

China

**Ex-Post Evaluation of Japanese Technical Cooperation Project**  
**Dairy Farming and Industry Development Project in Heilongjiang Province**

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**0. Summary**

Heilongjiang Province in China, ranking high in dairy production, had been making efforts to develop and promote dairy farming and the dairy industry but had issues in the quality/quantity of cattle forage and the productivity of raw milk, as well as problems such as delays in the development of dairy products. This project was intended to address such development needs while aiming for improvement of the technologies for forage production, feeding management and dairy processing. Therefore, its relevance was high. The goal of this project was to establish a model for dairy farming and dairy industry in the province, and this was achieved through the improvement of technologies for forage production and feeding management in the dairy farming sector, and through the diversification and quality improvement of dairy products in the dairy industry. Since the completion of the project, the established model, that is to say the systematized technological methodology, has been promulgated by the authorities concerned to the entire province, and its effects have been manifested in the improvement of raw milk production and the increase in dairy farmers' earnings, thus substantiating its positive impact. Furthermore, since the project has been implemented in accordance with the schedule and the results have been proportionate to the inputs, the implementation can be considered to have been efficient. With regard to the sustainability of the project, although some challenges remain in the technological and financial aspects concerning the technical advancement of the extension workers, no problems have been observed in terms of the project policy and structure.

In light of the above, this project is evaluated to be highly satisfactory.

**1. Project Description**



**Project Location**



**Cattle Shed at the Project Model Stock Farm**

## **1.1 Background**

Situated in an extremely cold region with long winters and boasting vast stretches of grassland and huge amounts of unutilized forage resources, Heilongjiang Province has long been more committed to dairy farming rather than other forms of agriculture as a means of gaining income throughout the year, producing the largest volume of raw milk and dairy products nationwide. From the perspective of these regional characteristics, the Heilongjiang Provincial Government had attached importance to the development of the province's dairy farming and dairy industry and had been taking various measures to promote animal husbandry. However, the province was mired in problems such as poor quality and production of pasture, low milk yield per cow, and delays in the development of forage management technology. On the other hand, in the 1990s when this project was being planned, grain was the main foodstuff consumed by the Chinese. Therefore, the intake of animal protein was low, posing the problem of poor nutritional balance. In this context, the government put effort into the promotion of animal husbandry, especially dairy farming, which would enable the efficient utilization of unused natural resources and provision of animal protein. However, due to the small scale of the dairy industry and its obsolete quality control technology, almost all the dairy factories were incapable of manufacturing any other products but powdered milk, making them unable to develop products or provide quality control services catering to the needs of consumers. In order to overcome these predicaments, the Chinese Government requested the Japanese Government in 1996 to extend technical support in a comprehensive project to research and develop new technologies concerning dairy farming and the manufacturing of dairy products.

In response, the Japanese side conducted a preliminary survey on the basic framework of the first project in 1997. As a result, although the relevance of implementing the project was substantiated based on the condition of dairy farming and the dairy industry in Heilongjiang Province and other circumstances, it emerged that a considerable narrowing down of the project scope was necessary as the content of the request by the Chinese side was extensive compared to the scale and budgetary constraints of the typical scheme of project-type technical cooperation. The contents of the request were as follows: (1) development of grassland improvement and forage production technologies; (2) development and guidance of forage-feeding technologies; (3) development and guidance of comprehensive livestock management technologies for increased milk yield; (4) development and guidance of quality control technologies for raw milk; and (5) development and guidance of comprehensive technologies for manufacturing staple dairy products. Besides, there were several project sites. Following a series of consultations between the Japanese and Chinese sides either directly or in writing for the subsequent few years, both sides reached an agreement on the cooperation scheme for this project in 2001. The agreed cooperation scheme specified that the project activities would cover four technical fields: forage production and feeding management in dairy

farming, and raw milk quality control and dairy product manufacturing in the dairy industry. In addition, part of the project activities would be handled by counterparts trained in Japan instead of dispatched Japanese experts. Furthermore, as a result of the number of project sites having been narrowed down to one per each project field, the initially-planned cooperation between the dairy farming and dairy industry fields was abandoned, and instead, it was decided that a project with two elements would be implemented.

## 1.2 Project Outline

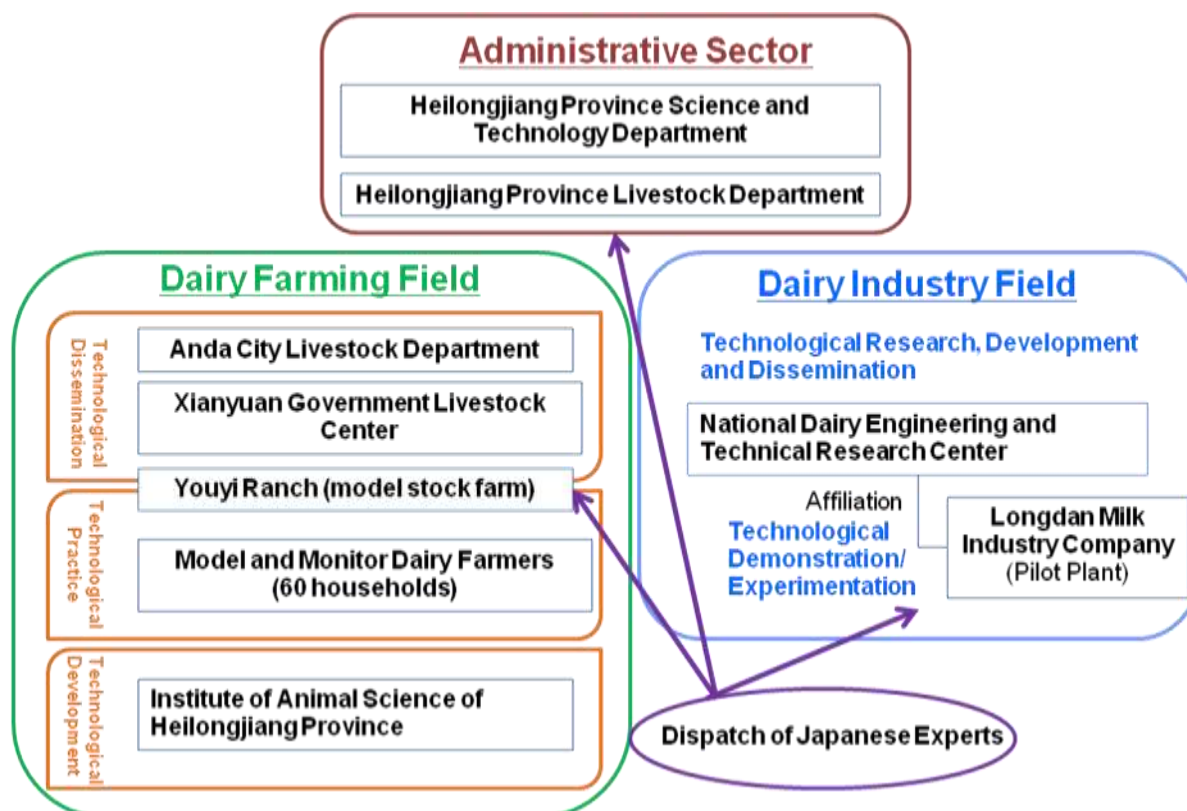
Super Goal		To improve the earnings of dairy farmers in Heilongjiang Province through the development of its dairy farming and dairy industry.
Overall Goal		To disseminate the model established in the project <sup>1</sup> throughout entire Heilongjiang Province.
Project Purpose		To establish a model for dairy farming and dairy industry suitable for Heilongjiang Province in the project area.
Outputs	Output 1	To ensure that dairy farmers in the project area are able to produce high quality forage.
	Output 2	To ensure that dairy farmers in the project area are able to feed dairy cattle appropriately while improving the quality of raw milk.
	Output 3	To achieve the quality improvement and diversification of dairy products.
Actual Inputs		<p>[Japanese Side]</p> <p>1. Dispatched experts: 44 personnel 13 long-term experts from 7 fields: chief advisor, forage production, feeding management, raw milk quality control, dairy product processing (cheese and fermented milk), and coordinator. 31 short-term experts from 27 fields: silage preparation technology, alkali soil modification technology, cow feeding environment arrangement, milking hygiene control, manufacturing technology for various types of cheese, collection and storage of lactic acid bacteria, equipment operation and maintenance, etc.</p> <p>2. Accepted trainees: 37 people (counterpart training in Japan)</p> <p>3. Equipment provision: 2,7 million yen (including consumption taxes, transport charges and insurance fees)</p> <p>4. Local operating expenses: 530 thousand yen</p>

<sup>1</sup> The “model” mentioned in the project purpose is defined as the “aggregation of dairy farming and dairy industry technologies introduced in the project.” The model areas were Youyi Village and Hongxing Village in Xianyuan Township of Anda City, and the model stock farm was Youyi Ranch in Anda City. The monitor farmers consisted of 60 dairy farmers in total (20 households in Youyi Village of Xianyuan Township, 20 households in Hongxing Zhun of Hongxing Village, and 20 households in Bayi Zhun of Tong Village). Of them, 3 households comprised the model farmers.

	<p>5. Others (including dispatch of inspection teams): management guidance inspection teams dispatched 2 times</p> <p>[Chinese Side]</p> <p>1. Counterparts: 89 personnel</p> <p>2. Land/facility provision, project offices, electricity/water bills</p> <p>3. Local-borne costs: 26.63 million yuan, counterpart payment, training budget</p>
Cooperation Amount	1.035 billion yen
Cooperation Period	July 1, 2001 – June 30, 2006
Chinese Organizations Concerned	Department of Science and Technology Government of Heilongjiang, Heilongjiang Livestock Department, Heilongjiang Province Livestock Research Institute, Anda City Livestock Department, Xianyuan Township Government Livestock Farming Center, Dairy Engineering and Technical Research Center and Longdan Milk Industry Company
Japanese Organizations Concerned	Ministry of Agriculture, Forestry and Fisheries; National Livestock Breeding Center; Snow Brand Milk Products Company, Limited; Nippon Milk Community Co., Ltd.
Relevant Matters	-

In order to realize the aforementioned three outputs, the following activities have mainly been implemented:

- Improvement of Forage Production: Establishment of forage improvement technologies through grassland improvement and effective use of unutilized resources; demonstration exhibition at the model stock farm, Youyi Ranch; practice at the nearby monitor farmers.
- Quality Improvement of Raw Milk: Establishment of feeding management and milking hygiene technologies; demonstration exhibition at Youyi Ranch; practice at the nearby monitor farmers.
- Quality Improvement/Diversification of Dairy Products: Improvement of raw milk quality control and dairy production technologies.



