

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR THE ESTABLISHMENT
OF
THE NATIONAL PLANT QUARANTINE SERVICES
IN
THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA**

AUGUST, 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

BASIC DESIGN STUDY REPORT ON THE PROJECT FOR THE ESTABLISHMENT OF THE NATIONAL PLANT QUARANTINE SERVICES IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

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PREFACE

In response to a request from the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan has decided to conduct a Basic Design Study on the Project for the Establishment of the National Plant Quarantine Services and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Sri Lanka a survey team headed by Mr. Takushi Obata, Director General of Yokohama Plant Protection Station, the Ministry of Agriculture, Forestry and Fisheries from October 28 to December 1, 1989.

The team exchanged views with the officials concerned of the Government of Sri Lanka and conducted a field survey. After the team returned to Japan, further studies were made. Then, a mission was sent to Sri Lanka in order to discuss the draft report and the present report was prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Democratic Socialist Republic of Sri Lanka for their close cooperation extended to the teams.

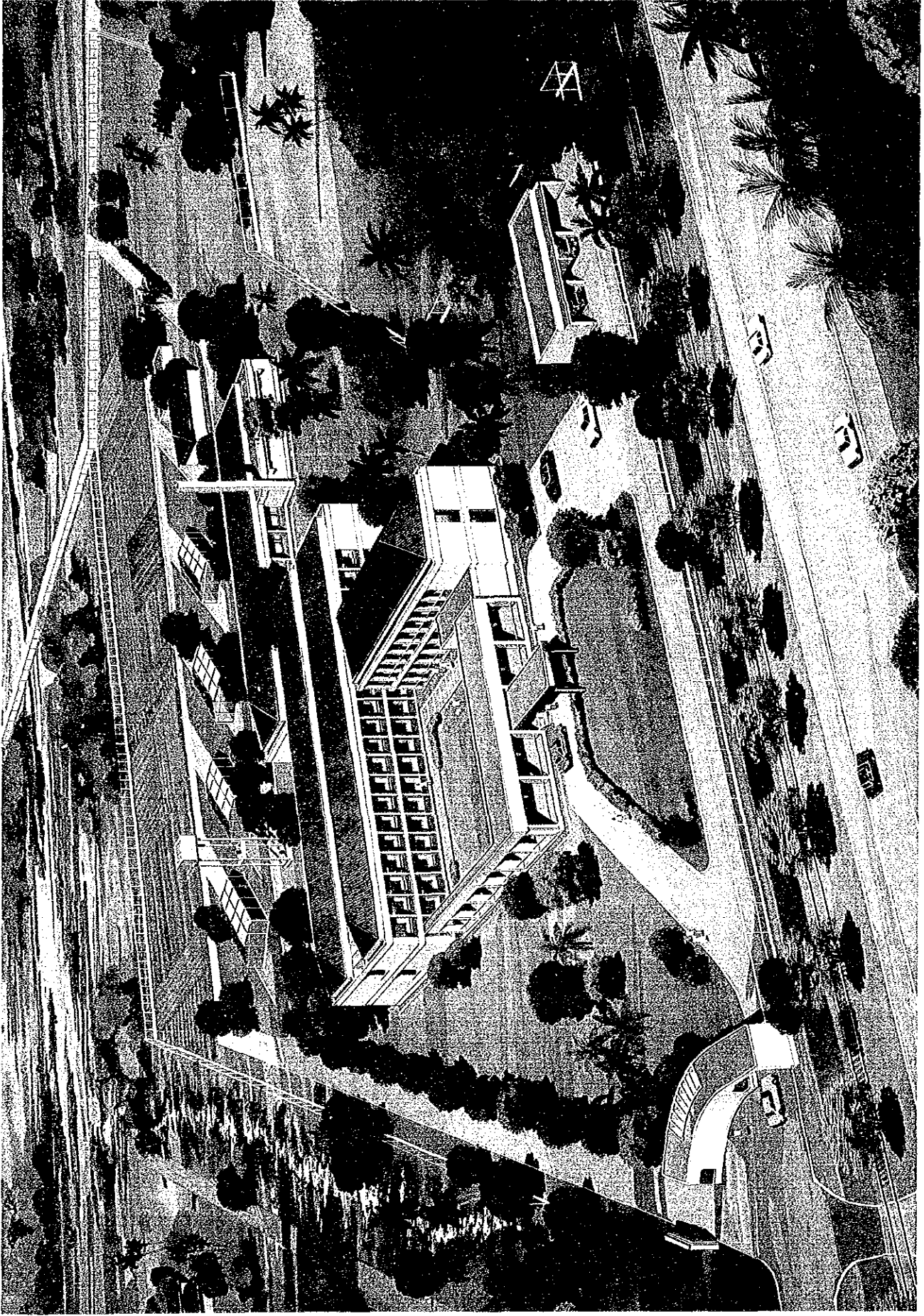
August, 1990



Kensuke Yanagiya

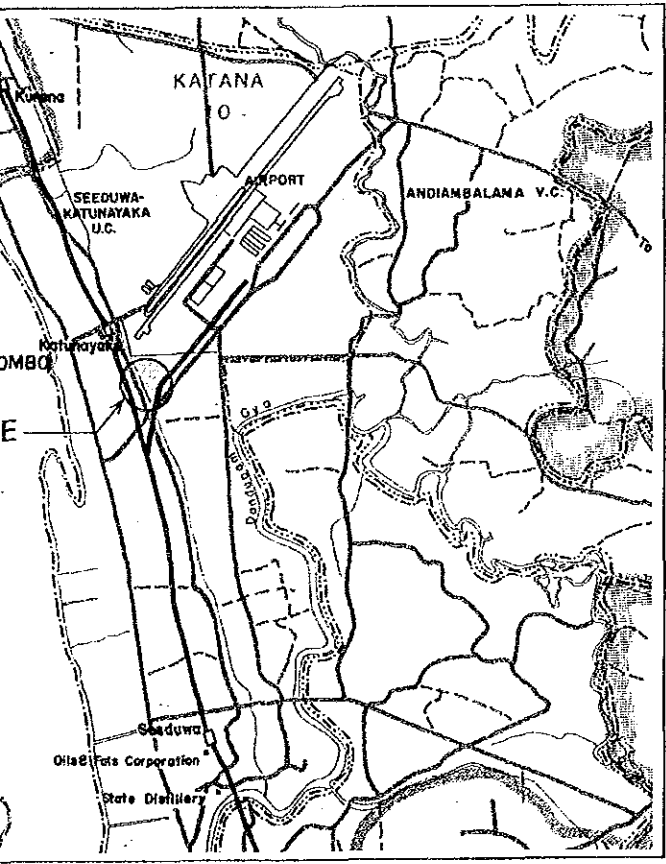
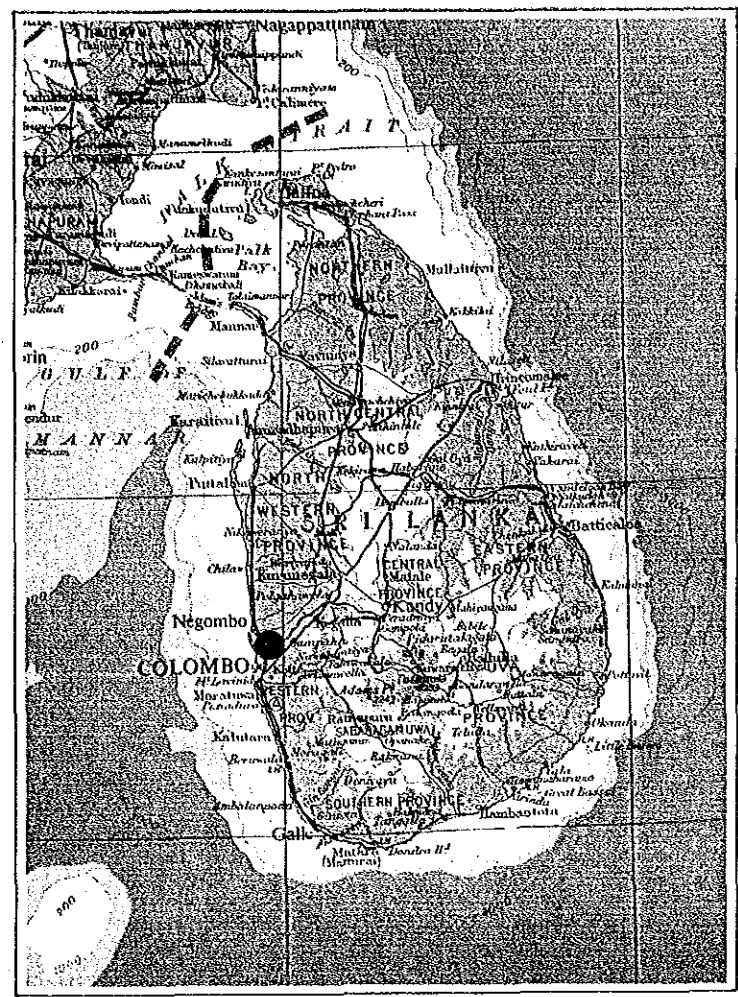
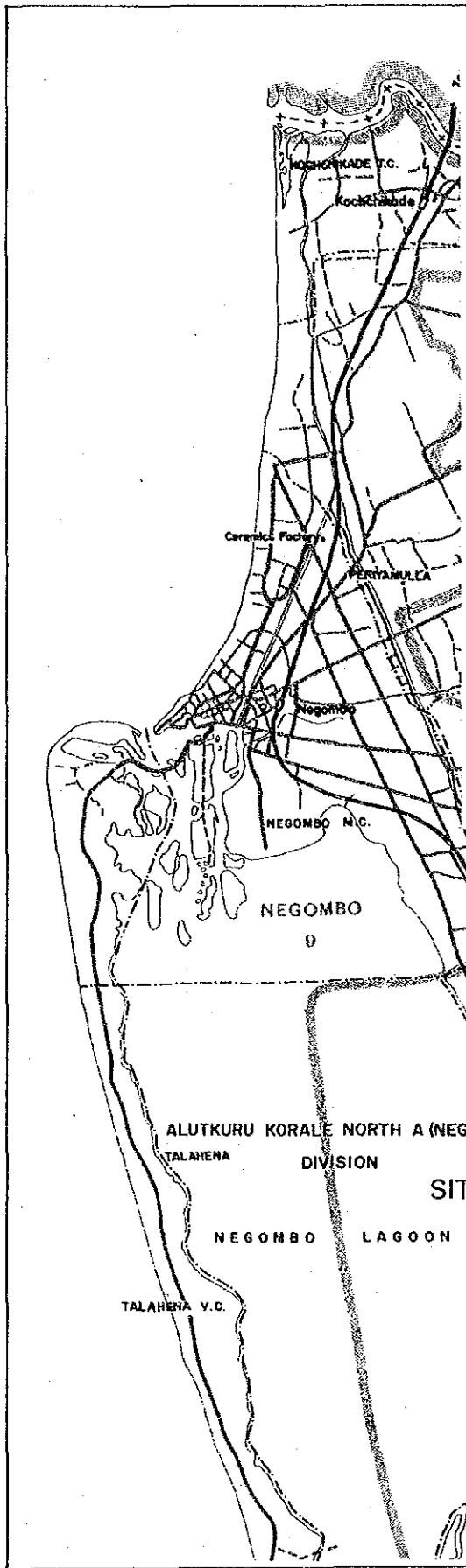
President

