# Cost-Benefit Analysis Report

# Project: Building a Village-run Vegetable
# Processing Factory in Shanghai

Created by:

Zhou Xiaojing (51- 108222)

Li Xinyu (51-118100)

Siritala Saengduang (51-108207)

# Table of Contents

# Executive Summary

Chinese central government is planning to offer 11 million interest-free loans to a small village, which located in the suburb of Shanghai, to build a village-run vegetable processing factory. It is a part of the "improving infrastructure in rural areas" project. This is a 1-year infrastructural project with 15-year service lifetime. The main cost of this project is from construction and operation of the project, and the main benefit is from the higher price of the processed vegetables. By offering more processed vegetables to the market, the social surplus will increase as well.

By our study, this project will be profitability and increase the average annual income of villagers from 25000 yuan to 32500 yuan in the first 10 years and 42500 yuan in the $11^{th}$-year to $15^{th}$-year. In addition, this project will have 97.76 million yuan net social benefit and yield social surplus of 44.0875 million yuan every year. If we use shadow price as adjustment, thanks to the relative low price of the domestic market and undervalue of RMB, the social surplus should be higher.

As a result of the study, the Chinese government should operate the village-run vegetable processing factory in Shanghai. However, the success of this project depends on some major factors which are (i) Strict quality control on raw material and production processes (ii) Type of plant (iii) Processing methodology. Moreover, a steady price has to be assured for the farmers.

It was more economic and more meaningful, in terms of development to see that the vegetable processing factory was expanded to other villages. However, the study for expanding processing factory will need to be adjusted. In this study, we assume that the demand curve is horizontal and the supply curve is vertical. This assumption may not be true if there are many factories since the product from a factory will be larger and will effect to Shanghai market. Another limitation is predicting volume of sell. We assume that all the outputs can be sold, and it is so for this processing factory. But for other factories, we need to consider the market conditions to predict the future sell so marketing is important for the processing factory project.

## 1. Introduction

There is a small village which is located in the suburb of Shanghai and living on vegetable cultivation. In order to promote the "new rural construction" plan and increase the income of local famers, Chinese central government is planning to offer 11 million interest-free loans for this villager to build a village-run vegetable processing factory. Our project will do cost-benefit analysis of this project, and provide relevant policy-making suggestions.

## 2. Data

There are 100 villagers who live on vegetable farming and farm 500 arcs in this village. The economic data are provided as follows (based on the price level of Shanghai).

● Without project:

・The villagers do vegetable farming and sell fresh vegetable to the market.

・Farming cost: 1000 yuan/arc•year

・Output: 3000kg/arc•year

・Fresh vegetable price: 2 yuan/kg

● With the project:

・It would take 1 year to build this factory. And the designed tenure of use of the factory is 15 years. This project also included a training and standardization program to farmers, which will increase the output of the vegetable.

・The price of processed vegetable is 8 yuan/kg.

・Other Data are provided in the following tables:

| Cost of the project | | data |
|---|---|---|
| construction | building | 6 million |
| | equipments | 4 million |
| training and preparation | | 1 million |
| operational cost | land rent | 0.5 million |
| | resources cost | 5 million |
| | administration cost | 2 million |
| | tax | tax rate:13% |
| | | interest rate:5% |
| external cost | Environmental externality of factory production | -0.2 yuan/kg |

| Revenue of the project | data |
|---|---|
| Output of vegetables | 4500kg/arc·year　(25% lose in processing) |
| liquidation of fixed assets | 1 million ( 15 years later) |

## 3. Feasibility Study

## 3.1 Relevant Policies in China

● *the Eleventh Five-Year Plan of Agriculture Product Processing Industry*: The priority of agriculture product processing industry development is to promote rural prosperity and enrich the farmers; Increase financial support for agricultural products processing industry; provide appropriate subsidies agro-processing enterprises which run by individual farmers or rural economic corporative organizations.

● *Catalogue of Industrial Structure Adjustment (2011)*: "Agriculture, forestry, animal husbandry and fishery products storage and transportation, preservation, processing and comprehensive utilization" is encouraged.

## 3.2 Financial Appraisal (Profitability)

・ Cost:

① The interest-free loan will be paid back in 11 years, 1 million yuan each year.

Current value of loan: $\dfrac{1\times10^{6}}{1.05}\times\dfrac{1-1.05^{11}}{1-1.05}=13.53$ million yuan.