**Figure 1 Schematic Diagram of the Project**

This project was aimed at establishing the technology model<sup>2</sup> for the fields of dairy farming and dairy industry. Since the project sites for these two fields were physically distant from each other, the project was virtually regarded as consisting of two sub-projects. In the dairy farming field, with the view to increasing milk yield and improving milk quality, demonstration exhibitions of technologies were held at the model stock farm, Youyi Ranch located in Xianyuan Township of Anda City, thereby transferring the technologies to nearby farmers as the dissemination targets. Furthermore, the livestock research institute of the province implemented technology transfer activities pertaining to the research and development of certain technologies<sup>3</sup>. In the dairy industry field, the National Dairy Engineering and Technical Research Center implemented technology transfer activities in Longdan Milk Industry Company serving as its pilot plant, aiming to achieve quality improvement and diversification of its dairy products. The Science and Technology Department and the Livestock Department of the provincial government set up a project management office, thereby assuming responsibility for the operation and management of the project.

<sup>2</sup> This refers to technologies concerning forage production and feeding management in the dairy farming field, and technologies for raw milk quality control, dairy product manufacturing, and lactic acid bacteria collection/storage. The dairy farming and industry model aimed for by the project was not defined properly during the project period. In the interview survey conducted at the time of the terminal evaluation, interpretations varied between project stakeholders concerning the model stock farm, style of dairy management, dairy products accepted by consumers, technologies transferred in the project, summarization of technologies and so on. This revealed that a common understanding was not reached.

<sup>3</sup> Forage analysis technologies, alfalfa seed production technologies, embryo transfer technologies.

It was expected that after the completion of the project, the dairy farming technology dissemination departments of provincial, city/county and township/town municipal governments and the National Dairy Engineering and Technical Research Center<sup>4</sup> would take the initiative in disseminating the respective dairy farming and dairy industry technologies.

### **1.3 Outline of Terminal Evaluation**

#### **1.3.1 Prospects of Overall Goal Achievement at Terminal Evaluation**

The overall goal was “to disseminate the model established in the project throughout entire Heilongjiang Province.” Although the project’s effects manifested at the time of the terminal evaluation were limited within and in the vicinity of the project areas and the direct beneficiaries, the Science and Technology Department and the Livestock Department of the province had already taken the initiative and formulated a dissemination strategy in order to accomplish an index of the overall goal: “to start implementing a dissemination program including the model established in the project in six areas<sup>5</sup>.” It was planned that the project team would travel around the six dairy areas in Heilongjiang Province to disseminate dairy technologies for the rest of the project period, and after the project was finished, a three-year dissemination plan would be drawn up for the said six areas in consultation with the administrative bodies of each area regarding which technologies to be disseminated, so that the project’s effects could be applied to each area. As above, it was concluded that, provided that the dissemination activities were implemented smoothly and the strategy for the dissemination plan was formulated in detail, there would be a high likelihood of achieving the overall goal.

#### **1.3.2 Prospects of Project Purpose Achievement at Terminal Evaluation**

The project purpose was “to establish a model for dairy farming and dairy industry suitable for Heilongjiang Province in the project area.” Based on the extrapolation of the production volume of high-quality raw milk in the project area from the production growth rate during the project period, the volume was expected to exceed the target value of 11,000 tons by the completion of the project. There had already been a tentative manual regarding dairy farming and dairy industry technologies systematized through the demonstration in the project, and a final version was expected to be compiled during the cooperation period by the end of the project. Therefore, it was concluded that the project purpose would largely be achieved.

#### **1.3.3 Content of Proposals at Terminal Evaluation**

##### **(1) Short-term Proposals (by the end of the cooperation period)**

1) With a view to summarizing the technologies that had been established in the project by its completion into a model, proposals were made to draw up final versions of technical manuals

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<sup>4</sup> The Dairy Product Technical Training Center in this center takes charge of the technology transfer.

<sup>5</sup> Six areas: Shuangcheng City, Fuyu of Qiqihar City, Beian of Heihe City, Mishan of Mudanjiang City, Dumeng of Daqing City, Suburbs of Mudanjiang City

regarding dairy farming and dairy industry, and to hold technical guidance and dissemination seminars catering to a wide range of stakeholders around the province. In response to these proposals, a technical manual was finalized for each of the dairy farming and dairy industry fields, and copies were distributed to the organizations concerned. In addition, peripatetic seminars aimed at technical guidance and dissemination were held in six locations within Heilongjiang Province.

2) In preparation for technology dissemination after the completion of the project, proposals were made to formulate dissemination plans under the leadership of the Project Management Office<sup>6</sup>. The proposals included several precautions to be taken during the planning such as the screening of the technological fields to be disseminated based on the results of the guidance, clarification on the sharing of responsibilities among the organizations concerned, concrete budgetary provision, utilization of trained engineers, and confirmation of the monitoring procedures. Although the Project Management Office had failed to come up with any dissemination plan by the end of the cooperation period, the Livestock Department of the province formulated a plan for the following year by the end of the year concerned.

#### (2) Long-term Proposals (after the end of the cooperation period)

1) In accordance with the dissemination plan and strategy, proposals were made to disseminate dairy farming and dairy industry technologies in Heilongjiang Province, conduct periodic monitoring of the progress under the initiative of the Science and Technology Department and Livestock Department of the province, and review the dissemination plans. At the time of the ex-post evaluation, the Livestock Department was playing a central role in the planning, execution and monitoring of the technology dissemination program.

2) For the sake of further development of Chinese dairy farming and dairy industry, proposals were made to publicize the results of technology dissemination to dairy farming and dairy industry stakeholders not only in Heilongjiang Province but also across the country, and actively create opportunities for technological exchange with Japanese counterparts. In relation to these proposals, several events such as the national convention of the National Dairy Association served as occasions to make public the project's technological achievements for the dairy farming sector by the time of the ex-post evaluation.

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<sup>6</sup> This signifies the "Management Department" in Figure 1.

## **2. Outline of the Evaluation Study**

### **2.1 External Evaluator**

Naoko Inada, IC Net Limited

### **2.2 Duration of Evaluation Study**

This ex-post evaluation study was conducted as follows:

Duration of the Study: November, 2010 – October, 2011

Duration of the Field Study: March 18 – March 30, 2011; June 28 – July 2, 2011

### **2.3 Constraints during the Evaluation Study**

Concerning dairy industry field, information about institutional aspects, technologies and financial affairs of National Dairy Engineering and Technical Research Center is limited, due to changes of implementation structure and its role.

## **3. Results of the Evaluation (Overall Rating<sup>7</sup>: A)**

### **3.1 Relevance (Rating<sup>8</sup>: ③)**

#### **3.1.1 Relevance with the Development Plan of China**

In the “9th Five-Year Plan (1996 – 2000),” the national development plan of China around the time of the project start, the development of the agricultural sector was regarded as the highest priority issue for the domestic economy. Since around 2004, when the project was in the cooperation period, the Chinese Government has been struggling to resolve low agricultural productivity, disparity between urban and rural regions, and farmers’ low income, the so-called “Three Rural Issues,” regarding them as priority matters. Meanwhile, the “11th Five-Year Plan Outline (2006 – 2010),” which was the national policy around the time of the project completion, advocated a new rural community reform in the name of “Socialist New Rural Community,” thereby promoting the innovation of agricultural technology, improvement of productivity through the expansion of agricultural investments, and enhancement of public services.

As described above, the agricultural sector has been the top priority in the Chinese development policy, with its strategic importance consistently unchanged from the start to the end of the project. Therefore, this project’s goal of promoting dairy farming and dairy industry technologies with the aim of boosting the earnings of small to mid-size dairy farmers is considered to be relevant to the policy needs

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<sup>7</sup> A: Highly satisfactory; B: Satisfactory; C: Partially satisfactory; D: Unsatisfactory

<sup>8</sup> ③: High; ②: Fair; ①: Low



### 3.1.2 Relevance with the Development Needs of China

Since the economic reform, China has witnessed growth exceeding 10% in the production of the livestock industry on a year-on-year basis every year, with stockbreeding contributing to the increase in farmers' incomes, improvement of dietary habits, and economic development.

Amid such circumstances, Heilongjiang Province, located in a cold climate region with long winters, attached special importance to the livestock industry as it guarantees earnings throughout the year. At the same time, the province was suitable for dairy farming on account of its vast expanses of grassland and huge amounts of unutilized forage resources, producing the largest volumes of raw milk and dairy products nationwide back when the project was commenced. Placing emphasis on the development of its dairy farming and dairy industry, Heilongjiang Provincial Government had been making efforts toward its promotion under the slogan of "Ban Bi Jiang Shan (to make the livestock industry account for 50% of agriculture)." However, the province had various problems such as poor quality and production of forage, low productivity of raw milk, and delays in the development of dairy products.

This project was aimed at lending support to the efforts to improve and advance technologies in the fields of forage production, feeding management and dairy processing, and thus the project was regarded as one of the endeavors to solve these problems. In the field of dairy farming, it was necessary for dairy farmers to improve the productivity of forage crops and feeding management for milk cows for the reinforcement of raw milk production and quality<sup>9</sup>. Meanwhile, in the dairy industry, the National Dairy Engineering and Technical Research Center, one of the executing agencies, deemed the improvement and diversification of quality control and product processing technologies for raw milk to be a challenge.

