China

Inner Mongolia Fertilizer Plant Construction Project (1)(2)(3)(4)

Report Date：November 2002
Field Survey：July 2001

1. Project Profile and Japan's ODA Loan

Site Map：Inner Mongolia Autonomous District

Site Photo： Inner Mongolia Fertilizer Plant

1.1 Background

Annual food production of China in 1980s had shifted in the range from 320 million tons to 410 million tons. In 2000, Chinese government set its food production target at 500 million tons based on the population of 1,250 million and per capita food requirement of 400 kg per annum. The government has realized that it is essential to increase the input of fertilizer to increase the volume of food production, which significantly contributes to the improvement in the productivity of food production. On the other hand, there is a considerable gap in the supply and demand of fertilizer in China and the nation is importing fertilizer in great volume every year. Volume of fertilizer imported in 1989[1] was 13.93 million tons (in weight[2]) and the amount of foreign currency paid for such import was as much as $2,360 million. Because of the situation, there is an urgent need of domestic fertilizer production for stable fertilizer supply and to save foreign currency. To solve this supply and demand gap in fertilizer, Chinese government has established a plan to construct 10 fertilizer plants in the whole nation with a total production capacity of 2.43 million tons (in net quantity basis[3]) in its 8th Five-Year Plan (1991～1995).[4]

In Inner Mongolia Autonomous District, site of this project, production of nitrogenous fertilizer of autonomous district in 1989 (in net quantity basis) was mere 120,000 tons (in three fertilizer types) and 170,000 tons against the demand of nitrogenous fertilizer (in net quantity basis) of 270,000 tons. And the shortages were filled by the shipments from other provinces. It has been a pressing need to construct a fertilizer plant in the autonomous district to cope with the future increase in the demand of nitrogenous fertilizer, in particular, urea fertilizer, in Inner Mongolia Autonomous District. And also, the district has abundant supply of residual oil and coal, both of which can be used as raw material and fuel respectively for fertilizer production. Thus, it was decided to construct a nitrogenous fertilizer (urea) plant, in which residual oil would be used as raw material in the suburbs of Hohhot of Inner Mongolia Autonomous District.

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[1] Chinese fiscal year is from January to December.
[2] Total of actual weight of all fertilizer types such as nitrogen, phosphate, potassium and complex type
[3] Total weight of active ingredients (nitrogen, phosphate and potassium) contained in the above fertilizers
[4] Among 10 plants in the 8th Five-Year Plan, six plants became the subject of the loan including this project.

1.2 Objectives

Objectives of this project are to cope with sharply increasing fertilizer demand and to improve productivity in the food production in Inner Mongolia Autonomous District through the construction of urea fertilizer plant with annual production capacity of 520,000 tons (or 240,000 tons in net quantity).

1.3 Project Scope

ODA loan covers total amount of foreign currency portion of the project cost, including the construction of ammonia and urea manufacturing facilities to produce urea fertilizer in the volume of 520,000 tons per annum.

1.4 Borrower/Executing Agency

External Trade Department, The People's Republic of China[5]/ Chemical Industry Department, The People's Republic of China

1.5 Outline of Loan Agreement

	First	Second	Third	Fourth	Total
Loan Amount	2,503 Million Yen	6,092 Million Yen	8,308 Million Yen	4,509 Million Yen	21,412 Million Yen
Loan Disbursed Amount	2,503 Million Yen	6,092 Million Yen	8,308 Million Yen	4,508 Million Yen	21,412 Million Yen (Note)
Exchange of Notes	November 1990	September 1991	October 1992	August 1993	-
Loan Agreement	November 1990	September 1991	October 1992	August 1993	-
Terms and Conditions	:				-
Interest rate	2.5%	2.6%	2.6%	2.6%	-
Repayment period (Grace Period)	30 years (i 10	30 years (10 years)	30 years (10 years)	30 years (10 years)	
Procurement	years)	General untied	General untied	General untied	-
	General untied				-
Final Disbursement Date	December 1995	November 1996	November 1997	March 1999	

Note: Executed total amount does not correspond to the total of each loan because of the rounding of figures.

2. Results and Evaluation

2.1 Relevance

This project has a high priority, as it is in line with the basic policy of planned economy of China in its 8th Five-Year Plan. And also, the plan is relevant from a viewpoint of improving food production and foreign currency saving, as it aims to increase fertilizer production. Furthermore, stable food production is a continuously important political issue for China. Even today, relevance of this project does not change at all in view of the production and sales of fertilizer, which contributes to the improved productivity in food production.

