize farmers. As the project progressed, however, the executing agency, ALRO, started to recognize just how much farmers engaging in integrating farming for the first time needed them to help popularize agricultural technologies and organize farmers. Employees at provincial offices voiced the opinion that simply digging farm ponds was not enough to allow the beneficiaries to independently engage in integrated agriculture. Revisions to the plan in 2005 led to an increase in non-technical support comprised of agricultural guidance and farmer organization. Farmers who were able to produce more fruits and vegetables than they needed for their own consumption now needed to find a market for their surplus produce. Thus, the development of community markets as distribution and sales-related activities was added to help support to farmers.

Because the Project focused on the development of participatory farming and agricultural communities, the External Evaluators believe that it was reasonable to have decided the plans after requiring an adequate understanding of the willingness of farmers to participate in the Project. As described below, the Project suffered from delays, both in the employment of consultants and in the actual start of the project more than two years later than planned. Based on the fact that there was far less need for farm pond construction than initially expected, the External Evaluators believe that conducting investigations into the specific needs of the target areas of each province and revising the initial plan at the time of the extension were appropriate actions. They also believe that the executing agency intended to use trial and error to ascertain the level of support required by the beneficiaries to construct a model to help promote integrated agriculture and that this was behind their flexible revision of the Project plan. Furthermore, they do not see a particularly large divide between the revised plan of 2005 and its actual achievements.

The plan was revised a second time in 2008. The purpose of this revision was not only to help farmers sell surplus produce at village or county markets, but also to create a model that would help increase farmer income through efforts to process produce and create added value and distribute that produce to outside markets. This revision led to plans for the construction of four processing plants, support for groups that process and sell organic rice, seasonings, and other food items, and processing- and marketing-related training.[20]

[20] The field survey of this evaluation covers the organic rice processing plant group of Maha Sarakham and the seasoning processing plant group of Sakhon Nakhon. The organic rice group consisted of a single TAO and 47 members from multiple villages, while the seasoning group consisted of 25 women from a single village.

Table 4: Changes in Planned Output and the Actual Results

Output		Unit	Initial Plan (1998)	Revised Plan (2005)	Extended Plan (2008)	Results (2011)
Basic agricultural infrastructure	Farm ponds	ind.	10,714	4,232		4,703
	Farm pond enlargement	ind.	1,607	649		650
	Community ponds	ind.	20	29		28
	Farm roads	km	504	830		818.03
	Farm road repair	km		108.2	108.2	215.21
	Channels, irrigation	rai	13,800	5,448		7,288
	Micro irrigation	ind.	N/A	1,624		1,617
	Group micro irrigation	ind.	N/A			11
	Shallow wells	site	N/A	N/A	2	2
	Map (1/4,000)	rai	300,000			300,000
	Construction equipment	unit	33	Cancelled		
Environment	Soil/water conservation	rai	6,000	Cancelled		
	Community forestry	site	N/A			6 community forests established
	Natural resource management		N/A			Numerous nurseries established, over 100,000 seeds planted, etc.
Organizational development	Farmers' groups	group				49 farmers' groups established, 19 groups improved
	Water users organizations	group				2 new groups established
	Farmers' networks	network				4 networks improved
	Executing agency, local government, community cooperation		N/A	N/A		Cooperative relationship w/ 8 TAOs
Processing marketing	Community markets	market	N/A			8 community markets
	Green markets, green corners	market	N/A			4 green markets, 2 green corners (within community markets)
	Processing plants/processing groups	group	N/A	N/A		4 processing plants/processing groups
	Contract cultivation		N/A	N/A		Tobacco cultivation in Mukdahan, etc.
	Training	course	N/A	N/A		8 processing training courses, 5 green market/community market training courses, 2 contract cultivation courses
Youth and new farmer development	Youth in school	course	N/A	N/A		6 school training courses
	New farmer development	person	N/A	N/A		85 new farmers
Low-interest loans to farmers	Low-interest loans	baht				50.59 million baht

Source: Created by External Evaluators based on Project-related data
Note: Blank spaces in the table indicate target values that had not been determined.