Japan International Cooperation Agency

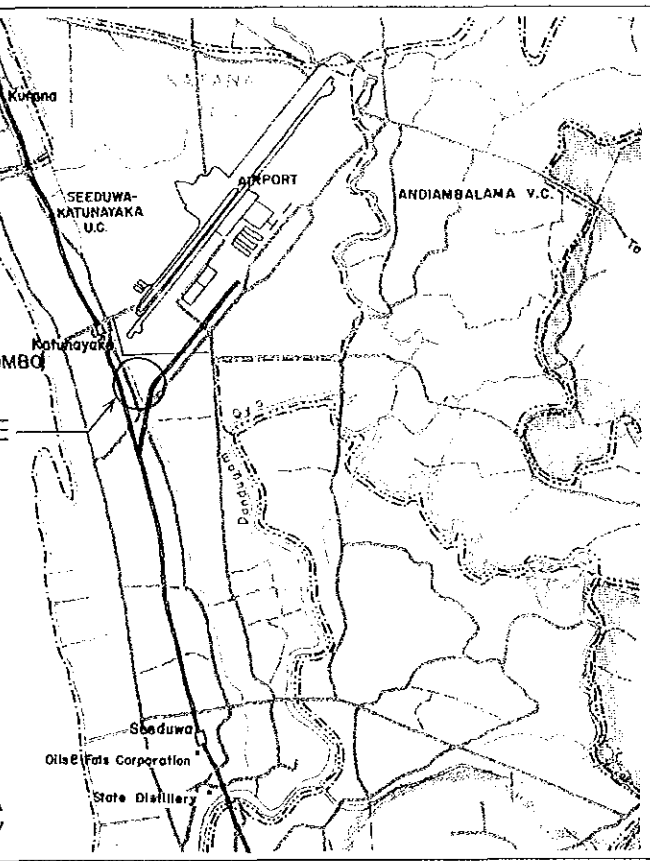
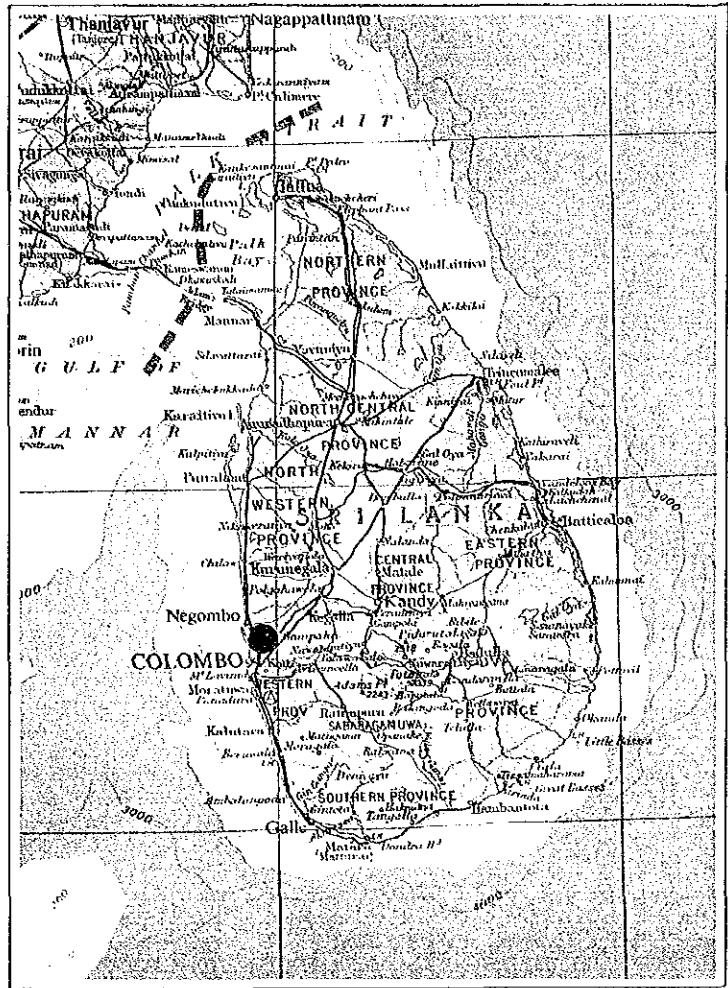
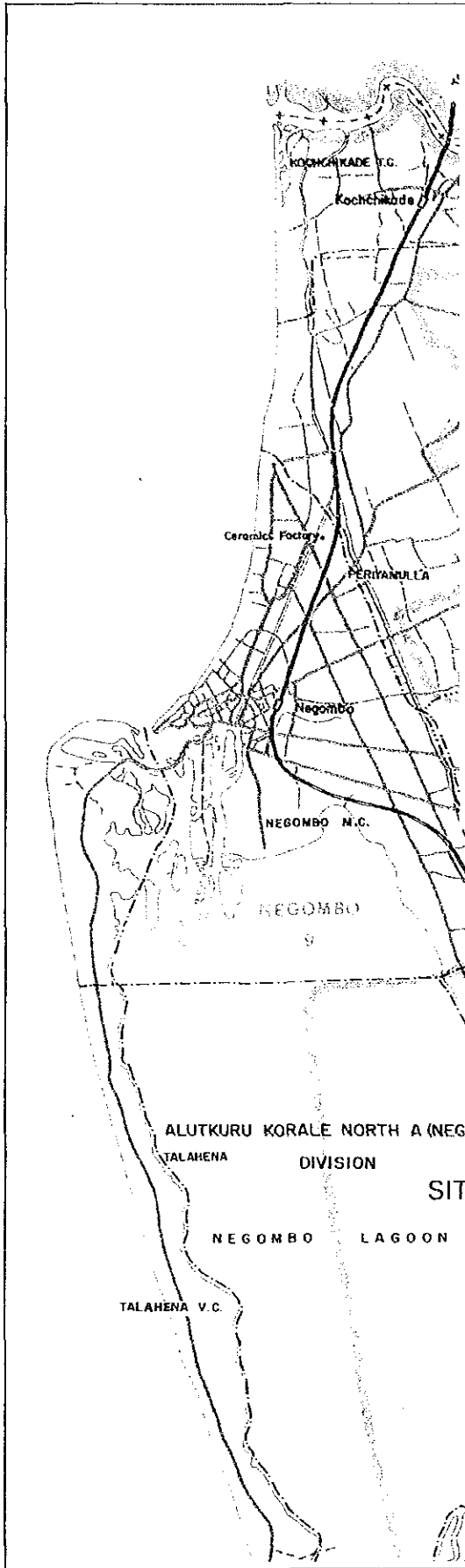