By the completion of the project, the demand for milk and other dairy products had soared in line with the improvement in people's standard of living. Heilongjiang Province still ranked high nationwide in the production of raw milk and dairy products and was regarded as one of the most important production bases. Therefore, the project has been consistently relevant to the development needs during the cooperation period.

### 3.1.3 Relevance with Japan's ODA Policy

In the Economic Cooperation Program for China (formulated in 2001), Japan placed emphasis on the "cooperation on the development of agriculture and farming communities in the inland regions where natural conditions are poor." In this context, this project's goal was to support the small-size dairy farmers and the local dairy industry in Heilongjiang Province, where environment and natural conditions are harsh. Therefore, its relevance was high.

As described above, this project has been fully consistent with the development policies and needs of China, as well as Japan's ODA policy; therefore, its relevance is high.

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<sup>9</sup> For example, the Heilongjiang Livestock Research Institute required the technologies for producing alfalfa (forage grass rich in protein) seeds and embryo production/transplantation to be transferred from Japan.

## **3.2 Effectiveness and Impact (Rating: ③)**

### 3.2.1 Effectiveness

#### 3.2.1.1 Project Outputs

The goal of this project was “to establish a model for dairy farming and dairy industry suitable for Heilongjiang Province in the project area” To that end, the project proposed the following three outputs: “to ensure that dairy farmers in the project area are able to produce high quality forage;” “to ensure that dairy farmers in the project area are able to feed dairy cattle appropriately while improving the quality of raw milk;” and “to achieve the quality improvement and diversification of dairy products.”

#### (1) Output Achievements

1) Output 1: To ensure that dairy farmers in the project area are able to produce high quality forage

With the aim of achieving these outputs, various activities were conducted to establish forage production technologies including small-scale grassland improvement, conversion of unutilized resources into forage, silage preparation, forage analysis, and alfalfa seed production, and exhibitions to demonstrate these technologies were also held.

As a result, technologies for grassland improvement, conversion of crop residues into forage, and preparation of maize silage were established in Youyi Ranch in Xianyuan Township, Anda City, which was the model stock farm of this project. Subsequently, through the technical guidance to the model farmers and monitor farmers in the vicinity, the forage production technology was improved. Specifically, the unit crop of silage maize produced by the monitor farmers (Index 1) reached 3,850 kg by one year prior to the end of the project as opposed to the target value of 4,000 kg, mostly achieving the target index. Furthermore, the yield of grass in Youyi Ranch exceeded the target, reaching 104% of the target value by the end of the project.

Aside from the aforementioned technical guidance catering to dairy farmers, project activities to modify crop cultivars and introduce new technologies such as excellent seeds contributed to the improvement of forage crop production.

Table 1 Changes in Index Data of Output 1

Index/Unit	Before Project in 2000	Target Value	Achieved Value in 2006	Achievement Rate at Project Completion	Achieved Values after Project			
					2007	2008	2009	2010
Index 1: The green forage yield per unit of maize used for maize silage recommended by the project increases in the monitor farmers.								
kg/Mu <sup>10</sup>	2,500	4,000	3,850*	96%*	-	-	-	-
Index 2: The green forage yield per unit of dry grass increases in Youyi Ranch.								
kg/Mu	220	300	311	104%	309	313	312	310

Source: Data provided by JICA and Youyi Ranch

Note: \*Data in 2005

2) Output 2: To ensure that dairy farmers in the project area are able to feed dairy cattle appropriately while improving the quality of raw milk.

In order to achieve this output, the following activities have been conducted: feeding management for dairy cows; milking hygiene control; establishment of feeding technologies such as embryo transplant technology; and demonstration exhibition of such technologies.

With regard to Index 1, the average annual milk yield per dairy cow in the monitor farmers exceeded the target value by more than 10% by the end of the project. As the collection of index data regarding raw milk quality in relation to Index 2 required specialized techniques and equipment, there only exist data collected one year prior to the end of the project. Nevertheless, the total bacterial count in raw milk had already decreased below the target value to 300,000/mL by that time, and the ratio of total dissolved solid had also exceeded the target value of 12%. Therefore, this output is considered to have been achieved in relation to both indices.

Table 2 Changes in Index Data of Output 2

Index/Unit	Before Project in 2000	Target Value	Achieved Value in 2006	Achievement Rate at Project Completion	Achieved Values after Project			
					2007	2008	2009	2010
Index 1: The average milk yield per dairy cow in the monitor farmers increases.								
kg	5,300	5,800	5,882	111%	5,896	5,931	5,929	5,936
Index 2: The quality of raw milk produced in the monitor farmers improves.								
Decrease in Total Bacterial Count (number/ml)	2 million	0.5 million	0.3 million*	Decrease	-	-	-	-
Increase in Ratio of Total Dissolved Solid	11.6%	12.0%	12.2%*	Increase	-	-	-	-

Source: Data provided by JICA and the Xianyuan Township Government Livestock Farming Center

Note: \* Average value between January and September, 2005

<sup>10</sup> 15 Mu = 1 hectare

In this project, in addition to the transfer of technologies such as feeding environment improvement and milking hygiene control to the model stock farm Youyi Ranch, activities for technology dissemination and educational guidance have been carried out by the model stock farm and extension workers, targeting the model and monitor farmers in the vicinity. As a result, the dairy farmers' attitudes toward the feeding environment have changed and they have started taking actions such as improving the materials for the cattle sheds and cleaning them, eventually leading to improvement in the quantity and quality of raw milk.

Moreover, according to the interviews with the dairy farmers, the improvement in the feeding environment has resulted in reduction in the incidence of diseases such as mastitis among their dairy cows by more than half, thereby contributing to the increase in the raw milk yield. As shown in Table 3, the dissemination of technologies has led to the decrease in diseased cattle in not only the farms of the direct beneficiaries but also those in other areas (see the section 3.2.2.1 Overall Goal Achievements for details).

Table 3 Changes in Number of Dairy Cattle with Diseases such as Mastitis before and after Technology Transfer<sup>11</sup>

	Dairy Farmers in Anda City				Dairy Farmers in Shuangcheng City	
	Monitor		Non-monitor		Before	After
	Before	After	Before	After	Before	After
Number of diseased dairy cattle (annual)	2.18	1.11	5.32	2.28	4.4	2.8
Number of dairy cattle owned	6.16	9.54	8.6	11.2	11.7	16.2
Ratio of diseased dairy cattle (annual)	35.4%	11.6%	61.9%	20.4%	37.6%	17.3%
Ratio of farmer households owing diseased cattle	83%	53%	83%	83%	93%	93%

Source: Results of the beneficiary survey

<sup>11</sup> The data prior to the technological transfer are from 2000 for the monitor dairy farmers in Anda City, from 2003 for the non-monitor dairy farmers, and from 2004 for those in Shuangcheng City. The data after the technology transfer are the achievement data from 2010.



Fig.2 Forage Grass



Fig.3 Milk Quality Inspection in Milking Plant at Model Stock Farm

3) Output 3: To achieve the quality improvement and diversification of dairy products.

This output was scheduled to be achieved through the improvement of technologies such as raw milk quality control, dairy product manufacturing, and collection and storage of lactic acid bacteria in the Dairy Engineering and Technical Research Center and Longdan Milk Industry Company<sup>12</sup>, which was a pilot plant within the center.

As an index to measure quality improvement, which was one of the outputs, standard deviation data on the acidity of yoghurt have been adopted. Although no data at the time of the project completion are available, the acidity was decreasing steadily between 2003 and 2005, thus indicating the achievement of the index. Furthermore, the acceptance rates of dairy products manufactured by the said center also increased during the two years prior to the end of the project. Therefore, quality improvement is considered to have been achieved.

With regard to the other output, i.e. diversification, no data at the time of the project completion are available on Index 2 regarding the number of trial products. Nevertheless, considering the achievements in 2005 and the fact that 20 processed cheese products and 10-12 fermented milk products were available by 2010, the output achievements are considered to have exceeded the target values.

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<sup>12</sup> A dairy company that is also a counterpart executing agency. It was state-owned at the time of the project start and was affiliated to the National Dairy Engineering and Technical Research Center, but was privatized in 2004 when the project was in progress. The company underwent a phased privatization process during the project period, and in the end was fully privatized in 2004. At this point, the Chinese project stakeholders confirmed in official writing that the privatization would not change the activities and framework of the project

Table 4 Changes in Index Data of Output 3

Index	Before Project	Target Value	Achieved Value	Achievement at Project Completion	Achieved Value after Project in 2010
Index 1: Quality dispersion in the existing dairy products of the National Dairy Engineering and Technical Research Center decreases.					
Standard Deviation of Yoghurt Acidity	6.80 (2003)		4.47*	Decreased	
Additional Index: Acceptance rates of dairy products manufactured by the National Dairy Engineering and Technical Research Center (Longdan Milk Industry Company)					
	98.3% (2004)		98.9%	Increased	99.7%
Index 2: Trial products of product candidates manufactured in the National Dairy Engineering and Technical Research Center increases.					
Natural Cheese		3 items	5 items*	Increased	None
Processed Cheese		5 items	6 items*	Increased	20 items
Fermented Milk		1 item	Over 10 trial items*	Increased	10-12 items
Additional Index: Production Volume of Fermented Milk Products by Longdan Milk Industry Company					
			12 tons	-	17 tons

Source: Data provided by JICA and Longdan Milk Industry Company

Note:\*2005

Although several factors that could potentially affect the achievement of the outputs were envisaged during the planning stage of the project, it turned out that no effects were observed in general, with the actual outputs being as follows:

Table 5 Potential Factors Anticipated to Affect Output Achievement

Anticipated Factors	Actual Outcome
Administrative Support for Farmers in Adopting Technologies Recommended in Project	<p>The following items of governmental support were available and were appreciated highly by the farmers:</p> <ul style="list-style-type: none"> <li>- Preferential pricing of silage forage crop seeds (2 Yuan/kg)</li> <li>- Allowance for silage storage (5 Yuan/m<sup>3</sup>)</li> <li>- The government allowance for artificial insemination was initiated after the project.</li> <li>- Government allowance paid for maize cultivation</li> </ul>
Weather Stability	<p>Although there were some unstable periods such as a drought in 2001 and localized downpours in August 2003, these events did not have a significant influence on the project outcome.</p>
Outbreaks of Cattle Diseases/Epidemics	<p>There were no outbreaks of cattle diseases that could affect the project outcome.</p>
Transfer of Counterparts	<p>The frequency of counterpart transfer during the cooperation period was limited to the minimum, and the project was not affected.</p>

Sources: Heilongjiang Livestock Department, Anda City Livestock Department, Xianyuan Township Government Livestock Farming Center, Youyi Ranch, and interviews with farmers.