(2) Impact of Changes on Project Effectiveness

Plan revisions were a big plus in terms of boosting Project effectiveness. In particular, the activities of several processing groups and vegetable sales groups had a clear effect on improved income. A rice processing group in Maha Sarakham has been using rice sales, labor provision, business investment and other methods to create income for its members. Support for this rice processing group has come from many places: the Project built a processing plant and provided a rice milling machine, special government agencies provided technical guidance on organic rice cultivation, research institutions provided training on the nutritional properties of rice, and NGOs provided training on how to protect indigenous rice varieties and universities developed packaging. From the community markets of villages to district and provincial green markets and hotels, groups within each province's vegetable groups are also cultivating new markets for their produce. This has resulted in increased quantities sold, which, in turn, has led to an increase in sales price. It could be said that gradually supporting the Project's sales methods in accordance with the level of farmer groups has led to expanded markets. Specifically, Project authorities found it difficult to expand into hotels and other outside markets if they did not go out and find customers. This was a case in which the high added value of the agricultural products was successfully marketed. Supporting processing groups allowed the ALRO to accumulate knowledge and experience on how to provide support for agricultural processing, distribution, and sales. These findings were later summarized in a manual at the conclusion of the Project.

Figure 17: Processing Group's Organic Rice Products (Maha Sarakham)

In this way, the flexible and combined provision of basic agricultural infrastructure, agricultural technologies, farmer organization, processing and marketing, and financing in accordance with the needs of the beneficiaries lead to the Project's effectiveness. Farmers were able to grow vegetables and fruits and raise fish to produce food for personal consumption for the first time. Many among the farmers were able to increase their production to levels that resulted in surplus produce that could be sold, while some were even able to add value to their produce and sell it to outside markets.

(3) Individual Component Outputs

1) Basic Agricultural Infrastructure

The numbers of farm ponds, farm pond enlargements and canals and irrigation facilities were dramatically reduced in the revised plan of 2005. The main reason for this reduction was that the Project required that farmers possess a land certificate for their land if they wanted a farm pond to be constructed on it. At the time of the appraisal, the Project team had greatly overestimated the number of land certificates that would ultimately be issued. The External Evaluators believe that the difficulty involved in precisely predicting the number of farming households that would possess these certificates at the time of the appraisal made changes to the plan unavoidable. For basic agricultural infrastructure, the ALRO planned to purchase construction machinery for construction, but Thai government policies led to changes in the scope of the ALRO's work[21] and forced them to outsource construction work.

Micro irrigation, group micro irrigation, shallow wells and other facilities designed to secure water for irrigation were added to the plan in 2005. Micro irrigation consists of sprinklers and water pipes designed to irrigate expanses of fruit and vegetables at reduced labor, and they were introduced to enhance agricultural production. As of this evaluation, the utilization rate is half capacity at best. Farmers cultivating crops bound for the market on large expanses of land found the equipment to have a high utility value despite the electricity and fuel costs required to run the pumps because it allowed them to efficiently irrigate their fields. Farmers cultivating vegetables and fruits for personal consumption, however, found the utility value to be low in terms of labor and cost involved. Consideration of this point when selecting target recipients is believed to have raised the utilization rate of micro irrigation. Shallow wells reduce the amount of agricultural land available and eliminate the option of digging ponds. For this reason, they were introduced to small areas where agriculture land per household is small.

Figure 18: Vegetable Cultivation Using Micro Irrigation (Maha Sarakham)

[21] Agricultural infrastructure development was removed from ALRO responsibilities because of a policy shift within the Thai government. ALRO duties of allotting land and installing infrastructure in place when the Project started have changed, and ALRO now exists to support farmer organizations and networks and promote the spread of agriculture.

Many of the beneficiaries desired farm roads, leading to an upward revision to the plan's budget for them in 2005. Surveys of beneficiaries and interviews with farm road users revealed that the farm roads greatly improved product transport and farm work commutes. The External Evaluators found that these roads worked in synergy with agricultural water and agricultural technical assistance to positively impact the production and distribution of agricultural produce.

Figure 19: Farm Roads Used to Transport Agricultural Products and Materials (Khon Koen)

2) Environment

The Project team made plans for afforestation and facility construction required to maintain soil and water quality around large-scale irrigation facilities. However, these plans were cancelled because the team was unable to receive approval from the private farmers who owned the target areas. On the other hand, activities added to the plan in 2005 included the development of community forestry, the production of seedlings, and the distribution of seedlings to those who desire them. Community forestry established rules for using forests, planting seeds, educating local residents and other activities intended to help regrow abundant forests.