2.2 Efficiency

① Project Cost

As the amount of investment increased from planned 1,026 million RMB to 1,819 million RMB, total project cost in Japanese Yen overran the budget by 8%. When the total project cost is converted into RMB, it became to as much as 3,394 million RMB from planned 2,050 million RMB because of the drop in the exchange rate of RMB[6] in addition to the increase of investment in RMB.

[5] Present External Trade Economic Collaboration Department. Also, after 1999, borrower of the Japanese Loan to China was changed to the government (Finance Department) of the People's Republic of China.

[6] Exchange rate in the planning stage was 1RMB = 20.9 Yen but it was reduced (average during investment period) to 12.7 Yen.

② Construction Period

Construction was started in October 1992 with the basic design. Construction of ammonia plant completed in August 1995 or four months ahead of the schedule and that of urea plant completed in early December 1996 or delayed about one year from original schedule due to the delayed delivery of equipment. After the comprehensive trial run, commercial run subsequently started at the end of December 1996 or about six months later than the schedule.

2.3 Effect (Degree of Achievement)

① Urea Production Volume

Planned volume and the result of urea production in this project are as shown in Table 1 below. Planned production volume in the first year after completion, which was assumed at the time of appraisal, was 70% of the final production target of 520,000 tons/year, that in the second year was 90% of the same and 100%, thereafter. However, the production in 1997 was only 31% of the final production target of 520,000 tons/year, as it took time to attain proficiency in the operation. In 1998, production reached at 62% and 87% in 1999, respectively. Production of urea plant in 2000 was just 74% of the production plan due to the malfunction of the motor in urea plant.

Table 1：Urea Production (in weight)

	1997 (Completed)	1998 (2nd year)	1999 (3rd year)	2000 (4th year)	2001 (5th year)
Planned Production (When appraised) (ton/year)	364,000	468,000	520,000	520,000	520,000
Production Result (ton/year)	160,678	322,633	450,458	384,882	---

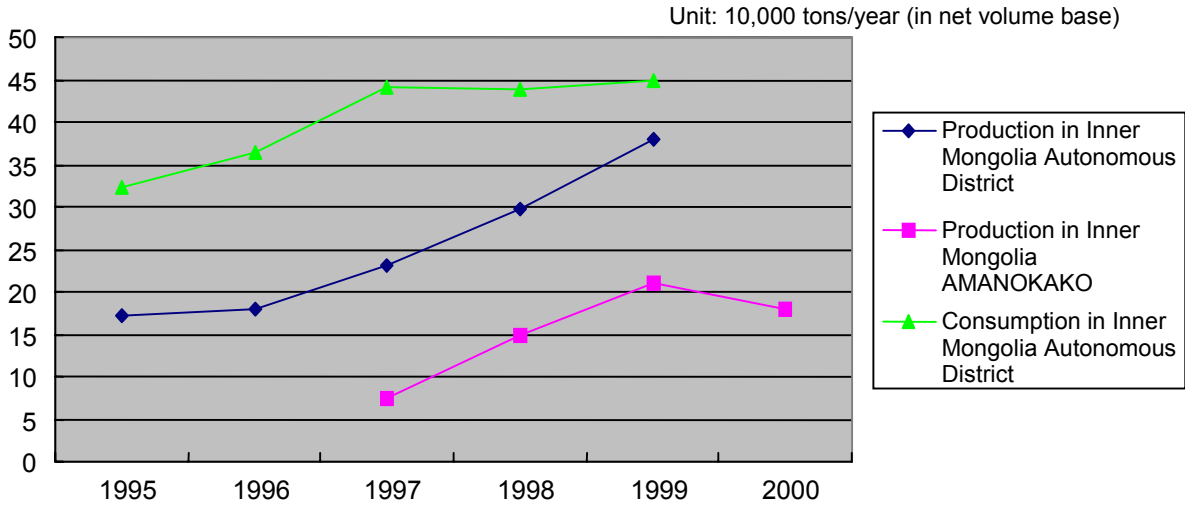
Source: Data of Implemented Organization

② Nitrogenous Fertilizer Demand in Inner Mongolia Autonomous District

Gap between the demand and supply for the nitrogenous fertilizer in the Inner Mongolia Autonomous District before the implementation of project (1989) was 150,000 tons (in net quantity) and it had gradually increased to 180,000 tons just before the completion of the project in 1996. However, since the start of operation in this project, this gap has narrowed down to 70,000 tons in 1999 as shown in Fig. 1.[7] Though a part of urea fertilizer produced in this project is sold to the outside of autonomous district due to the change in the environment of market, it can be confirmed that the project has contributed to the improved balance of supply and demand of fertilizer in the Inner Mongolia Autonomous District.