### 3.2.1.2 Achievement of Project Purpose

Project Purpose: To establish a model for dairy farming and dairy industry suitable for Heilongjiang Province in the project area.

The purpose of the project was to establish a technological model in the project area through the enhancement of forage production, optimization of feeding management, and quality improvement of raw milk and dairy products.

As a result of the increase in average milk yield and the improvement of milk quality through the project, the raw milk sales volume in the model area has nearly doubled compared to before the project, exceeding the initial target by almost 50%. This, therefore, has corroborated the efficacy of the model developed in the project in Heilongjiang Province. Furthermore, the information pertaining to the technologies introduced in the project has been compiled into manuals and other educational materials, which have facilitated the creation of an environment conducive to technological dissemination. Therefore, the indices for the project purpose are considered to have been achieved.

Table 6 Changes in Index Data of Project Purpose

Index/Unit	Before Project in 2000	Target Value	Achieved Value in 2006	Achievement Rate at Project Completion	Achieved Values after Project			
					2007	2008	2009	2010
Index 1: The annual sales volume of high-quality raw milk <sup>13</sup> produced in the model area increases.								
Ton	8,300	11,000	15,806	144%	19,142	21,890	23,735	26,061
Index 2: Manuals regarding dairy farming and dairy industry technologies are compiled by the completion of the project.								
Dairy Farming	Manual booklets, training materials, instruction manuals for major equipment, etc.							
Dairy Industry	Manual booklets, training materials, instruction manuals for major equipment, etc.							

Sources: Heilongjiang Livestock Department, Xianyuan Township Government Livestock Farming Center, and Youyi Ranch

The items covered by the dairy farming manuals include those related to forage production, feeding management, and mechanical maintenance. These manuals explain the technologies practiced by the model and monitor farmers by item with the use of pictures and diagrams. These are not intended for dairy farmers but for extension workers who are engaged in technical guidance for dairy farmers.

Aside from the compilation of these manuals described in the index, the extension workers have been instructed on how to transfer technologies through the inspection of technical application to the model farmers, thereby promoting the establishment of these technologies.

The technologies covered by the dairy industry manuals mainly include those related to raw milk quality inspection and management, manufacturing of dairy products such as yoghurt and cheese, collection, storage and cultivation of lactic acid bacteria, and utilization of equipment. These manuals have been distributed to the relevant entities in Heilongjiang Province including dairy companies.

In the planning stage of this project, various factors that could affect the achievement of the project outputs were anticipated. In reality, however, no effects have been observed in general, with the actual outcome being as follows:

<sup>13</sup> The definition of high-quality raw milk is pursuant to the national standard (revised in 2010). Besides, dairy companies that purchase raw milk also have their own standards.



Table 7 Potential Factors Anticipated to Affect Project Purpose Achievement

Anticipated Factors	Actual Outcome								
Stabilization and Increase of Milk Demand	<p>Throughout the cooperation period, the demand for milk in the project province increased in a stable manner as below:</p> <p style="text-align: center;">Table 8 Changes in Raw Milk Yield in Heilongjiang Province</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th data-bbox="564 456 954 501">Year</th> <th data-bbox="954 456 1114 501">2001</th> <th data-bbox="1114 456 1257 501">2006</th> <th data-bbox="1257 456 1353 501">2010</th> </tr> </thead> <tbody> <tr> <td data-bbox="564 501 954 546">Production (10 thousand tons)</td> <td data-bbox="954 501 1114 546">189.0</td> <td data-bbox="1114 501 1257 546">432.6</td> <td data-bbox="1257 501 1353 546">687.0</td> </tr> </tbody> </table> <p>Source: Heilongjiang Province Livestock Department</p>	Year	2001	2006	2010	Production (10 thousand tons)	189.0	432.6	687.0
Year	2001	2006	2010						
Production (10 thousand tons)	189.0	432.6	687.0						
Continuation of Duties by Trained Personnel	<p>Of the 34 counterparts who had participated in the training courses in Japan, 27 continued to engage in related duties by the end of the project. In addition, the newly assigned personnel were provided with training opportunities so that the progress of the project would not be affected.</p>								

Sources: Heilongjiang Livestock Department, Anda City Livestock Department, Xianyuan Township Government Livestock Farming Center, Youyi Ranch, and Longdan Milk Industry Company.

In light of the above, the project purpose is considered to have been largely achieved in relation to each index.

### 3.2.2 Impacts

#### 3.2.2.1 Sustainability of Project Outputs

In this section, it is examined whether the effects confirmed in section “3.2.1 Efficacy” have been manifested in a sustainable manner since the end of the project. According to the results of field surveys, it has been confirmed that many of the effects have generally been manifested to date in a sustainable manner. In particular, the annual sales volume of raw milk and the number of commercialized dairy products in the model area, i.e. two of the indices that enable precise measurement of the effects, have continuously been increasing.

The forage (grass) yield in the model stock farm, the index of Output 1, was maintained between the end of the project and the time of the ex-post evaluation (see Table 1).

The average milk yield per dairy cow in the monitor farmers, the index of Output 2, has remained above the target value since the end of the project (see Table 2).

With regard to the index of Output 3, of the three types of dairy products that were subject technology transfer in the project, there was no demand for natural cheese since it did not suit the palate of local people, and thus, no natural cheese products have been commercialized. On the other hand, fermented milk and processed cheese products have been diversified and their quality has been improving. The acceptance rates of dairy products manufactured by the implementing entities in the dairy industry have been increasing steadily since the end of the project (see Table 4).

Longdan Milk Industry Company, which assumed responsibility in the dairy industry field of this project, was privatized during the project period. Accordingly, both this project and corporate efforts have had an impact on the subsequent improvement, diversification and expansion of products. The following examples show the manifestation of the project effects:

(1) Commercialization of Products Utilizing Original Lactic Acid Bacteria

Longdan Milk Industry Company succeeded in isolating lactic acid bacteria from traditional pickles of Harbin in Heilongjiang Province, with counterparts working in tandem with specialists. They then contributed the results of this experiment to a Japanese scientific journal. This strain of bacteria has been utilized for the development of the company's in-house products since the end of the project.

(2) Promotion of Cheese Production.

Prior to the project, Longdan Milk Industry Company had scarcely manufactured cheese products, but as a result of the smooth implementation of technological transfer, the move toward the commercialization of cheese products has gradually been accelerating. It was planned at first that they would request the government to start subsidizing the construction of cheese factories by around two to three years after the end of the project. However, since the market demand for cheese has not increased that much, the production scale has not expanded more than the capacity of the production line in the factory. With the relocation of the factory scheduled at the end of 2011, they are currently considering adding a production line for children-oriented cheese products, depending on the results of market research.



Fig.4 Longdan Milk Industry Company's Products (Yoghurt)

### 3.2.2.2 Sustainability of Project Purpose

Since the completion of the project, the total raw milk sales volumes in the project model area and Xianyuan Township area have been steadily increasing as shown in the table below.

Table 9 Changes in Annual Sales Volumes of High-Quality Raw Milk in Model Area and Xianyuan Township Area

Year	Model Area	Xianyuan Township	
	Raw Milk Sales Volume (ton)		Number of Dairy Cattle (head)
2006	15,806	47,988	18,805
2007	19,142	49,448	17,519
2008	21,890	56,080	18,577
2009	23,735	64,620	21,260
2010	26,061	72,280	23,278
Target Value	11,000		

Source: Xianyuan Township Government Livestock Farming Center

One of the potential factors that was anticipated to affect the sustainability of the project effects was whether the demand for milk could be maintained. Due to the incident that occurred in 2008 involving powdered milk containing toxic substances, the consumption of dairy products as a whole declined temporarily, but it has recovered gradually thereafter. Although the demand for powdered milk is still low, the demand for yoghurt has been growing on account of the national government's policy to popularize dairy products as well as the change in people's taste in step with the economic growth, and the trend is expected to continue in the future.

Furthermore, due to the momentum toward corporate privatization and foreign dairy companies making inroads into the Chinese market after the country's joining the WHO, the approval standards for newly-established ventures have become stricter in terms of environment, technology and equipment. In this context, the quality-control technologies transferred in the project are capable of satisfying these standards and requirements. Therefore, for all intents and purposes, the efficacy of the technologies introduced in this project has been maintained.

### 3.2.2.3 Model Utilization Status at Dairy Farmers' Level

Hearing surveys with the organizations concerned and project beneficiaries have confirmed that the model established in this project has been in use for five years after the end of the project by the direct beneficiaries, i.e. Youyi Ranch, the monitor farmers, and Longdan Milk Industry Company. Moreover, in the field of dairy farming, it has been revealed that the government's efforts to disseminate and transfer technologies have helped this model to be

utilized not only by the direct beneficiaries of the project but also dairy farmers in other cities outside the project area (see the section “3.2.2.4 Overall Goal Achievement” for dissemination).