3) Organizational Development

The executing agency decided that it would be best to engage in activities in ways that would enhance cooperation with TAOs that would be responsible for maintaining farm roads and irrigation facilities after Project completion. This led to the 2008 addition of items intended to enhance cooperation among the ALRO, TAOs and the local community. Specifically, these additions included the sharing of information related to Project activities and meetings between Project authorities. Staff members from ALRO provincial offices reported that they were able to establish good working relationships with TAOs during the second half of the Project.

4) Processing and Marketing

The ALRO’s intent to find customers for the surplus agricultural produce of farmers led to the 2005 addition of support for community markets and green markets. Furthermore, the ALRO's desire

to create a model for selling agricultural produce and processed agricultural products with added value to outside markets led to the 2005 addition of support for processing plants and processing groups. These additions significantly increased the farming income of project beneficiaries.

5) Development of Younger and Next Generations of Agriculture

These items were added in 2008. Behind this addition was the awareness of this problem among farmers and the ALRO's desire to respond to the younger generation's loss of interest in agriculture. Agricultural training was offered to high school students, middle school students, elementary school students and other young people interested in farming with the hope that these youth might someday inherit local agriculture. People have said that some youths showed a greater interest in agriculture after participating in the training offered as a part of this assistance.

6) Low-Interest Loans for Farmers

This has not changed since the time of the appraisal. These loans have been used to cover personal expenses for the work of enlarging farm ponds, buy cattle and agricultural machinery and fund a variety of other agricultural investments.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The total Project cost at the time of the appraisal was 4.975 billion yen (3.617 billion yen in Japan's ODA loans). Comparatively, the actual cost was 3.426 billion yen (2.686 billion yen in Japan's ODA loans), or 69% of the planned cost. The primary reasons for the reduced cost were the significant reduction in the number of farm ponds to be constructed following the 2005 plan revision and reductions to the budget for basic agricultural infrastructure due to the cancellation of irrigation facilities.

The Project cost of loans for the installation of basic agricultural infrastructure decreased from 2.975 billion yen at the time of the appraisal to 1.453 billion yen[22]. Considering that the actual irrigation area was 27% greater than what was estimated in the revised plan of 2005, the construction cost per unit area was reduced to a level significantly lower than that of the initial plan.

Reviewing the items of the project changed the scope of consulting services required and led to an increased budget. Reinforcing the areas that ALRO staff members were unable to handle themselves with consulting services was necessary to ensure that activities proceeded smoothly and effectively.

3.4.2.2 Project Period

At the time of the appraisal, the Project was scheduled to last 58 months, from June 1998 to June 2003. In reality, the loan expiry date was extended twice and the Project lasted 150 months, from June

[22] The irrigation area was reduced to 55% of that of the original plan. The planned amount when this reduction is applied is 1.636 billion yen, which is 89% of the actual result.

1998 to February 2011[23] (258% of what was planned).

The primary reasons for the initial extension were delays in the selection of consultants and the construction of farm ponds and other basic agricultural infrastructure. The selection of consultants was delayed approximately two years because of the influence of slow decision-making on the part of the ALRO and delays in domestic procedure. There were a number of reasons for construction delays. First was a change in policy to outsource infrastructure development that, prior to the Project, had been directly managed by the ALRO itself. The ALRO's network of construction companies was inadequate, and the contractors that the ALRO outsourced to were small in scale. Possessing multiple contracts and a shortage of construction equipment and funds tended to delay construction efforts. Because the initial contract was for over 10 million baht, progress could not be made on bidding procedures until the construction of a fair number of farm ponds had been decided. Delays to construction planned for the dry season pushed them into the rainy season, and, having to wait until the next dry season, the construction schedule lagged even further. To deal with these circumstances, the lower limit of the initial contract was abolished, reducing the period between the completion of construction and payment, and improving delays in construction. In response to the problem of construction delays due to construction companies possessing multiple contracts, companies were restricted to only two contracts at a time.