[7] Data on the quantity of production as well as that of consumption in the autonomous district for 2000 could not be obtained.

Fig 1: Nitrogenous Fertilizer Balance in the Inner Mongolia Autonomous District



Source: Inner Mongolia Autonomous District Almanac, Chemical Industry Almanac and China Almanac

③ Recalculation of Internal Rate of Return (IRR)

When the financial internal rate of return (FIRR)[8] of this project was calculated by counting initial investment (such as construction cost) and operation and maintenance expense as expense and sales revenue of fertilizer as income based on the annual production volume of 520,000 tons, rate of return became to negative figure compared with the planned figure of 10.9% at the time of appraisal. This was caused by the increased residual oil price as raw material oil and difficulty to increase the sales price of urea,[9] in addition to the increased investment (increase in the investment made in RMB and that in RMB value invested in foreign currency due to the fall of RMB). Similarly, when economical internal rate of return (EIRR) was calculated using urea fertilizer production of this project as an effective import substitution (saving in foreign currency), recalculation resulted to 2.8% against 8.4% at the time of appraisal. Main cause of such drop in EIRR is considered due to the increase of residual oil price used as the raw material in addition to the increased investment.

Table 2 below shows comparative calculations in price at the time of appraisal and that of evaluation used for the calculation of rate of return. As the system was in the transition period to the market economy and it seemed that the method to calculate breakdown of expenses by the implementing organization was not fully established, costs of manufacturing and sales were calculated based on the information obtained from the implementing organization at the time of field survey.

Table 2: Comparison of Manufacturing/Sales Cost and Sales Price per Unit Product

	Manufacturing/Sales Cost (Note 1)	Domestic Sales Price	Import CIF Price (Note 2)	Exchange Rate (Note 3)
When appraised	452 RMB/ton	1,000 RMB/ton	814 RMB/ton	20.9 Yen/RMB
When evaluated	910 RMB/ton	1,073 RMB/ton	1,242 RMB/ton	14.3 Yen/RMB

Source: JBIC data and Data of Implemented Organization

Note 1: Cost of product and sales does not include depreciation expense.

Note 2: CIF price is a value converted into RMB per US$150/ton.

Note 3: Exchange rate used for evaluation is average of January-March 2001 in IMF Data.

[8] FIRR is based on the total capital.

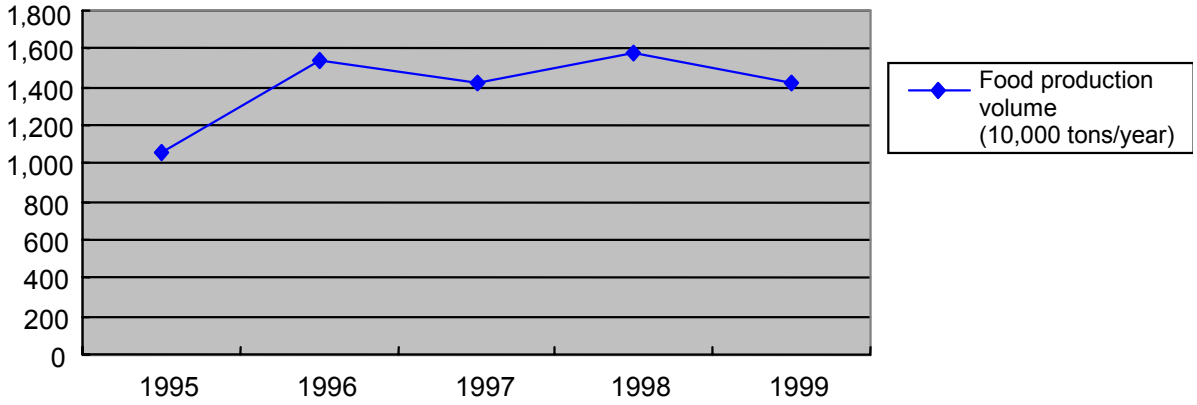
[9] When an inductive analysis was carried out on the factor of FIRR drop, it was confirmed that the cost increase and sluggish sales price gave considerable impact among three factors (increased investment, cost increase and sluggish sales price) pointed out in this paper.