The technologies transferred in the project have both been utilized continuously and have become widespread. This is because the technologies—both conventional and new ones—have been selected in a flexible manner depending on the environment and condition, and have been improved and applied in accordance with the situation and needs on the ground.

Of the technologies transferred to the monitor farmers, those utilized and unutilized at the time of the ex-post evaluation were as shown in the table below.

Table 10 Utilization Status of Technologies Transferred in the Project

	Field	Technical content	Factor
Utilized Technologies	Fodder Production	Silage production technology, Mixed fodder production, improvement of corn cultivars and cultivation methods, utilization of residues, forage storage	These technologies were easily accepted due to the manifestation of production increase effects.
	Feeding Management	Improvement of feeding environment (ventilation, lighting), use of cryopreserved semen of excellent breeds, milking hygiene control, hoof cutting, feeding management for calves	The technical levels and input scales of these technologies were applicable to even small-scale farmers. Since dehorning requires machinery, only farmers in the vicinity of Youyi Ranch are implementing it.
Unutilized Technologies	Feeding Management	Physique appraisal of dairy cattle, weight/height measurement, hair shaving	Application of the appraisal and measurement technologies to small-scale dairy farmers was difficult because these were more suitable for medium- to large-scale dairy farmers both technically and financially. The hair shaving technology was transferred with the intention of preventing mastitis. However, as its effects failed to be fully understood, the technology never took hold.

Source: Created based on the information obtained from the Heilongjiang Livestock Department, Anda City Livestock Department, Xianyuan Township Government Livestock Farming Center, Youyi Ranch, and beneficiary survey.

In addition to the above technologies, a mastitis examination technology was transferred to stock farms and dissemination centers of the township government providing services to dairy farmers. At present, however, examinations are commonly conducted by dairy companies at the time of raw milk shipment collection. Therefore, the organizations concerned in this project are not utilizing this technology in their services catering to dairy farmers.

The government support packages for dairy farmers to complement the dissemination and establishment of technologies are as follows. The beneficiary<sup>14</sup> survey has confirmed that the beneficiaries were highly content especially with vaccination and artificial insemination services for excellent cultivars.

<sup>14</sup> The beneficiary survey covered 40 households of monitor dairy farmers and 30 households of non-monitor dairy farmers in Anda City, as well as 50 households of dairy farmers in Shuangcheng City, one of the areas subject to technological dissemination selected at the end of the project.

Table 11 Percentage of Farmers Receiving Subsidies from Government

(Unit: %)

	Dairy Farmers in Anda City		Dairy Farmers in Shuangcheng City
	Monitor	Non-monitor	
Silage Subsidy	42.5	86.6	0.0
Crop Seed Subsidy	0.0	0.0	60.0
Preventive Vaccination	100.0	86.6	100.0
Cryopreserved Semen of Excellent Breeds	95.0	86.6	100.0
Farm Equipment Subsidy	85.0	26.7	6.0

Source: Results of beneficiary survey

#### 3.2.2.4 Overall Goal Achievement

Overall Goal: To disseminate the model established in the project throughout entire Heilongjiang Province.

Index: The dissemination program including the model established in the project is implemented in the six areas.

The dairy farming and dairy industry technologies established in the project were expected to be disseminated throughout the province after the end of the project.

The index of the overall goal was based on the six areas in the province as the scope of technological dissemination. Prior to the end of the project, seminars were held and manuals were distributed in these areas. In reality, the dissemination activities after the end of the project were not limited within particular areas, but the technologies and expertise demonstrated in the project have been incorporated into the conventional dissemination programs of the province. Consequently, the technologies have become more widespread than initially targeted throughout the province.

The model established in the project, namely the systematized group of technologies, has been utilized by the relevant entities in dissemination activities for small-scale dairy farmers, and its effects have been manifested in the improvement of the production of forage and raw milk.

#### (1) Activities during Project Cooperation Period (six months between terminal evaluation and end of cooperation)

During the six months running up to the end of the project, the final versions of the technical manuals were completed, and peripatetic instruction sessions on dairy technology were held in the said six areas.

## (2) Activities after Project Completion

Since the end of the project, the provincial government, with a view to applying the project effects to each area, has examined appropriate technologies to be disseminated and has reflected the technologies introduced in the project in its annual dissemination plan for dairy farming technology. On the other hand, it was each of the city and county governments that were supposed to take the initiative in formulating dissemination strategies and plans specifically catering to the said six areas in accordance with the dissemination plan of the province. Therefore, the project stakeholders were not directly involved in the formulation process.

Afterward, the organizations concerned have implemented the monitoring of the dissemination activities and progress status of dairy farming and industry technologies in line with the dissemination plans of the province as well as each of the cities and counties, thereby corroborating the following achievements and effects thus far.

### 1) Dairy Farming

The manuals and other training materials compiled through the project have been distributed to the organizations concerned and dairy technology extension workers. The Heilongjiang Livestock Department and the project stakeholders in Anda City have highly appreciated the efficacy of these materials. The manuals are being utilized by the provincial, city, county, township and town<sup>15</sup> governments in formulating their dissemination plans and holding training courses, primarily referring to the technological items intended for small-scale dairy farmers. As shown in Table 12, small-scale dairy farmers account for over 90% of all the dairy farmers in the province; thus, the content of the manuals satisfies the needs of the province. The technological items utilized mainly include those pertaining to the improvement of feeding environment, preparation of silage forage, use of cryopreserved semen of excellent breeds, blending of forage, prevention of mastitis, hoof cutting, and feeding management for calves.

Table 12 Number of Dairy Farmers by Scale in Heilongjiang Province

Scale of Dairy Farmers	Number of Dairy Cattle	2006	2010
Small-scale	40,693	65,238	99,707
Medium-scale	30-200	3,246	5,764
Large-scale	200 or more	295	997
Total		68,779	106,468

Source: Heilongjiang Province Livestock Department

The model stock farms and areas of the project have also been continuing their activities as the bases for technological dissemination.

In Xianyuan Township, where the model area of the project was located, training sessions

<sup>15</sup> In general, Chinese administrative divisions have a three-tiered structure, with provinces, cities/counties, and townships/towns. Townships/towns are the smallest administrative divisions.

targeting a total of 400 dairy farmers are being held six times annually. In addition, peripatetic door-to-door technical instruction activities have continued to be implemented, covering about half of the dairy farmer population in the township, and the number of instructed dairy farmers has been increasing compared to during the project period. The content of the training is renewed every time, with the technologies established in the project being improved to keep abreast of the situation so that they can be disseminated promptly.

Approximately 35 inspection teams visit Youyi Ranch, the model stock farm, annually. Consequently, the stock farm is playing a role as a base for technological dissemination, where demonstration exhibitions for the technologies transferred in the project are held.

To measure the effects of technological dissemination outside the project area, data pertaining to the production of forage crops and raw milk were collected, which were identical to the output indices, via a beneficiary survey. The results were as follows: The yield of forage maize has increased by 30% owing to technology transfer. Furthermore, an analysis of the effects of technology transfer that promotes the improvement of feeding management has confirmed that the milk yield has increased by 10% to over 20%.

Table 13 Changes in Annual Production of Silage Maize before and after Technological Transfer  
(Unit: kg/ha)

	Before	After	Growth Rate
Anda City	4,926	6,400	130%
Shuangcheng City	-	-	-

Source: Beneficiary Survey Results

Table 14 Changes in Annual Milk Yield per Cow before and after Technological Transfer  
(Unit: kg/cow)

	Before	After	Growth Rate
Anda City	4,470	5,542	124%
Shuangcheng City	3,318	3,848	116%

Source: Beneficiary Survey Results

In the beneficiary survey, over 90% of the beneficiaries have responded that their raw milk yields have increased after they received technical instruction. Specifically, the improvement of the feeding environment has led to the decrease in the incidence of disease among dairy cattle (see Table 3), and the improvement of forage has led to increase in the production and quality of raw milk.

## 2) Dairy Industry

On account of the privatization of the dairy industry<sup>16</sup>, the roles played by the government to disseminate technologies in this field have been reduced. The introduction of competition due to privatization has prompted each company to take unique approaches such as cooperation with foreign firms and research institutions, business partnerships between companies, and investments in facilities and equipment. Thereby, these companies are proceeding with the development of dairy products catering to the taste of consumers and the streamlining of operations.

The manuals created in the project have been distributed to the relevant entities such as dairy companies in the province and are being referred to and utilized for research and product development purposes.

Table 15 Major Dairy Companies in Heilongjiang Province

Company Name (Chinese Name)	Products other than Milk	Daily Milk Production (ton)
Feihe International, Inc.	Powdered Milk	1,000
Heilongjiang Beingmate Dairy Industry, Ltd.	Powdered Milk	300
Hei Longjiang Yaolan Dairy Co. Ltd	Powdered Milk	300
Heilongjiang Hui'Erkang Qingxin Dairy Industry Co. Ltd.	Sterilized Milk, Milk Beverages	160
Harbin Prince Dairy Products Industrial Co. Ltd.	Milk Beverages, Powdered Milk	60

Source: Heilongjiang Province Livestock Department

At present, the Chinese Government is making efforts toward technological dissemination in the field of dairy industry only on a small scale. The Dairy Product Technical Training Center within the National Dairy Engineering and Technical Research Center, which was one of the executing agencies of the project, is taking the initiative in providing college students in relevant faculties with training courses on the manufacturing of processed cheese. The actual annual number of trainees in 2010 was approximately 80.

### 3.2.2.5 Prospects of Super Goal Achievement

Super Goal: To improve the earnings of dairy farmers in Heilongjiang Province through the development of its dairy farming and dairy industry.

Index: The average dairy farming income of dairy farmers in Heilongjiang Province increases.

## (1) Growth of Dairy Farming and the Dairy Industry in Heilongjiang Province

### 1) Dairy Farming and the Dairy Industry in Heilongjiang Province

Dairy farming and dairy industry in Heilongjiang Province have grown dramatically in the past decade including the 5 years of the project period and the subsequent 5 years. For example,

<sup>16</sup> The Chinese Government's policy of privatizing state-owned enterprises started in the late 1990s and this reform became full-fledged from around 2003.



the raw milk production within the province has more than tripled since the start of the project, and even compared the end of the project, the amount is 1.5 times greater (Table 8).