② Current value of operation cost (15 years): $\dfrac{7.5\times10^{6}}{(1.05)^{2}}\times\dfrac{1-1.05^{15}}{1-1.05}=146.79$ million yuan

・ Revenue:

①Gross annual income of the factory: $4500\times500\times75\%\times8=13.5$ million yuan/year

Current value of income (15 years): $\dfrac{13.5\times10^{6}}{(1.05)^{2}}\times\dfrac{1-1.05^{15}}{1-1.05}=264.23$ million yuan

(Current value of tax: $13\%\times264.23=34.35$ million yuan)

②Current value of fixed assets liquidation: $\dfrac{1\times10^{6}}{(1.05)^{16}}=0.46$ million yuan

・ Net profit of this project (current value):

Revenue (after tax) – Cost = $264.23+0.46-34.35-13.53-146.79=70.02$ million yuan

・ Average net income of farmers:

1$^{st}$ year (with out the project): 25,000 yuan/year,

2$^{nd}$ to 12$^{th}$ year: $\dfrac{13.5(1-13\%)-1-7.5}{100}=32450$ yuan/year,

13$^{th}$ to 16$^{th}$ year: $\dfrac{13.5(1-13\%)-7.5}{100}=42450$ yuan/year.

・IRR:

$$\sum \frac{B_t - C_t}{(1+IRR)^t} = \frac{25000-110000}{1+IRR} + \sum_{t=2}^{11} \frac{32450}{(1+IRR)^t} + \sum_{t=12}^{16} \frac{42450}{(1+IRR)^t} = 0$$

IRR=0.383

・Annotation: To avoid double accounting, we will not include labor cost into the cost of the project. Because the factory is owned by the farmers, so we can consider the income getting from selling products to be the wage they get.

## 3.3 Economic Appraisal (Cost – Benefit Analysis)

## 3.3.1 Primary Market

● Without project:

There is no vegetable processing factory before the project, so the cost is zero.

● With project:

・Cost:

③ The interest-free loan will be paid back in 11 years, 1 million yuan each year.

Current value of loan: $\frac{1 \times 10^6}{1.05} \times \frac{1-1.05^{11}}{1-1.05} = 13.53$ million yuan.

④ Current value of operation cost (15 years): $\frac{7.5 \times 10^6}{(1.05)^2} \times \frac{1-1.05^{15}}{1-1.05} = 146.79$ million yuan

⑤ Current value of environmental externality cost (15 years): 6.61 million yuan

・Benefit:

①Gross annual income of the factory: $4500 \times 500 \times 75\% \times 8 = 13.5$ million yuan/year

Current value of income (15 years): $\dfrac{13.5 \times 10^6}{(1.05)^2} \times \dfrac{1 - 1.05^{15}}{1 - 1.05} = 264.23$ million yuan

②Current value of fixed assets liquidation: $\dfrac{1 \times 10^6}{(1.05)^{16}} = 0.46$ million yuan

・Net benefit of this project (current value):

Benefit – Cost = 264.23 + 0.46 – 13.53 – 146.79 – 6.61 = 97.76 million yuan

・IRR=0.549

## 3.3.2 Secondary Market

We consider the fresh vegetable market as the secondary market.

● Without project:

Cost: $1000 \times 500 = 0.5$ million yuan/ year

Income: $3000 \times 2 \times 500 = 3$ million yuan/year

Average net income of farmers: $\dfrac{3 \times 10^6 - 0.5 \times 10^6}{100} = 25,000$ yuan/year·person

● With project:

After the project start operating, there will be no fresh vegetable output from this village, so the cost and benefit of the fresh vegetable market will both be zero. For the whole fresh vegetable market, the market is very large. Therefore, the decrease of

output from this village has no influence on the price of fresh vegetable. There is no price distortion between processing vegetable market and fresh vegetable market.

## 4. Economic Analysis of Public Policy

### 4.1 Social Surplus

Shanghai is a big city and the product from a small village actually is relatively tiny. Therefore, for processing vegetable market, we assume that the demand curve is horizontal and the supply curve is vertical. After the project start operating, the supply curve shifts rightward a little bit.
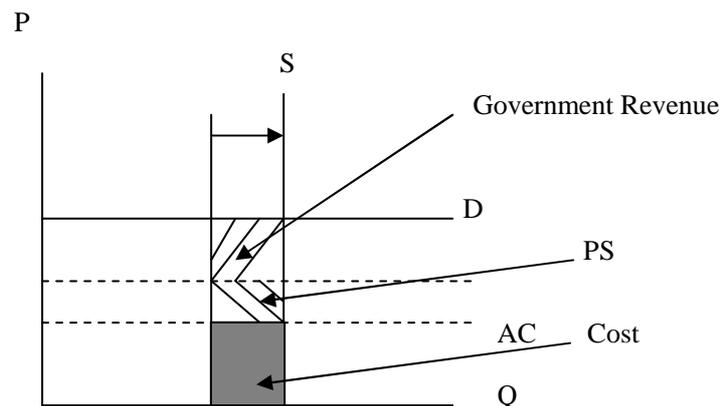