2.4 Impact

① Food Production Volume and Productivity in Inner Mongolia Autonomous District

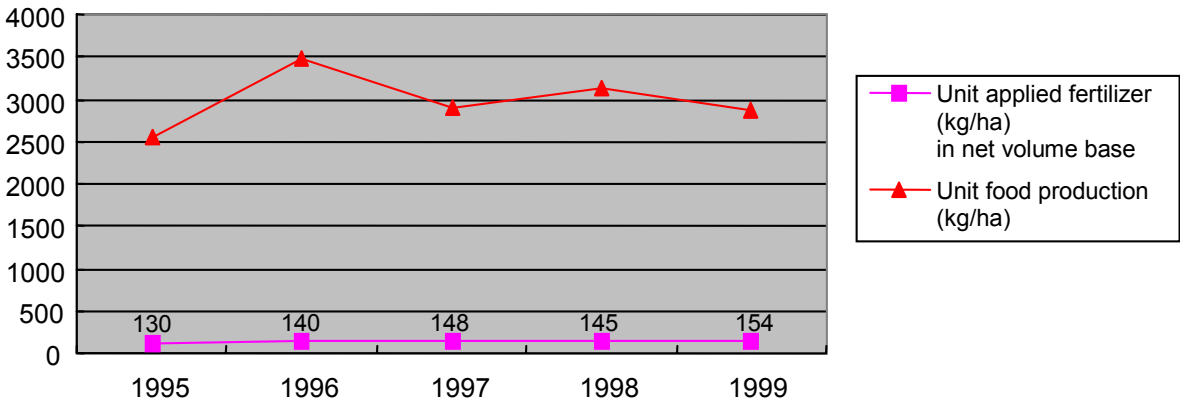
As a result of this project, increased supply or input of urea fertilizer improved productivity of food production (unit production volume) including corn and wheat, which are the key agricultural products in the Inner Mongolia Autonomous District. Thus, an impact to increase food production was expected. In Fig. 2 and Fig. 3, food production volume, unit applied fertilizer and unit food production in the Inner Mongolia Autonomous District are shown. However, it is rather difficult to realize the existence of expected impact from these data.

Fig 2: Food Production Volume in the Inner Mongolia Autonomous District



Source: China Almanac, Inner Mongolia Autonomous District Almanac and Chemical Industry Almanac

Fig 3: Unit Applied Fertilizer and Unit Food Production in the Inner Mongolia Autonomous District



Source: China Almanac, Inner Mongolia Autonomous District Almanac and Chemical Industry Almanac

② Regional Development and Promotion of Employment in Inner Mongolia Autonomous District

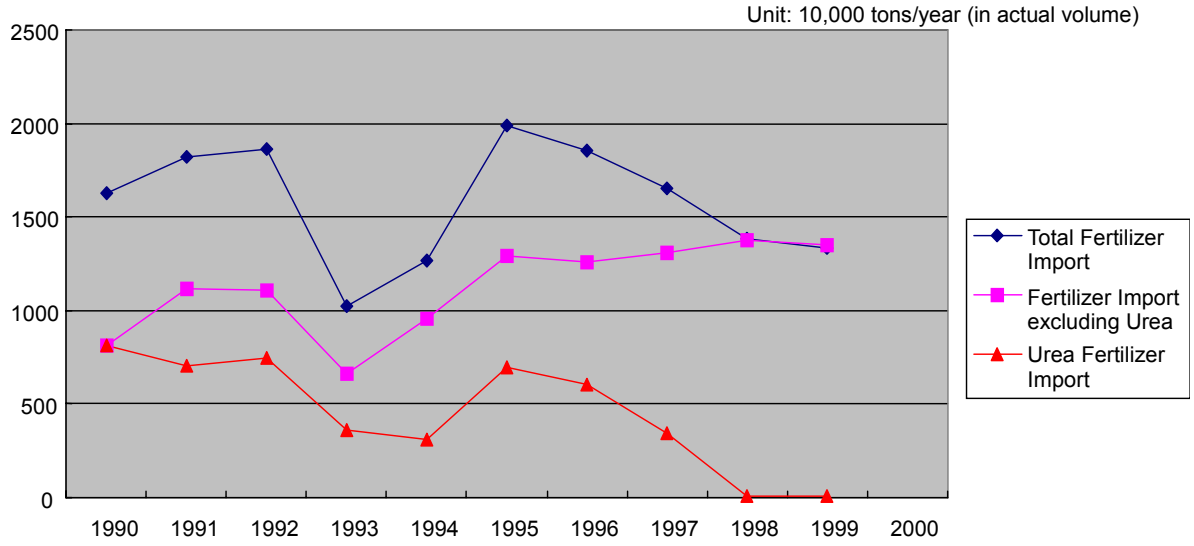
Since subject plant of this project and related plants were constructed, a plot of ground in the size of approximately 175 hectares was developed for the plant and peripheral site in the suburbs of Hohhot city of Inner Mongolia Autonomous District, which was originally an agricultural region, and a private railroad line in 5km length and 3km road were prepared. Also, according to the Inner Mongolia Chemical Industry, a business operator of this project, a number of direct employees of this project are 1,864 (including about 670 female employees) and a number of residents increased in the surrounding area of this project are approximately 10,000. As such, it can be said that this project has contributed to the increase of employment opportunity.