THE NATIONAL PLANT QUARANTINE SERVICES

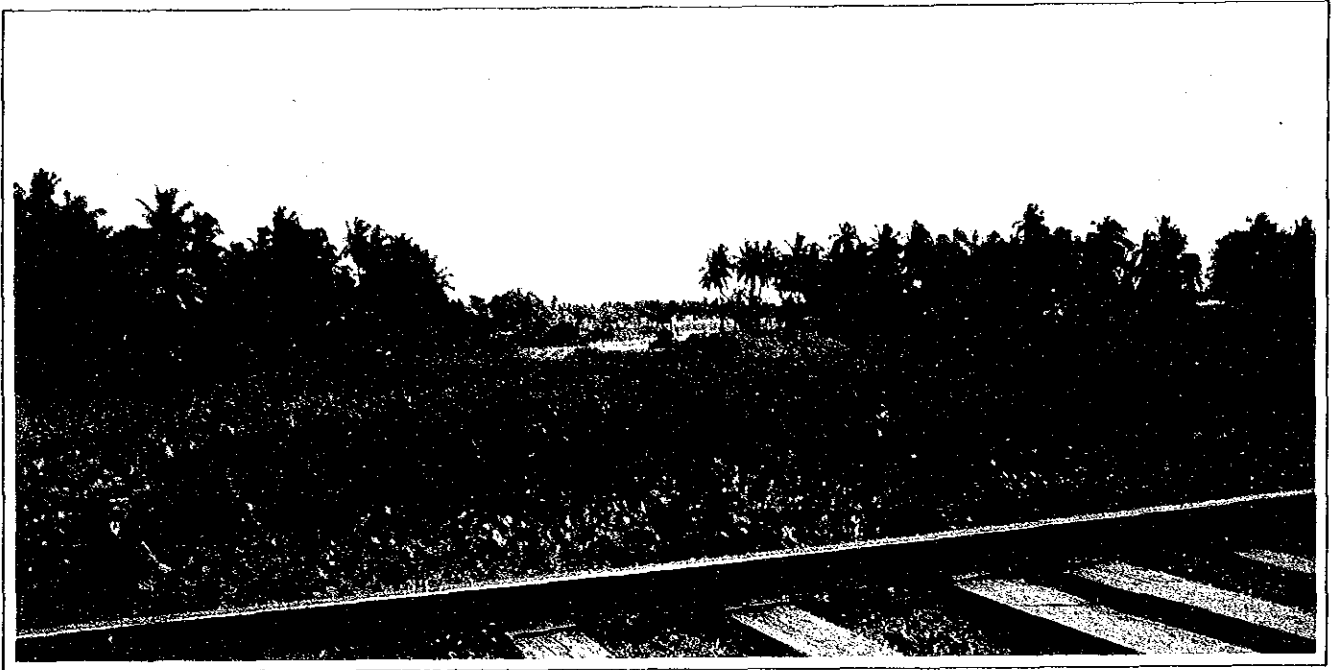
BIRD'S EYE VIEW



SITE LOCATION MAP



SITE LOCATION MAP



PROPOSED CONSTRUCTION SITE

SUMMARY

SUMMARY

Agriculture plays a major role in Sri Lanka's economy, accounting for 24 percent of GDP, 46 percent of the employed population and 43 percent of total exports. While agriculture is the most important sector of Sri Lanka's economy in terms of percentages of GDP and exports, the demand far exceeds the supply for major agricultural products such as rice and onions. As a result, the country is dependent on the importation of such agricultural products. For this reason, the Government of Sri Lanka has given top priority to an improvement in self-sufficiency in agricultural production and an improvement in the trade balance in its economic policy.

Reflecting such a situation in the country's agricultural sector, both exports and imports of agricultural products have been increasing in recent years. In keeping with this trend, plant quarantine work is on the increase. The main plants and plant products which are subject to plant quarantine include imported agricultural products, such as agricultural products for domestic consumption, seed potatoes, seeds and seedlings of vegetables etc. for planting, and plants for breeding. The "minor agricultural products" for export, such as vegetables, fruits, ornamental plants and spices, are also subject to plant quarantine. It is expected that both exports and imports of these agricultural products will continue to increase in keeping with the upturn in economic activity and the government's policy to expand exports.

On the other hand, Sri Lanka has suffered a number of times from heavy damage to its agricultural crops by invasion of exotic pests/pathogens. Sri Lanka is a country encircled by the sea and therefore it forms a unique chorological biosphere. If alien pests/fungi invaded the country, it would most likely be a fatal blow to the country's agriculture. In order to realize stable agricultural production, it is essential to prevent invasion of pests/fungi by reinforcing the country's plant quarantine services.