The background and purpose of the second extension differ from those of the first. The ALRO wanted to intensify efforts to process, distribute, and sell the surplus agricultural produce by farmers to increase their income even further after implementing the Project. The ALRO requested the development of agricultural produce processing centers and the creation of a model for support for processing, distribution, and sale of agricultural produce, once again extending the loan expiry date.

It is worth noting that the lengthening of the Project period contributed to its effectiveness. Vegetables and fruits can only be harvested once or twice per year, and farmers need a great deal of time to go through the trial and error required to improve the size and quality of their harvests. The External Evaluators believe that the long period of assistance allowed the cultivation of vegetables and fruits to take hold. Time spent enhancing the organization of farmers' groups and training exemplary farmers whose farms became Learning Centers[24] led to efforts by independent organizations and individuals to promote integrated agriculture even after the completion of the Project.

3.4.3 Results of Calculations of Internal Rates of Return (IRR) (Reference Value)

Assuming a Project life of 30 years, a cost based on the Project cost and the costs to maintain facilities, and a benefit based on increases to the production value of agricultural produce, the economic internal rate of return (EIRR) calculated at the time of the appraisal was 15%. When recalculating this value, cost was based on the Project cost and consulting and service costs submitted by the executing agency and facility maintenance cost estimates determined through interviews.

[23] The last contract for construction of the Nong No Pumping Station in Khon Kean province was completed on 8 February 2011.

[24] Beneficiaries who excel at integrated agriculture initiatives are positioned as Learning Centers that serve to transfer technologies to other beneficiaries.

Positive and negative benefits were calculated based on production value increases in relation to land use and the opportunity cost of production value of agricultural produce lost through the development of basic agricultural infrastructure. The result was an EIRR of 10.9%. Additionally, the calculation method for increases to the production value of agricultural produce used at the time of the appraisal was not specified, so it is possible that the calculation method used during the appraisal differs from that of the post-project evaluation. Because of this possibility, the External Evaluators did not compare appraisal and ex-post project evaluation values.

In light of the above, although the Project cost was within the plan, the Project period was significantly exceeded. Therefore efficiency of the Project is fair.

3.5 Sustainability (Rating: ②)

3.5.1 Structural Aspects of Operation and Maintenance

At the time of Project appraisal, the plan basically called on individual facility owners to take responsibility for their maintenance. In other words and as can be seen in Table 5, it was envisioned that the farmers that owned farm ponds would be responsible for maintaining them while communities would be responsible for maintaining community ponds and the ALRO would assume responsibility for the maintenance of farm roads and various irrigation facilities.

After the start of the Project, there was a shift in Thai government policies that made the operation, maintenance, and management of the agricultural infrastructure established by the Project the responsibility of individuals or TAOs. Control of farm ponds, micro irrigation, and shallow wells was transferred to individuals. Control of community ponds and processing plants was transferred to TAOs and their everyday maintenance to communities and processing groups, respectively. Maintaining farm ponds and community ponds is easy, and the performance of the processing plants so far has revealed few issues in terms of future maintenance of these facilities. On the other hand, the control farm roads transferred to TAOs and of control of irrigation facilities slated to be transferred to TAOs are organizationally problematic because TAOs are short of capable personnel. As described below, there are also technical and financial issues with which to be dealt and a need for TAOs to strengthen their maintenance systems.

Table 5: Agricultural Infrastructure

	At time of investigation	Actual Result
Farm ponds	Individual	Individual
Farm pond enlargement	Individual	Individual
Community ponds	Community	TAOs
Farm roads	ALRO	TAOs
Irrigation	ALRO	TAOs/ALRO
Micro irrigation		Individual
Group micro irrigation		Individual
Shallow wells		Individual
Processing plants		TAOs

Source: Data at the time of the appraisal, Agricultural Land Reform Office

In terms of the dissemination of integrated agriculture, the ALRO policy of making farmer groups self-reliant has enhanced their ability to work together in an organizational capacity. For this reason, focused assistance will not be needed upon completion of the Project. Nonetheless, some groups do not yet share this same level of organizational ability. Similar to what provincial offices have already implemented, it is important that the activities of groups like these are monitored at fixed intervals and that consultation occurs if a problem arises. Specifically, if a machine at a processing plant breaks down, the processing group consults with a provincial office and receives an introduction to a repair service. Additionally, it would be best to continue study tours, equipment procurement and other low cost assistance. The ALRO has already received requests for assistance from farmers' groups and is considering budget allocations for them.