③ Urea Fertilizer Import and Foreign Currency Payment of China

Five-year average import of urea fertilizer in China under 8th Five-Year Plan (1991～1995) had reached to 5.64 million tons/year or US$932 million/year though it had somewhat fluctuated by the year as shown in Fig. 4 and Fig. 5. Because of the increase in the national production of urea fertilizer including this project, import of urea fertilizer started to fall from its peak of 1995. Furthermore, since Chinese government banned import of urea fertilizer because of excessive buildup of domestic inventory in 1997, volume of import had drastically dropped to 120,000 tons in 1998 and 70,000 tons in 1999. Because of this, amount of payment made for the import of urea fertilizer in foreign currency had suddenly dropped to US$17 million/year in 1998. Abrupt drop of import in China, which was a prominent importing country of urea fertilizer in the world, gave a considerable impact on the international price of urea and as shown in Table 3, price of urea after 1997 had considerably dropped.

On the other hand, import of fertilizer other than urea such as Nirinan, NPK conversion, NP conversion, potassium chloride, potassium sulfate and ammonium nitrate has been gradually increasing since 1995 and thus, decrease in the total fertilizer import and payment in foreign currency are being checked. Background or future prospect of this could not be confirmed in this report, however. For instance, a separate study would be required from a viewpoint of changes in the selection of fertilizer type (due to high polymerization[10] and increased complexity[11] of fertilizer) by the consuming farmers caused by the shift of overall economic system into market economy.

Fig 4: Total Fertilizer Import Volume of China

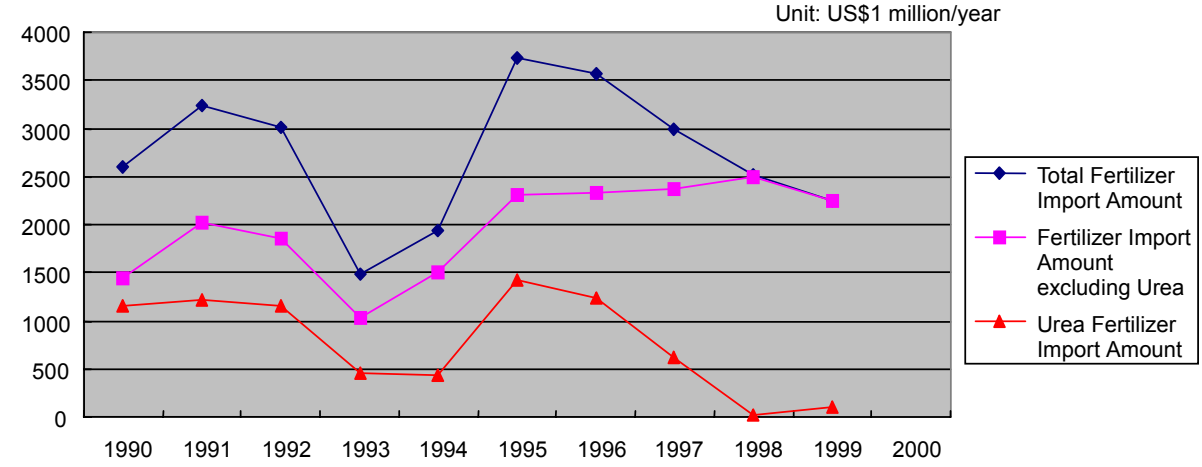


Source: China Almanac and Chemical Industry Almanac

[10] High polymerization means increase of active ingredients (nitrogen, phosphate and potassium) contained in the fertilizer.