Environmental externality of factory production: -0.2 yuan/kg

Social Surplus = Consumer Surplus + Producer Surplus + Gov. Revenue – External Cost

$$= 13.5 \times 10^6 \times 13\% - 4500 \times 500 \times 75\% \times 0.2 = 1417500 \quad \text{yuan/year}$$

So, when we think about the primary and secondary market together, the total Social Surplus of the project is

74170000-25000×100×15+1417500=44.0875 million yuan/ year

**4.2 Shadow Prices**

Agriculture export (China has relatively lower domestic price, and due to the low-evaluated RMB currency rate, the export price rises to 10 yuan/kg, and 40% of the processed vegetable are exported)

Then the gross income for the factory is

4500*500*75%*40%*10+4500*500*75%*60%*8=6750000+8100000=14.85 million

Then the Current value of income (15 years):

14.85*10^6/1.05*(1-1.05^15)/(1-1.05)=305.18 million yuan

Then the net value of the benefit of the project is

305.18+0.46-36.07-13.53-154.13=101.91 million yuan

Then the total SS of the project is

101910000-25000*100*15+1417500= 65.8275 million

As a result, we can see that when taking the relative low price in China and the undervalue of RMB, the social surplus should be higher than the previous analysis.

**5. Conclusion**

**5.1 Financial Appraisal**

| Cost | Investment Cost | -10 million yuan |
|---|---|---|
| | Operational Cost | -7.5 million yuan |
| **Total Present Value of Cost** | 160.32 million yuan | |
| **Revenue** | Gross annual income of the factory | 13.5 million yuan/year |
| | liquidation of fixed assets | 1 million ( 15 years later) |

| Tax | 13% |
|---|---|
| Total Present Value of Revenue | 230.34 million yuan |
| Net Profit (current value) | 70.02 million yuan |
| IRR | 0.383 |

This is a profitable project for the villagers with an ideal IRR of 0.383. With the project, villager's income will increase by 30% in the next 10 years.

## 5.2 Economic Appraisal (CBA)

| Cost | Investment Cost | -10 million yuan |
|---|---|---|
| | Operational Cost | -7.5 million yuan |
| | Environmental externality of factory production | -0.2 yuan/kg |
| Total Present Value of Cost | 166.93 million yuan | |
| Benefit | Gross annual income of the factory | 13.5 million yuan/year |
| | liquidation of fixed assets | 1 million ( 15 years later) |
| Total Present Value of Benefit | 264.69 million yuan | |
| NPV | 97.76 million yuan | |
| IRR | 0.549 | |
| Total Social Surplus | 44.0875 million yuan/ year | |

This project provides net social benefit and social surplus with an ideal IRR of 0.549.

Under the current policy of Chinese government, this project is feasible and should be

encouraged.

**5.3 Policy recommendations**

According to a result of the study, the Chinese government should operate the village-run vegetable processing factory in Shanghai. However, the success of this project depends on the following factors:

(1) Strict quality control on raw material and production processes.

(2) Type of plant

(3) Processing methodology

For the farmers, they should be first assured that there will be a steady and regular market. Only that way we can assure them in terms of a steady price. Moreover, it was more economic and more meaningful, in terms of development to see that the vegetable processing factory was expanded to other villages. Vegetables processing industry, in general, is showing signs of healthy growth with expanding product range and increased acceptability in the local market. Favorable natural environment, increasing population, rising demand for processed vegetables and fruits, and relatively lower labor cost are some of the factors that can contribute towards sustained growth rate in this particular sector.

However, this study has a limitation. In this study, we assume that this is the first factory which will be built and the product from a factory in a small village is relatively tiny compared to Shanghai market. Therefore, for processing vegetable market, the demand curve is horizontal and the supply curve is vertical. This assumption may not be true if the government expand this factory building project in

other areas. If there are many factories, the product from a factory will be larger and will effect to Shanghai market. Therefore, the demand curve will not be horizontal and the supply curve will not be vertical. Another limitation is predicting volume of sell. We assume that all the outputs can be sold, and it is so for this processing factory. But for other factories, we need to consider the market conditions to predict the future sell so marketing is important for the processing factory project.

## 6. Acknowledgement

learning the method, we can do more meaningful jobs in the future. Thanks to the local officers of Zhejiang and Shanghai, we cannot get the data and local conditions without their help.

## 7. References

http://www.stats.gov.cn National Bureau of Statistics of China

Development Research Center, Shanghai People's Government: Shanghai Economic Almanac, 2010.

The Editorial Committee of Shanghai Commercial Yearbook: Shanghai Commercial Yearbook, 2009.

*Cost Benefit Analysis: Concepts and Practice* (3rd Edition) by Anthony E. Boardman, David H. Greenberg, Aidan R. Vining, and David L. Weimer