Furthermore, the annual milk yield per dairy cow has increased by around 20% compared to before the technology transfer to dairy farmers (Table 14), thus demonstrating the effects of the transfer. In the dairy industry field, the government encouraged citizens to consume dairy products, and the privatized companies competed against each other to improve their products. This has led to the increased production and diversification of dairy products.

## 2) Impacts of the Project on Dairy Farming and the Dairy Industry in the Entire Province

This project was aimed at disseminating a model established via the project throughout Heilongjiang Province. As mentioned above, this model is being utilized as part of the dissemination plan of the province and is playing a certain role in the overall dissemination effort of the province. In the dairy farming field, in particular, the model is being utilized as an affective manual and teaching material by small-scale dairy farmers, who account for more than 90% of all the dairy farmers in the province. In interviews, extension workers highly appreciated the model. In the dairy industry field, the scope of the government's activities in the technology transfer was limited after the privatization of dairy companies. Accordingly, the government's involvement in this project was indirect. Nevertheless, the manuals prepared in the project have been distributed to relevant entities such as dairy companies in the province, where they have been referred to and utilized for research and product development purposes. Therefore, they can be evaluated as contributing to the growth of these private companies. In addition, Longdan Milk Industry Company, which was a project implementing organization in the dairy industry field, has seen the quality of its yoghurt products improve through the project, and this effect has been maintained ever since the end of the project. As a result, the company's market share of yoghurt products has expanded within the province, exceeding 50% at the time of the ex-post evaluation. Given the increase in the raw milk yield so far (see Table 8) and the production of fermented milk by the company (see Table 4), the share is expected to continue growing in the future.

In order to maximize the effect of technical cooperation within the constraints of limited inputs, the dissemination process after the project implementation holds the key. In the case of this project, as stated above, technologies were selected and transferred in accordance with the actual needs and conditions in the province. As a result, the results of the technical cooperation have been successfully incorporated into the overall dissemination plan of the province. Given the successful implementation of cooperation with an eye on the dissemination phase, this project can be evaluated to have played a role in boosting the effectiveness of the overall dissemination policy of the province.

(2) Improvement of Dairy Farmers' Income in Heilongjiang Province

As mentioned above, the effects of technological dissemination have been confirmed in the form of increase in the raw milk yield per cow. However, according to the beneficiary survey, factors such as increasing costs for purchasing forage have caused the dispersion of dairy farmers' earnings from area to area. The table below shows the survey results on the actual income of dairy farmers in the cities of Anda and Shuangcheng before and after the technological transfer<sup>17</sup>.

Table 16 Changes in Dairy Farmers' Income before and after<sup>18</sup> Technological Transfer

(Unit: Yuan)

	Household Income			Profit per Dairy Cow		
	Before	After	Amount of Increase	Before	After	Amount of Change
Dairy Farms in Anda City (monitor)	19,449	33,741	14,292	4,164	3,842	-322
Dairy Farms in Anda City (non-monitor)	37,640	31,529	-6,111	4,395	3,761	-634
Dairy Farmers in Shuangcheng City (non-monitor)	9,712	67,052	57,340	1,133	4,723	3,590

Source: Beneficiary Survey Results

\* The income figures before the technical transfer have been adjusted for inflation.

As shown in the table above, the actual incomes of the monitor farmers have increased since the start of the project and exceeded the average income of the non-monitor farmers, thus clearly demonstrating the effects of the technical transfer in the project. However, the profit per head of cattle has decreased, albeit slightly. According to the explanation by the livestock departments of Heilongjiang Province and Anda City, this is probably attributable to the increase in the production expenses including the forage costs. In fact, in Shuangcheng City where the home production of forage is possible, the effects have been greater, with the profit margin per head of cattle having increased significantly. The table below compares the costs per head of cattle between both cities. In Anda City, due to restrictions pertaining to natural environment and land resources such as its arid climate, alkaline soil and limited cultivated area, there are limits as to how much forage can be produced. Accordingly, the purchase costs for forage have significantly added to the production expenses, resulting in the decreased profitability of the dairy industry.

<sup>17</sup> Taking into account the price escalation rate, the actual incomes adjusted for inflation were compared. Since the number of the samples is limited and other conditions also vary, the figures were analyzed as references.

<sup>18</sup> The data prior to the technological transfer are from 2000 for the monitor dairy farmers in Anda City, from 2003 for the non-monitor dairy farmers, and from 2004 for those in Shuangcheng City. The data after the technology transfer are the achievement data from 2010.

Table 17 Changes in Production Costs before and after Technological Transfer

(Unit: Yuan)

	Cost per Dairy Cow		
	Before	After	Growth Rate
Anda City	2,380.9	3,558.2	149%
Shuangcheng City	2,271.1	1,435.1	63%

Source: Beneficiary Survey Results

\* The income figures before the technical transfer have been adjusted for inflation.

The other factors contributing to the significant rise of the dairy farmers' income in Shuangcheng City compared to that in Anda City include its higher accessibility to the market and the greater number of dairy cattle owned. With Shuangcheng City located on the outskirts of the provincial capital Harbin and the dairy farmers there owning five more cows on average than those in Anda City, there is clear difference in the production scale between those two cities (see Table 3).

In comparison of the earnings between the monitor and non-monitor farmers in Anda City, while a certain level of income improvement has been confirmed among the monitor farmers, the actual income of the non-monitor farmers has decreased. This may derive from the difference in the achievement status of productivity enhancement<sup>19</sup> between these two types of farmers.

On the other hand, the market price of raw milk, which can have a potential impact on the dairy farmers' income, has been stabilized, partially owing to the price adjustment efforts by the government. The price of raw milk plummeted temporarily after the incident that occurred in 2008 involving powdered milk containing toxic substances, whereas the price of forage went up when its supply could not keep up with the demand due to the decrease in the number of farmers producing forage. The price fluctuated thereafter until the government took price adjustment measures, thanks to which the dairy farmers were spared from the major effects of the price fluctuation. When asked to evaluate the current price level (degree of satisfaction) in the beneficiary survey, 12% of the dairy farmers responded that they are "satisfied," 64% "somewhat satisfied," and 24% "unsatisfied," thus indicating a relatively stable degree of satisfaction.

<sup>17</sup> As shown in Table 16 in the previous section, the raw milk production of the non-monitor farmers has been growing. However, the annual yield per cow is still 400 kg lower than that of the monitor farmers. Therefore, the production improvement effects are still not sufficient.

Table 18 Changes in Raw Milk Price (Actual Price) in Heilongjiang Province

Year	2006	2010	Growth Rate
Actual Price (yuan/kg)	1.78	2.75	
Price Adjusted for Inflation (yuan/kg)	1.99	2.75	138%

Source: Heilongjiang Province Livestock Department

In light of the above survey results, the current status and factors regarding the income improvement of dairy farmers are summarized as follows:

Table 19 Current Status and Factors Regarding Dairy Farmers' Income Improvement

Factors of Income Improvement	Actual Income	Profitability of Dairy Cattle	Market Prices	Production Costs (Forage)	Average Number of Cattle (Scale)
Anda City					
Monitors	Increased	Decreased	Stabilized	Significantly impacted	10 head (increased)
Non-monitors	Decreased	Decreased	Stabilized	Significantly impacted	11 head (increased)
Shuangcheng City (Non-monitors)	Significantly increased	Improved	Stabilized	Stabilized	16 head (increased)

By present time, the sales price of raw milk has been stabilized, and productivity has improved on the whole. However, factors such as the increase in production costs due to the rising prices have resulted in the dispersion of the dairy farmers' earnings depending on the area and business environment. That said, the super goal is considered to have been achieved to a certain extent.

In order to harness the dissemination of the dairy farming model to improve the farmers' income throughout the province, it will be necessary to maintain advantageous conditions for the farmers to own at least a certain head of cattle, in addition to the improvement of productivity and the streamlining of production costs.

### 3.2.2.6 Factors to Promote or Inhibit Achievement of Overall Goal and Super Goal

#### (1) Promoting Factors

Although it is the national government that takes the initiative in implementing technical instruction and assistance programs for dairy farmers, entities other than governmental authorities are observed to have played and exerted the following roles and influence:

- There is a livestock producers' association that wields a strong influence over sales and distribution. The affiliated members of the association are companies and large-scale

dairy farmers in the province. Although the membership does not include small-scale farmers who were covered by this project, the association has a say in proposals to the government and milk price negotiation, and thus, is involved in the promotion of the farmer assistance program of the province and the stabilization of sales prices.

- According to the beneficiary survey, about 10% of the dairy farmers were receiving technical instruction not only from the dissemination agencies of the government but also from forage companies and dairy companies. In particular, raw milk whose production quality and quantity has improved as a result of instruction from dairy companies tends to be shipped to the same companies. Furthermore, dairy farmers have become more conscious of the quality control of their raw milk in conformity with the company-specific quality standards<sup>20</sup> for raw milk.

Although it is difficult to fathom how the above-mentioned promoting factors influenced the project effects, a certain degree of synergistic effect must have come into play as association activities and companies were involved in the technical dissemination.

## (2) Inhibiting Factors

Due to China's joining the WTO in 2001, the import volume of low-priced foreign-made powdered milk products has been increasing since 2005, thus raising concern of either the milk price dropping or the sales of domestic raw milk being impeded.

### 3.2.2.7 Other Impacts

#### (1) Impacts on Natural Environment

In Xianyuan Township, which was one of the project areas, approximately 1,000 Mu of grassland were recovered during the period between 2003 and 2006. Furthermore, thanks to the transfer of manure treatment technologies, environmental health problems such as the stench around Youyi Ranch and the monitor dairy farms have been alleviated. There have been no other environmental problems resulting from the project.