[11] Means to contain at least two ingredients of three elements (nitrogen, phosphate and potassium) of fertilizer. For example, urea is a monolithic fertilizer that contains approximately 21% nitrogen and triple superphosphate (TSP) is also a monolithic fertilizer that contains approximately 56～58% phosphate, while Nirinan (DAP) is a composite fertilizer that contains approximately 18% nitrogen and approximately 46% phosphate. Trend of fertilizer is shifting towards high polymerization and increased complexity for efficient farming and high-added-value farm produce harvest in the farming industry.

Fig 5: Total Fertilizer Import Payment of China

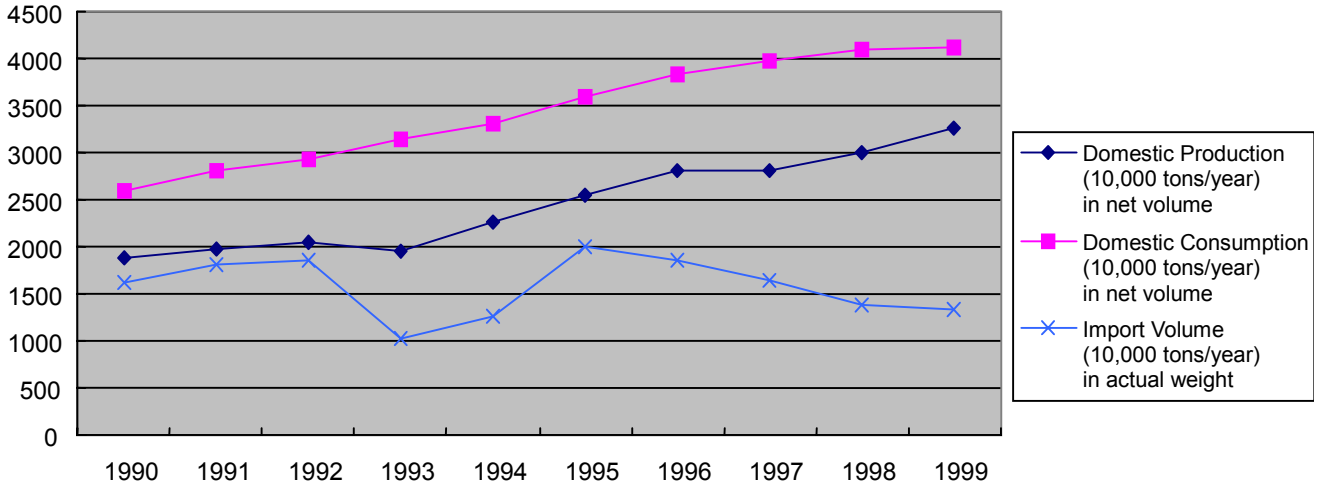


Source: China Almanac and Chemical Industry Almanac

④ Stable Fertilizer Supply in China

Recent supply and demand balance of fertilizer of whole China shown in Fig. 6 indicates a sort of decrease in the gap between consumption and production of total fertilizer in China. This project, which is supposedly to contribute to the stable domestic supply of fertilizer in 8th Five-Year-Plan, has somewhat contributed to the improvement in the balance of supply and demand.

Fig 6: Fertilizer Demand-Supply Balance of China



Source: China Almana

⑤ Improved Food Production and Productivity in China

A policy target, to increase food production to 500 million tons in 2000 based on the population of 1.25 billion and per capita food requirement of 400 kg per annum, which was established in 8th Five-Year Plan, high level plan of this project, was materialized as shown in the data of Table 4. We believe that this project to construct urea fertilizer plant with annual production volume of 520,000 tons (or 240,000 tons in net volume) has somewhat contributed to the materialization of the above higher-level target.

Table 3: Improved Food Production and Productivity in China

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Food Production (10,000 tons/year)	44,624	43,529	44,266	45,649	44,510	46,662	50,454	49,417	51,230	50,839
Population (x10,000)	114,333	115,823	117,171	118,517	119,850	121,121	122,389	123,626	124,810	125,909
Per Capita Food Production (kg)	390	376	378	385	371	385	412	400	410	404
Fertilizer applied acreage = Planted acreage (x1,000 ha)	113,466	112,314	110,560	110,509	108,544	110,060	112,548	112,912	113,787	113,161
Unit applied fertilizer (kg/ha) Net	228	250	265	285	306	326	340	353	359	364
Unit food production (kg/ha)	3,983	3,876	4,004	4,131	4,102	4,240	4,483	4,377	4,502	4,493

Source: China Almanac

⑥ Impact on Natural Environment

Environment Protection Bureau of Hohhot City, which is a controlling government agency for environmental protection, has carried out regular or spot environmental inspection on this project; however, people related to the government agency of Inner Mongolia Autonomous District reported that they did not receive any instruction or recommendation relative to the environmental protection of this project.