The ALRO has proposed policies that would use the accumulated expertise and model of the Project to expand activities focused around farmer-to-farmer outreach and technology transfer and take advantage of the farmers' groups it has trained up until now to allow farmers to use exemplary farmers as Learning Centers. Provincial offices have also drawn up action plans.

Based on the above, no major problems have been observed in terms of the Project's operation, maintenance and management systems.

3.5.2 Technical Aspects of Operation and Maintenance

No problems are foreseen in terms of farm ponds, micro irrigation, and other facilities transferred to individual control, because they are technically easy to maintain. With farm ponds, for example, the farmers themselves can perform the work of mowing slopes or planting vegetation that will serve as retaining walls on slopes that appear likely to collapse. Micro irrigation sometimes requires minor repairs of pipes and sprinklers or the replacement of broken parts, but this, too, is within the range of what farmers are able to handle by themselves. These maintenance methods were taught in the training offered to farmers as part of the Project. If a larger problem arises, farmers can request repairs from a construction company or consult with coordinators or engineers at ALRO provincial offices. These offices are staffed with a number of university-graduate engineers and technical school-graduate technicians.

Despite control being transferred to TAOs, community ponds maintained on a day-to-day basis by communities are similar to individual farm ponds in terms of the ease of maintenance involved. Day-to-day maintenance, simple repairs, and other tasks at processing centers are the responsibility of processing groups that are able to consult with TAOs or the ALRO in the event that a larger problem arises.

Farm roads placed under control of TAOs are not technically difficult to maintain. They periodically require repair, but the work is easy enough for local contractors to handle. On the other hand, the two irrigation facilities set to be placed under the control of TAOs will require repairs to pumping stations, waterways, and other facilities. Maintenance at this level may prove difficult for the technical capacity of the organizations as they currently exist. TAOs that will control the two irrigation facilities have only one technical school-graduate technician assigned to each TAO, and it will be up to

them to respond to every technical issue faced at those facilities. The small number of technical staff is also likely to complicate management of the irrigation facilities. Although a maintenance manual for the irrigation facilities has been created, the technical abilities of TAO staff members is not at a level that will allow them to use the manual to carry out the maintenance required. Although the ALRO maintenance of the facilities will continue for several years to come, the plan is for control of the facilities to be gradually transferred to TAOs. Whether or not TAOs can improve their maintenance capacity and steadily take control of the irrigation facilities remains an issue.

The ALRO will not have any problems, as they are staffed with the project managers of this project as well as engineers specialized in agricultural infrastructure. They also have engineers stationed at nearby provincial offices.

Figure 20: Irrigation Facility Pumping Station (Mukdahan)

3.5.3 Financial Aspects of Operation and Maintenance

Individuals bear the maintenance costs of farm ponds, micro irrigation and other individually controlled facilities, but the expense is low enough as to not be a problem financially. For example, the biannual mowing of farm ponds is a task that can be performed by a single individual in a day's time. Also, in the case of spare parts of micro irrigation, sprinkler heads (the part that rotates and sprinkles water) cost several dozen baht (100–200 yen), and farmers interviewed reported buying them at agricultural equipment stores in nearby towns.

Community ponds that have been transferred to TAOs but are maintained on a day-to-day basis by communities are similar to individual farm ponds in terms of cost of maintenance. Interviews with staff at ALRO provincial offices revealed that the work of cleaning and mowing the areas around community ponds and planting trees and vegetation as retaining walls typically takes two days per year at a cost of 300–800 baht (980–2,600 yen) per community pond. Heat, electricity, water, and other operating expenses of processing plants, as well as the day-to-day maintenance and repair of buildings and machinery, are the responsibility of the processing groups that use them. Through the major operating expenses of electricity and water differ modestly from facility to facility, annual costs are estimated to be 3,000–10,000 baht (9,780–32,600 yen), which is well within the scale of what

these processing groups are able to handle with the profits they earn from the sale of their processed goods. Because the facilities are still new, there is little in terms of additional maintenance cost. Some processing groups are also planning to start saving money in anticipation of future maintenance expenses.[25]

Farm roads placed under control of TAOs can be damaged by heavy rainfall and will require partial repairs at the close of the rainy season in each year. There will be few financial issues with larger TAOs that will command a budget equally large in scale, but smaller TAOs command smaller budgets that could jeopardize their ability to allot the budget required for farm road maintenance. A measure being considered by the ALRO would loan their own construction equipment to TAOs and allow TAOs to use that equipment to repair roads as long as TAOs are willing to pay for fuel. This method has proved effective in other regions, and it may also be applied to the target areas of the Project.