In Sri Lanka, plant quarantine is currently conducted under the jurisdiction of the Department of Agriculture, Ministry of Agricultural Development and Research. With the chief plant inspector of the Plant Quarantine Division of the Central Agricultural Research Institute (CARI), which is under the direct control of the Department of Agriculture, as the responsible person, the plant quarantine stations of Colombo Seaport and Katunayake Airport are responsible for primary inspection, CARI's Plant Quarantine Division for precise inspection and the Department of Agriculture for plant quarantine administration. Thus, it can be said that the country's plant quarantine system is in order. However, the facilities of the Department of Agriculture and CARI's Plant Quarantine Division are both located in Peradeniya, which is about 120km away from Colombo Seaport and Katunayake Airport, where most of the exported and imported agricultural products are handled. In addition, the quarantine equipment owned by these institutions is considered unsatisfactory both qualitatively and quantitatively, which hinders to carry out efficient plant quarantine operations at these institutions. Furthermore, the country's export and import amounts of agricultural products now exceed these institutions' capacity.

With the background described above, the Government of Sri Lanka decided to implement a project to construct new plant quarantine facilities which are intended for effective and efficient plant quarantine to integrate three basic functions, namely, precise inspection, quarantine/treatment and centralized plant quarantine administration. It also decided to implement a project to reinforce the equipment of the plant quarantine stations at Colombo Seaport and Katunayake Airport. Thus the Government of Sri Lanka requested the Government of Japan to provide grant aid for the implementation of the project.

In response to the request of the Government of Sri Lanka, the Government of Japan decided to conduct a basic design study on the Project for Establishment of the National Plant Quarantine Services and the Japan

International Cooperation Agency (JICA) dispatched a Basic Design Study Team to Sri Lanka from October 28 to December 1, 1989 to conduct a survey to confirm the contents of the request and to examine the basic concept for the facilities and equipment as well as the necessity and appropriateness of the grant aid. After an additional study team was dispatched to Sri Lanka from May 19 to May 31, 1990, due to the change of the proposed construction site, the basic design of the facilities and selection of the necessary items of equipment were conducted based on the results of the analysis of the above-mentioned surveys. The draft final report was prepared and briefed in Sri Lanka from July 21 to August 1, 1990. After that, this basic design study report was prepared.