⑦ Impact on Social Environment

People related to the government agency of Inner Mongolia Autonomous District explained that no negative social impact has been reported on the construction of this project.

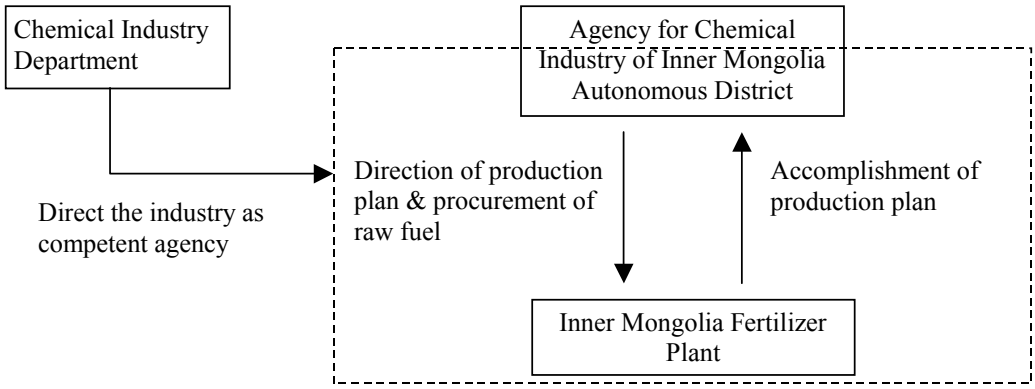
2.5 Sustainability

① Operation and Maintenance System

At the time of appraisal, it was agreed that the Chemical Industry Department of the Central Government directs the industry as a competent authority under the planned economy system as

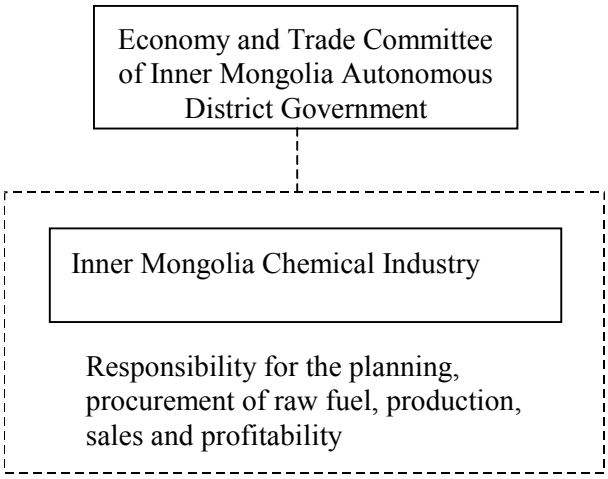
shown in Fig. 7 and Inner Mongolia Fertilizer Plant carries out actual operation and maintenance based on the production plan prepared by the Chemical Industry Bureau of Inner Mongolia Autonomous District who is also responsible for the procurement of raw fuel. However, in the course of this project, China has made a fundamental change in its economical principle and introduced socialism market economy and fertilizer field has also shifted into market economy around 1996 in the midst of such trend, and the shift is still continuing. According to the shift in the economic system, higher functions of central government and that of autonomous district were abolished. And business operator itself started to carry out all necessary works such as planning, procurement of raw fuel, production, and marketing and assumed responsibility for the profitability of the project. Operation and maintenance system at the time of evaluation was changed as shown in Fig. 8.

Fig. 7: Operation and Maintenance System at the time of Appraisal



Source: JBIC Data

Fig. 8: Control and Operation System at the time of Evaluation



Source: Data of Implemented Organization

Inner Mongolia Chemical Industry, which was a renamed organization of Inner Mongolia Fertilizer Plant in July 2000 under the Economy and Trade Committee of Inner Mongolia Autonomous District, carries out the operation and maintenance of this project. Total number of employees of Inner Mongolia Chemical Industry at the time of appraisal was 1,864, consisting of 1,107 in production, 94 in production control, 407 in administration and management, and 251 in other departments. Inner Mongolia Chemical Industry has proper organization and personnel for the

maintenance and for the series of business activities such as procurement of raw materials and services, production in the plant, and marketing of urea product. Management has a good sense of responsibility and, therefore, any significant problem is found in the organization and the system to carry out this project.