The two large irrigation facilities that have not yet been placed under the control of TAOs are expensive to maintain. Though the ALRO bears these expenses at the time of survey in September 2012, how TAOs and water users' organizations will bear the maintenance costs in the future remains an issue. According to ALRO estimates, the irrigation facility in Nong No, Khon Kaen will cost 720,000 baht (2.35 million yen) per year to maintain, while the irrigation facility in Huai Bang Sai, Mukdahan will cost 1.1 million baht (3.6 million yen) per year to maintain. In the future, ALRO guidance will probably increase the amount of money collected for water usage by raising the productivity of farmers cultivating in irrigated areas and by enhancing the organizational strength of water users' organizations.

3.5.4 Current Status of Operation and Maintenance

With the exception of micro irrigation, no problems are foreseen in terms of farm ponds, farm roads, irrigation facilities, processing plants, markets and other facilities that are appropriately operated, maintained and used by beneficiary farmers, farmers' groups and ALRO provincial offices. As far as micro irrigation facilities are concerned, it is estimated that less than half of the farmers who received them have continued using them. The External Evaluators believe that this low activity rate is not due to the difficulty in maintaining these facilities; rather, it is primarily because those farmers cultivating fruits and vegetables for personal consumption do not consider these facilities to have high utility value in terms of cost and labor.

Farm ponds and micro irrigation transferred to the control of individuals have generally been maintained properly, though to differing degrees. Processing plants and community ponds maintained on a day-to-day basis by farmers' groups and communities also show no major problems, not even in terms of the procurement and servicing of parts. On the other hand, inadequate repairs to parts of farm roads that have been eroded by rain have been observed in places. The limited budgets of TAOs are

[25] The organic rice processing group in Maha Sarakham estimates future repair costs for buildings and rice milling machines at 20,000 baht (65,200 yen) per year and plans a project that will allow them to cover these maintenance costs with income earned from the processing and sale of organic rice.

likely preventing sufficient allocation of funds for road repair.

Some problems have been observed in the technical and financial aspects of the operation and maintenance of the Project. Therefore, sustainability of the Project effect is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This Project was carried out by the Agricultural Land Reform Office with the objectives of enhancing agricultural productivity, raising incomes, and stabilizing livelihoods in Land Reform Areas of Northeast Thailand. The Project has helped develop farm ponds, farm roads and other basic agricultural infrastructure, and it has provided non-infrastructure assistance in the form of agricultural technical training and help with organization of farmers' groups and the sale and processing of agricultural products. Combined, such support has enabled farmers in the region to cultivate rice, vegetables and fruit and raise fish and livestock in the same area using water from the farm ponds; the Project has introduced integrated agriculture to the farmers. The agricultural development of Northeast Thailand, which has poor agricultural productivity and high rates of poverty, is consistent with Thailand's development policy and needs and is also in line with Japan's ODA policy. Therefore its relevance is high. Over 90% of beneficiaries adopted the integrated agriculture promoted by the Project, resulting in greater yields and profits and more stable livelihoods for farmers. Accordingly, the Project's effectiveness and impact is high. The Project fell considerably behind schedule because of construction delays and plan changes, but final expenses were around 70% of those initially planned, therefore efficiency of the Project is fair. The Project's development impact is attributable to its flexibility, with modifications made and activities added on over 12 years according to the needs of beneficiaries. There are no problems with maintenance of agricultural facilities such as farm ponds, which have been transferred to farmers. Some issues remain regarding maintenance of farm roads, which have been transferred to Tambon Administration Organizations (TAOs), and irrigation facilities, which will be transferred in the future, but there are plans for continued aid from the Agricultural Land Reform Office, so the infrastructure should be managed sustainably. Therefore, sustainability of the Project effect is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) Although the farm roads placed under the control of TAOs are not technically difficult to maintain, work is required to ensure that TAOs allot sufficient budgets for the adequate maintenance and repair of these roads. If the executing agency is able to cooperate with TAOs, it is recommended that they assist these organizations with the monitoring of road conditions and other related issues. As for the planned transfer of two irrigation facilities to TAOs over the next several years, the large size of these facilities will make it difficult for these organizations to maintain them