#### (2) Land Acquisition and Resettlement

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

#### (3) Other Indirect Impacts

##### 1) Organization of Dairy Farmers

The staff at Youyi Ranch, who have been trained in Japan during the project, under the support of the Xianyuan Township Government, established the Youyi Village Dairy Cattle

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<sup>20</sup> Although there are government-imposed standards for raw milk quality, these company-specific standards can sometimes be stricter.

Association in 2004 along with other dairy farmers in the vicinity, by referring to the Japanese Agricultural Cooperative. The association was continuing its activities at the time of the ex-post evaluation, and three other dairy farmers' associations have been founded in the township. The activities of the associations include the transfer of feeding management technologies supported by the government, provision of disease prevention services, price negotiation with forage companies, and coordination of payment. These activities are thought to be contributing to the improvement in the technology and income of dairy farmers.

## 2) Regional Infrastructure Development

Since the project completion, Youyi Ranch and the Anda City Government have developed roads in the dairy farming project area. This has enabled regular collection of raw milk by dairy companies.

The implementation of this project has led to the achievement of the project purpose of establishing dairy farming and dairy industry technologies and the overall goal of disseminating dairy farming technologies to a certain extent. Moreover, the effects of the project have been manifested as planned. Therefore, the efficacy and impacts of this project have been high.

### 3.3 Efficiency (Rating:③)

#### 3.3.1 Inputs

The planned inputs and achievements of this project were as follows:

Input Element	Plan	Achievement (at completion)
(1) Expert Dispatch	<ul style="list-style-type: none"> <li>- Long-term experts from six fields</li> <li>- Short-term experts: to be dispatched as necessary in accordance with the basic plan.</li> <li>Number: To be determined</li> </ul>	<ul style="list-style-type: none"> <li>- 13 long-term experts from 7 fields: chief advisor, forage production, feeding management, raw milk quality control, dairy product processing (cheese and fermented milk), and coordinator.</li> <li>31 short-term experts from 27 fields: silage preparation technology, alkali soil modification technology, cow feeding environment arrangement, milking hygiene control, manufacturing technology for various types of cheese, collection and storage of lactic acid bacteria, equipment operation and maintenance, etc.</li> </ul>

(2) Trainee Acceptance	Main training fields To be accepted as necessary No concrete plans	Main training fields: Forage production, feeding management, raw milk quality control, dairy product manufacturing, fertilized egg production, etc. 37 trainees
(3) Equipment Provision	Main input equipment: Material and equipment necessary for the following operations (forage production, feeding management, raw milk quality control, and dairy product manufacturing); material and equipment necessary for offices, vehicles, etc.	Main input equipment: Milking facilities, machinery necessary for forage production, cheese ripening air conditioning equipment, raw milk analytical machinery, etc.
Total Cooperation Amount	NA	1.3562 billion yen in total
Chinese Government Input Amount	Personnel expenses and other allowances for the counterparts and other Chinese stakeholders, expenses and depreciation charges necessary for the development of land, buildings and incidental facilities, technology dissemination costs, and expenses necessary for other project activities.  <u>Amount To be determined</u>	Personnel expenses, material/equipment purchasing costs, building maintenance expenses, technology research expenses, etc.  <u>26.63 million yuan in total</u>

### 3.3.1.1 Input Elements

#### (1) Japanese Side

The dispatch of experts satisfied the planned fields and was implemented while making changes to correspond to the needs during the project period. In particular, a certain Chinese stakeholder expressed the view that the long-term dispatch and multiple dispatch of the same experts were highly effective in understanding the local needs, building a trusting relationship, and selecting and relocating appropriate technologies. However, there have been some problems such as frequent replacement of short-term experts, which slightly delayed the progress of the project. Nevertheless, this did not affect the ultimate achievements of the outputs.

The counterparts who received training in Japan have stated that they were able to put what

they learned into practice in the project activities in one way or another.



Fig.7 Inspection/Analytical Equipment at the Dairy Industry Site



Fig.8 Milking Plant Developed at the Dairy Farming Site

## (2) Chinese Side

Of the 89 counterparts allocated, 71 remained stationed by the end of the project; therefore, the retention ratio was relatively high.

### 3.3.1.2 Cooperation Amount

Since the ex-ante evaluation amount could not be confirmed, no comparison between the plan and the achievement is available.

### 3.3.1.3 Cooperation Period

The cooperation period was as planned, lasting for 60 months between July 1, 2001 and June 30, 2006.

As above, although the absence of a planned value for the cooperation amount renders it impossible to make a comparison between the plan and the achievement, the inputs made in the project were appropriate in proportion to the achievement outputs, and the cooperation period was as planned. Therefore, the efficiency of the project was high.

## 3.4 Sustainability (Rating: ②)

### 3.4.1 Policy and Institutional Aspects

The policies at the time of the ex-post evaluation were as follows: The policies for dairy farming production were aimed at promoting the expansion, sustainability, dissemination and effects of the technologies introduced in the project. By contrast, the government has promoted the privatization of the dairy industry, and thus, has not taken the initiative in formulating policies to encourage technological development in this field.



### (1) Dairy Farming Field

In the National People's Congress convened in March 2011, it was declared that the nation would continue to attach utmost importance to the support for agriculture and rural development, and a fiscal expenditure of 988.45 billion Yuan was earmarked for the period between 2011 and 2010 (a year-on-year increase of 130.48 billion Yuan).

According to the "Heilongjiang Province Million Tons of Milk Strategic Business Plan (2008-2012)," the province is aiming for the promotion of excellent breeds, increase of model stock farms, expansion of their operation scale, increase of forage production, and recycling of livestock manure. In addition, the dairy farming support system<sup>21</sup> currently introduced by the government is serving as an incentive for dairy farmers to maintain the project effects and introduce new technologies. According to interviews with dairy farmers, they were especially appreciative of the fact that semen used for artificial insemination of excellent breeds and vaccination are free of charge.

### (2) Dairy Industry Field

Since the privatization of many of the state-owned dairy companies, private companies have been independently promoting the development of dairy industry technologies, and at the same time, the roles played by the government agencies in technology dissemination have been reduced. Although the National Dairy Engineering and Technical Research Center regards promotion of the dairy industry, support for market revitalization, and encouragement for increased consumption of dairy products as its three main missions, it has now virtually no functions as a research and inspection body, according to project stakeholders.

#### 3.4.2 Structure of Counterparts

In the dissemination of dairy farming and dairy industry technologies, the organizations shown in the table below are sharing responsibilities. In the field of dairy farming, extension workers are assigned to the livestock department of each local municipality, which is responsible for formulating and supervising its activity plans. In the field of dairy industry, on the other hand, the privatization of dairy companies has enabled each company to develop technologies and products on its own, thus diminishing their roles in technological dissemination.

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<sup>21</sup> Preferential pricing for silage forage crop seeds, allowances for silage storage, artificial insemination services, allowances for forage corn production, etc.

Table 20 Organizations Involved in Dissemination of Dairy Farming and Industry Technologies and their Roles

Roles	Dairy Farming	Dairy Industry
Formulation of dissemination policies/plans; supervision of dissemination activities	Heilongjiang Province Livestock Department, city/county livestock departments	National Dairy Engineering and Technical Research Center
Implementation of dissemination activities	Technical extension staff at province, city/county, and township/town livestock departments	National Dairy Engineering and Technical Research Center
Development of technologies	Heilongjiang Province Livestock Research Institute	Each dairy company (private)

Sources: Created based on the information obtained from the Heilongjiang Livestock Department, Anda City Livestock Department, Xianyuan Township Government Livestock Farming Center, and Longdan Milk Industry Company.

#### (1) Dairy Farming Field

There is an established technological dissemination structure in place in the field of dairy farming, where technical extension staff assigned to each of the administrative units from province to village have been providing dairy farmers with necessary services such as artificial insemination and preventive vaccination pursuant to the plans. According to interviews with the organizations concerned, although the number of extension workers is sufficient, challenges remain concerning their technical levels and the paucity of financial resources for dissemination activities. In the beneficiary survey, no respondents voiced dissatisfaction with the technical instruction by the government.

The model stock farm of the project, Youyi Ranch, is cooperating with the Xianyuan Township Government Livestock Farming Center (in charge of technical dissemination and instruction) and the Anda City Government Livestock Department in disseminating technologies. Youyi Ranch is engaged in technological dissemination activities for dairy farmers on a daily basis along with the Xianyuan Township Government, and holding meetings to share information on the progress of their activities with the Anda City Livestock Department at a frequency of about every month. Youyi Ranch has seen hardly any transfers of project stakeholders in the field of dairy farming, and many of the staff at the Anda City Government have been assigned to duties related to dairy farming even after personnel transfers. Therefore, the structure to implement dissemination and monitoring activities to maintain the project effects has scarcely been affected.

In Anda City, to which the project model area belongs, there are a total of 130 township/city government personnel in charge of technological dissemination and public relations. On the

village level, there are 500 to 6,000 extension workers<sup>22</sup>. In Xianyuan Township, where the project model area was located, the number of extension workers has been unchanged at seven for the past 10 years. There are 40 extension cooperators in the nine villages within the township.

## (2) Dairy Industry Field

One of the executing agencies in the dairy industry field, Longdan Milk Industry Company, was privatized in conformity with the government policy in 2004, when the project was still in progress. Consequently, the mobility of human resources since the end of the project has been high. The only thing the provincial government could do was to request the company to keep the outflow of human resources to a minimum, but as many as 30 workers have transferred to other companies in the same line of business within the province. According to an interview with Longdan Milk Industry Company, the majority of these workers are engaged in research and development in their new companies. This may have adversely affected the sustainability of the project in the short run, but from the perspective of technological dissemination, it may also be said to have contributed to the dissemination of the dairy technologies transferred in the project.