② Situation of Operation and Maintenance

Generally speaking, in the ammonia plant that uses residual oil as raw material and coal as fuel, receiving and storage facility of fuel coal, gasification facility of fuel oil and waste water treatment equipment are in most cases contaminated. However, as a result of field inspection, it was found that there is no problem in the maintenance of the facilities of this project, as these places were kept clean and warehouses for urea and supplies were kept in good order. Also, in view of the behavior of operator in the central control room and others who were incidentally working there, no problem was found in the technical competency of the staffs for their operation and maintenance.

Inner Mongolia Chemical Industry has been functionally carrying out the purchases of raw material residual oil and fuel coal and has necessary operating skill and the system for the total plant control. Further, in view of the fact that the plant was smoothly operated with 100% load at the time of evaluation, as far as the technical side is concerned, we do not see any specific problem to achieve planned production volume of 520,000 tons after 2001. Also, with regard to the marketing of urea product, it seems that there will be no problem in the marketing of urea produced in this project, as the Inner Mongolia Chemical Industry not only leaves sales activity to the third party marketing organization but also is carrying out its own sales activities.

③ Financial Situation

Although we were unable to obtain the data sufficient for detailed analysis on the financial situation of Inner Mongolia Chemical Industry, we have tried to calculate financial situation of 1999 and 2000 based on the information learned at the time of field survey. The result of our calculation is shown in Table 4.[12] Because of the increased raw material residual oil price and the sluggish market price of urea as product, environment of profitability has become worse than the one at the time of appraisal. Although the profit is narrowly kept in black figure in the stage of gross profit, it is expected that the end figure is in the red in view of the burden of interest payment.

Table 4: Financial situation of Inner Mongolia Chemical Industry

(x 10,000 RMB)

Year	(a) Sales revenue	(b) Production/ sales expense (Note)	(c) Gross profit	(d) Interest payment	(c) - (d)
1999	55,541	46,163	9,378	15,477	-6,099
2000	38,488	33,221	5,267	7,916	-2,649

Source: Prepared based on the data obtained from Implementing Organization

Note: Including depreciation expense

From the above situation, no specific problem is found in the organization, system and technology with regard to the operation and maintenance of this project. However, it must be noted that the financial side of this project indicates that the environment for the profitability of the project has become worse than that at the time of planning, because of the increase in the price of raw fuel oil or sluggish product market price. Furthermore, as a considerable change is expected in the trend of domestic market for urea fertilizer in China such as the change in the needs of fertilizer by the consumer/farmer according to the development of market economy or the influence on the

[12] It was not possible for us to obtain the data that shows entire financial situation of the total plant including all nonoperating revenues such as repayment of project cost or taxes required by the project.

macro-economy made by the entry into WTO, managing situation of Inner Mongolia Chemical Industry must be closely watched in the future.

Comparison of Original Plan and Actual Scope

Item	Plan	Result
① Project Scope		
(1) Ammonia Plant	300,000MTPY	300,000MTPY
(2) Urea Plant	520,000MTPY	520,000MTPY
② Construction Period		
(1) Preparatory works	Jan, 1991－Dec. 1992	Jan, 1992－Dec. 1992
(2) Contract	Oct. 1992	Oct. 1992
(3) Ammonia plant	Oct. 1992－Dec. 1995	Oct. 1992－Aug. 1995
(4) Urea plant	Oct. 1992－Dec. 1995	Oct. 1992－Dec. 1996
(5) Comprehensive trial run	Jan. 1996－Jun. 1996	Mar. 1996－Dec. 1996
(6) Start of commercial run	Jun. 1996	Dec. 1996
③ Project Cost		
Foreign Currency	21,412 Million Yen	21,412 Million Yen
Local Currency	21,437 Million Yen (1,025.71 Million RMB)	24,741 Million Yen (1,819.17 Million RMB)
Total	42,849 Million Yen	46,153 Million Yen
ODA loan portion	21,412 Million Yen	21,412 Million Yen
Exchange Rate	1 RMB = 20.9 Yen	1 RMB = 13.6 Yen (Note)

Source: JBIC Data and Data of Implemented Organization

Note: Result of exchange rate is an average of annual average exchange rate during construction period weighted by the investment made in Chinese currency.