adequately at their current technical and financial capacities. Before the official transfer of control, it is recommended that the executing agency provide systematic support for creating a system that will enable TAOs and water users' organizations to technically and financially maintain these facilities.

(2) With the executing agency serving in the capacity of coordinator, a wide range of stakeholders from government agencies, universities, research institutions, local administrations, NGOs, and farmers' networks participated in Project activities and contributed to its effectiveness. Continuing into the future, it is recommended that the executing agency cooperate with other organizations (the Department of Fisheries, Department of Agriculture, Department of Livestock Development, and other special departments of the Ministry of Agriculture and Cooperatives, TAOs, etc.) in the Project's target regions to provide support that ensures that the activities of the beneficiaries that have occurred up until now are continued and expanded to include other area farmers. The executing agency is hoped to establish itself as a facilitator between the beneficiaries and the involved organizations, working to enhance cross-organization cooperation systems and provide support in accordance with the needs of the beneficiaries.

(3) In the Project's target region, the development of new markets for agricultural produce in urban areas and the growth of the agricultural food businesses of processing groups have resulted in valuable experience and a great number of success stories. As the direct results of the Project, Learning Centers (farms of exemplary farmers); vegetable production and sales groups, processing groups, and other personnel and organizations; and guidelines and manuals created from the experiences of the Project should be used to help expand these activities to other farmers in the Project's target region as well as to farmers in other regions.

4.2.2 Recommendations to JICA

In this Project, the executing agency achieved success by flexibly combining a variety of support items and providing them to beneficiaries. Now, loan assistance experts are being dispatched to the area and are continuing to provide support to the beneficiaries while condensing the experiences learned from the Project into a series of guidelines. The investments of loan assistance efforts have led to the documentation of results and have set the stage for the spread of these activities to other regions. The next step is for the executing agency to utilize these guidelines and success stories to expand these activities to other farmers in the Project's target region as well as to farmers in other regions. The results of this project can be effectively expanded with JICA's support. An example is technical cooperation that trains staff members at the executing agency's provincial offices to serve in the capacity of rural development coordinators and enriches functions to connect regional farmers' groups, the government, citizens, NGOs and other assisting organizations. Such support should be an advantage for an executing agency that has had its organization's mission changed from that of

granting land rights and developing infrastructure to one of agricultural extension services.

4.3 Lessons Learned

A characteristic of the Project is that it provided timely support in terms of infrastructure, technical training, organization, marketing and other means over a long period of time to beneficiaries in accordance with their stage of development. Additionally, each of these means of support worked in synergy to develop learning centers and farmers' groups capable of making continuous improvements to agricultural production, processing and sales. The lessons learned from this project are as follows:

(1) Creating synergy requires a variety of activities, including infrastructure development, organizational enhancements, and marketing support. Even if activities span multiple areas, it is important that the executing agency implement them as uniformly as possible. For example, the Project's agricultural infrastructure development, agricultural technical support, organizational enhancement of farmers and support for agricultural sales and processing were all implemented by the same executing agency. In this Project, it proved fortunate that, as an executing agency, the ALRO had jurisdiction over infrastructure development, technical support and a wide range of other tasks concerned with the development of Land Reform Areas. If a project is implemented with infrastructure, cultivation, organization and other fields divided among multiple specialized organizations, mutual coordination of activity content and period of implementation can prove difficult. Sharing money allotted for activities can also prove difficult if the budget for those activities is allotted among separate executing agencies. That one executing agency (ALRO, in this case) could be in control of everything and execute the Project is largely because of its unique characteristics. During the planning stage, the executing agency's range of tasks and organization must be analyzed and a system considered that would allow for the project’s smooth implementation.