The Department of Agriculture, Ministry of Agricultural Development and Research is the implementing organization of the Sri Lankan side for this project. The original body of the planned plant quarantine facilities is the Plant Quarantine Division of the Central Agricultural Research Institute. In actuality, however, it will be operated independently under the direct control of the Department of Agriculture, Ministry of Agricultural Development and Research. The total number of staff will be 46 at the first stage and the budget for facility maintenance and operation will cost 2,860,000Rs a year including personnel expenses.

The planned facilities will have the three basic functions of plant quarantine, namely, precise inspection, quarantine/treatment and centralized plant quarantine administration. The precise inspection function means precise inspection of plants and plant products for export and imported products, which is to be carried out by four (4) sections, namely, the Pathological Inspection Section, the Virological Inspection Section, the Entomological Inspection Section, the Nematological Inspection Section. The quarantine/treatment function is carried out by the Treatment Section and the Tissue Culture Section. The quarantine/treatment function includes development of treatment technology, which enables export of the country's agricultural products as well as the

treatment for plants which are exported and imported mainly at Katunayake Airport.

The centralized plant quarantine administration function includes general administration, personnel management, publicity, etc.

The facilities and equipment required for fulfilling the above-mentioned functions are as outlined below.

- Project site:
Katunayake Gampaha District (at west end of premises of Katunayake Airport with an area of approximately 8 ha)

- Floor area of facilities:

Building	approx 4,525 m ²
Outdoor structure	approx 1,415 m ²
Total	approx 5,940 m ²

- Structure and stories:
Reinforced concrete buildings, two stories (partially one story)

• Facilities and equipment

Sections		Facilities	Equipment
Plant Inspection	Pathological Inspection	Pathological Inspection Rm	Safety Cabinet, Fume Hood, Plant Growth Cabinet, Microscope w/Camera
	Virological Inspection	Virological Inspection Rm, Purification Rm	Safety Cabinet, Deep Freezer, Spectrophotometer, Fume Hood, Microplate Reader
	Entomological Inspection	Entomological Inspection Rm, Insectarium Rm	Soft X-ray Apparatus, Biotron
	Nematological Inspection	Nematological Inspection Rm	Microscope W/Camera, Microscope W/DIC Attachment
	Treatment	Treatment Rm, Analysis Rm, Cold Material Rm	Microscope W/ Camera, Gas Chromatograph, Prefabricated Cold Rm
	Tissue Culture	Tissue Culture	Plant Growth Cabinet, Phytochrome Testing Equipment
	Common	Preparation Rm Specimen Rm Dark Rm	Water Still, Ice Maker
Plant Quarantine		Plant Quarantine, Reception	Desk & Chair, Microscope
Treatment Facilities		Treatment Rm, Preparation Rm	Vapor Heat Treatment, Vacuum Fumigation Chamber, Fumigation Rm
Administration		Office, Director's Rm, Meeting Rm Library	Personal Computer
Outdoor Facilities		Glass house, Net House, Soil Sterilization house	Large Steam Autoclave, Steam Generator
Katunayake Airport Quarantine Station			Microscope, Balance, Copier, Motor Bicycle
Colombo Seaport Quarantine Station			Pickup Truck, Microscope, Motor Bicycle

When this project is implemented with grant aid from the Government of Japan, it will be reasonable to complete the construction work in one phase of about 12 months for both the construction work and the equipment procurement/installation work in the light of the scale of the facilities.

When implemented, this project will help reinforce Sri Lanka's plant quarantine system as well as streamline the plant quarantine operations in the country. As a result, it will become possible to prevent introduction of pests/fungi with which imported agricultural products, seeds and seedlings are contaminated, which will result in stabilized agricultural production for the country. In addition, the implementation of this project will lead to improvements in the country's treatment technology and exportation of new agricultural products, which will contribute to the promotion of exports of agricultural products as well as to the acquisition of foreign exchange.

As the project is expected to have far-reaching positive effects on Sri Lanka's agriculture and at the same time contribute to the sound economic development of the country, it is considered reasonable to implement the project with grant aid from the Government of Japan.