On the other hand, with regard to the technological dissemination structure for the dairy industry, the other executing agency, the National Dairy Engineering and Technical Research Center, has taken the initiative in providing training courses catering to university officials. At present, it is private companies that are taking charge of the dairy industry, with each company developing technologies at its own discretion. Therefore, the government is not conducting technological dissemination activities targeting private companies.

### 3.4.3 Technologies of Counterparts

The equipment and facilities supplied and allocated in the project have been utilized, and there appears to be no problem regarding operation and maintenance in the future. In the dairy industry field, despite some outflow of technologies due to the transfer of human resources trained in the project from Longdan Milk Industry Company, efforts have been made, for example, to provide training courses for new talent. Consequently, the outflow has not significantly affected the maintenance of the technologies transferred in the project.

In the dairy farming field, the extension workers are playing crucial roles in promoting technological dissemination throughout the province. Although the minimum skill levels of the extension workers are being maintained through periodic testing, there are financial constraints in implementing training programs to transfer new technologies. These constraints are serving

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<sup>22</sup> Village extension workers are in charge of providing services under the technology dissemination structure of the Chinese Government. They are paid by the Government and need an academic background and expertise in a specialized field. In order to maintain and improve the skill levels, they are required to renew their licenses by passing periodic examinations. In the field of dairy farming, they are engaged in services such as preventive vaccination and artificial insemination.

as inhibiting factors in promoting technological dissemination to dairy farmers. This problem was pointed out unanimously in interviews with the dairy farming technology extension staff of the provincial, city/county, and township/town governments.

### (1) Equipment

It was macroscopically confirmed that most of the supplied equipment was maintained in good condition and fully utilized. The table below shows the utilization status of the major equipment:

Table 21 Utilization Status of Equipment Worth over Five Million Yen

Use Frequency (A: Always - B: Often - C: Sometimes); Condition (A: Good - B: Normal - C: Bad)				
Machinery Name	Price (1000 yen)	Installation Location	Use Frequency	Condition
Milking Facilities	8,364	Youyi Ranch	A	A
Tractor	7,570	Youyi Ranch	A	B
Tractor	6,536	Youyi Ranch	A	B
MilkoScan	12,376	Longdan Milk Industry Company	A	A
Ripening Room and Air Conditioning for Natural Cheese	29,103	Longdan Milk Industry Company	A	A
Power Shovel	5,946	Youyi Ranch	A	B
Wrapping Machine for Processed Cheese	8,462	Longdan Milk Industry Company	B	A
Decentralized Stability Analyzer	5,590	National Dairy Engineering and Technical Research Center	A	C*

Sources: Youyi Ranch, Longdan Milk Industry Company

Note:\* With some of the parts difficult to obtain, operation is done manually.

Some of the equipment and facilities supplied to Youyi Ranch are being operated and maintained by outsourcing experts. Longdan Milk Industry Company keeps the machinery and equipment for the dairy industry field because the company has space for storage, and the company shares it with the National Dairy Engineering and Technical Research Center. During the project period, Longdan Milk Industry Company relied on the project manuals for operation and maintenance, but has been using its own versions and revisions thereafter.

### (2) Dairy Farming Field

There are some challenges in improving the skills of extension workers who are directly responsible for dissemination activities in townships/villages and cities/counties. Although the extension workers in cities/counties and townships/villages take a one-to-two-week training course provided by the provincial government once every couple of years, the frequency of the training is too low for them to reach a technical level that allows them to provide instructions on technical improvement. As a result, the quality of the extension workers has not reached a

satisfactory standard yet. With the technologies related to dairy farming being renewed on a daily basis, the current frequency and length of personnel training are clearly insufficient for the extension workers to undergo proper technological transfer.

In order to continue the technological dissemination activities demanded by dairy farmers, it will be necessary to increase the opportunities of training for extension workers.

### (3) Dairy Industry Field

Approximately a quarter of the personnel trained in the project were still engaged in the operations at the time of the ex-post evaluation. According to the Longdan Milk Industry Company, the newly-assigned personnel have inherited the skills through training courses. Therefore, there should be no problem concerning the maintenance of the technologies.

#### 3.4.4 Financial Affairs of Counterparts

According to the staff at the Heilongjiang Livestock Department, although their financial condition allows the employment of human resources in relation to technological dissemination, they have been able to secure only a minimum amount of training budget for dissemination activities and improvement of personnel skills from the government budget. They have explained that they are unable to implement sufficient dissemination activities for production improvement needed by dairy farmers.

On the other hand, there was no problem in the financial sustainability of Youyi Ranch and Longdan Milk Industry Company, which were the project executing agencies, and interviews with persons concerned have revealed that their business is expanding.

### (1) Dairy Farming Field

In order to maintain the financial sustainability for technological dissemination, it is necessary to improve personnel skills and secure activity costs such as transportation expenses and allowances. Although the number of extension workers and the size of the budget are increasing in the province as a whole, they are still not sufficient. Furthermore, despite the sufficient number of extension workers secured at the city/county and township/town levels, the skill development of each worker is a challenge, with the training budget for them not sufficient.

The subsidies provided by the national, provincial and city governments are on the increase compared to at the time of the project completion (see Table 11 for details).

Meanwhile, the financial sustainability of the project model areas is as follows: The expenditures related to technological dissemination and public relations by the Xianyuan Township Government have been unchanged at 200,000 Yuan annually for the past five years, but have increased from 100,000 Yuan during the project period. Although Youyi Ranch is being run on a self-financing basis, it does not seem to have any financial issues, with its business

growing as evidenced by the addition of new milking plants and cattle sheds after the end of the project.

## (2) Dairy Industry Field

The total annual sales of Longdan Milk Industry Company, an executing agency in the dairy industry field, grew from approximately 500 million Yuan in 2005 to approximately 800 million Yuan in 2010. The company continues to be in the black, thus posing no problems for securing operation and maintenance fees for the equipment and facilities.

### 3.4.5 Sustainability Status of Effects

#### (1) Sustainability of Effects

In the section “3.2.2 Impacts,” the status of the project achievements and goals after project completion was mentioned. Besides this, the effects on the following research fields have been observed.

The annual production and land area of alfalfa seeds in the Heilongjiang Province Livestock Research Institute have been expanding since the end of the project, indicating the effects of the technological transfer. This research institute contacts the Anda City Livestock Department of the dairy farming site a few times a year as necessary to offer support services such as embryo transfer and provision of excellent alfalfa seeds.

Table 22 Changes in Alfalfa Seed Production in Provincial Livestock Research Institute

Year	Annual Production (Catty)	Production Land Area (Mu)
2006	183	12
2007	450	30
2008	675	45
2009	900	90

Source: Heilongjiang Province Livestock Research Institute

#### (2) Promoting Factors

Since October 2009, JICA has been dispatching senior volunteers in the field of dairy farming, and they have been addressing challenges such as improvement of alkaline soil, cattle manure treatment, and reproductive difficulties of dairy cattle. The daily duties of these dispatched volunteers include instructing farmers on how to apply the technologies transferred in the project to limited conditions. According to interviews with the staff at Youyi Ranch and the volunteers, these activities have not only ensured that the technologies are assimilated but also contributed to changing the mindset and attitude of the workers toward the utilization and application of the technologies.

As above, some problems have been observed in terms of the technical and financial conditions of the project; therefore the sustainability of the project effects is fair.

## **4. Conclusion, Lessons Learned and Recommendations**

### **4.1 Conclusion**

Heilongjiang Province in China, ranking high in dairy production, had been making efforts to develop and promote dairy farming and the dairy industry but had issues in the quality/quantity of cattle forage and the productivity of raw milk, as well as problems such as delays in the development of dairy products. This project was intended to address such development needs while aiming for improvement of the technologies for forage production, feeding management and dairy processing. Therefore, its relevance was high. The goal of this project was to establish a model for dairy farming and dairy industry in the province, and this was achieved through the improvement of technologies for forage production and feeding management in the dairy farming sector, and through the diversification and quality improvement of dairy products in the dairy industry. Since the completion of the project, the established model, that is to say the systematized technological methodology, has been promulgated by the authorities concerned to the entire province, and its effects have been manifested in the improvement of raw milk production and the increase in dairy farmers' earnings, thus substantiating its positive impact. Furthermore, since the project has been implemented in accordance with the schedule and the results have been proportionate to the inputs, the implementation can be considered to have been efficient. With regard to the sustainability of the project, although some challenges remain in the technological and financial aspects concerning the technical advancement of the extension workers, no problems have been observed in terms of the project policy and structure.

In light of the above, this project is evaluated to be highly satisfactory.

### **4.2 Recommendations**

#### **4.2.1 Recommendations to Counterparts**

##### **(1) Soil Improvement for Increased Forage Production**

In order to increase the income of dairy farming households, forage production has proved to be important in curtailing production costs, especially forage purchasing expenses. In Anda City, where the project area was located, the arable land area where forage can be produced is limited due to the abundance of alkaline soil. Consequently, the farmers can only produce insufficient volume of forage on their own, forcing them to buy commercial forage. In turn, the added costs are undermining the profitability of each dairy farmer. In order to increase the forage production in such an environment, one cannot count solely on the efforts of individual dairy farmers to improve their forage production technologies. Therefore, large-scale support efforts must be made by dedicating an entire project to certain undertakings such as alkaline soil improvement.

## (2) Enhanced Training for Extension Workers

In order to enhance the skill levels of extension workers in the field of dairy farming, it will be necessary to increase the frequency and quality of the training. Although the number of extension workers is sufficient, they are unable to provide dairy farmers with satisfactory services regarding technological dissemination just by undergoing training once annually under the auspices of the Livestock Department of the province. The Chinese Government has been promoting financial support for dairy farmers nationwide to reinforce the agricultural sector including dairy farming and animal husbandry, and it has been confirmed that budget can be secured at a local municipality level. It is desirable that the financial resources be secured and the structure and quality of the training be improved.

### 4.2.2 Recommendations to JICA

None in particular

### **4.3 Lessons Learned**

None in particular