(2) Projects that promote integrated agriculture must not only place emphasis on the development of basic agricultural infrastructure but must also offer agricultural technical cooperation, farmer organization and non-technical support, such as agricultural extension services, that are dependent on the progress of the project. In this Project, the change in Project policies from a focus on basic agricultural infrastructure at the time of the appraisal to the use of infrastructure to provide non-technical support for the production and sale of produce proved effective. Particularly in a project like this one, in which attempts are being made to implement a kind of agriculture with which the beneficiaries have no experience, it is often insufficient to provide nothing but infrastructure. It is believed that a system that pays close attention to the growth process of the beneficiaries over a long period of time and offers support as needed in a timely manner is important. This system should teach farmers how to grow crops, provide them with equipment, allow them to observe more advanced regions and give them opportunities to learn alongside their peers. It is recommended that support items such as these be included in plans in advance and that

support be provided in accordance with the circumstances on the ground and the progress of project activities. Additionally, in cases such as these, special care must be taken when establishing a project period.

(3) In the event that attempts are made to expand the development of integrated agricultural over a wide range or the project's target region has not been narrowed down, it is not always possible to implement an adequate feasibility study before the start of the project. In such a project, further investigation can be carried out after the project is already underway in the specified target region. Once the needs of farmers are better understood, ways of reviewing the plan as needed and flexibly responding to changes to it in accordance with the progress of the project are necessary. Additionally, these possibilities of revision should be included during the initial planning stages. Furthermore, if there are means of simplifying the procedures involved in ordering small-scale construction projects in great numbers and hastening the construction work itself, these could also aid in efficient and effective implementation. Because four provinces with differing circumstances were selected as the target regions of this Project, a representative region could not be targeted for further investigation. Additionally, there were many uncertainties, including difficulty in projecting the number of individuals who wished to participate in activities or the number of land certificates to be issued as a standard for the selection of beneficiaries in each region. Circumstances such as these make it difficult to draft a plan in line with the needs of target regions at the time of the appraisal and leave the executing agency with no choice but to review the plan again after the project is underway. As the project progresses, new needs emerged from among the beneficiaries, and these needs differed between regions and beneficiaries. In addition to understanding the situation in the field, it is believed that understanding the needs of beneficiaries through close communication and monitoring and responding flexibly to those needs by adding or changing activities, as a result, has spreaded integrated agriculture and improved the food self-sufficiency rate and income of farmers.

Comparison of the Original and Actual Scopes of the Project

Item	Original	Actual
(1) Project outputs		
Farm ponds	10,714 sites	4,703 sites
Farm pond enlargement	1,607 sites	650 sites
Community ponds	20 sites	28 sites
Farm roads (new)	504 km	818.30 km
Farm roads (repaired)	N/A	215.21 km
Canals, irrigation	13,800 rai (2,208 ha)	7,288 rai (1,166 ha)
Micro irrigation	1,624 sites (2005 plan)	1,617 pcs
Group micro irrigation	N/A	11 pcs
Shallow wells	2 sites (2008 plan)	2 sites
Processing plants	4 sites (2008 plan)	4 sites
Soil/water conservation	6,000 rai (960 ha)	Cancelled
Map (1/4,000)	300,000 rai (48,000 ha)	As planned
Construction equipment	33 machines	Cancelled
Organization strengthening	N/A	Farmers' groups (new: 49, improved: 19), etc.
Processing/marketing	N/A	8 community markets, 4 processing groups, etc.
Development of Younger and Next Generations of Agriculture		6 school training courses, 85 new farmers
Low-interest loans to farmers		50.59 million baht in loans
2) Period	Sep. 1998 – Jun. 2003 (58 months)	Sep. 1998 – Feb. 2011 (150 months)
3) Project cost		
Amount paid in Foreign currency	424 million yen	212 million yen
Amount paid in Local currency	4.551 billion yen (14.24463 billion baht)	3.214 billion yen (1.10862 billion baht)
Total	4.975 billion yen	3.426 billion yen
Japanese ODA loan portion	3.617 billion yen	2.686 billion yen
Exchange rate	1 baht = 3.17 yen (Sep. 1998)	1 baht = 2.899 yen (Sep. 1998 – Feb. 2011 avg.)