It is desirable that a project-type technical cooperation program be implemented by the Government of Japan to promote the improvement of quarantine technology in Sri Lanka. It will be necessary, on the other hand, for the Government of Sri Lanka to work out and to implement proper personnel assignment and sufficient budgetary appropriations for the maintenance and management of the facilities and equipment, and the precision and reliability of plant quarantine at a high level in order to enhance the expected effects of this project.

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CHAPTER 1 INTRODUCTION

CHAPTER 1 INTRODUCTION

The Government of Sri Lanka requested the Government of Japan to provide grant aid for the construction of new plant quarantine facilities and the reinforcement of the equipment in the existing facilities at the seaport and airport plant quarantine stations, to improve and strengthen the plant quarantine system in Sri Lanka.

In response to the request from the Government of Sri Lanka, the Government of Japan decided to conduct a basic design study on the Project for the Establishment of the National Plant Quarantine Services and the Japan International Cooperation Agency (JICA) dispatched a basic design study team headed by Mr. Takushi Obata, Director General of Yokohama Plant Protection Station, the Ministry of Agriculture, Forestry and Fisheries from October 28 to December 1, 1989. The basic design study team discussed and examined the contents of the request and the background of the project, and conducted the following survey concerning the feasibility of grant aid from the Government of Japan for the implementation of this project.

- (1) Analysis of the background and appropriateness of the project
- (2) Present situation of the Plant Quarantine Division of the Central Agricultural Research Institute and related organizations
- (3) Discussion on the scope of activities and activity plans of the plant quarantine station
- (4) Examination of the necessity of the facilities and equipment requested
- (5) Confirmation of the planned project implementation system, the planned facility/equipment operating and managing system, the planned budget for the operation, maintenance and management of the facilities and

equipment and the planned budgetary appropriations for the works to be implemented by the Sri Lankan side

- (6) Survey of the project site
- (7) Survey of the existing similar facilities
- (8) Survey on the situation of the construction industry in Sri Lanka

As the project site had been changed, JICA conducted a survey of the new project site from May 19 to May 31, 1990. After their return to Japan, the basic design of the facilities and the selection of the necessary items of equipment were made according to the analysis and a draft final report was prepared. From July 21 to August 1, 1990, JICA dispatched the basic design team to Sri Lanka headed by Mr. Toshio Morita, Director of the Research Division, Yokohama Plant Protection Station, Ministry of Agriculture, Forestry and Fisheries and explained the draft final report. This report is to present the results of the above-mentioned survey and analysis.

A list of the members of the basic study team, the time schedules of the surveys, the representatives of the government of Sri Lanka interviewed and the minutes of the discussions are attached at the end of this report.

CHAPTER 2 BACKGROUND OF THE PROJECT

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2-1 Agriculture in Sri Lanka

2-1-1 Position of Agriculture in Sri Lanka's Economy

Sri Lanka is a tropical country situated between lat. 5°05'N and lat. 9°50'N. The country belongs to the Southwest Asian Monsoon Zone. In the country, the largest height difference is about 2,500 meters, which means wide regional climatic differences. Furthermore, the constitution of the soil consists of nine (9) different types in the country. Reflecting such natural conditions, Sri Lanka has a wide variety of plant ecosystems. The country's whole land is divided into a total of 24 agricultural production areas.

Since ancient times, Sri Lanka's economy has developed with its agricultural sector as a key element, taking advantage of its geographical as well as climatic conditions. As shown in Table 2-1, agriculture is among the largest sectors of Sri Lanka's economy.

Table 2-1 Position of Agriculture in Sri Lanka's National Economy

Item	Total Amount (Unit)	Industry		
		No.1	No.2	No.3
1. Gross Domestic Product (1988)	119,044 (Million Rs)	Services (49.7%)	Agriculture (23.7%)	Mining (16.7%)
2. Employed Population (1981)	4,737.7 (Thousand Rs)	Agriculture (45.8%)	Services (13.7%)	Industry (12.0%)
3. Export Volume (1987)	46,928 (Million Rs)	Industry (43.8%)	Agriculture (42.8%)	Mining (5.5%)

(Source: Statistical Pocket Book)

2-1-2 Present State of Major Agricultural Products

The Government of Sri Lanka considers the growth of agriculture essential to economic development, and it centers agricultural policy on the

establishment of self-sufficiency in food stuff and diversification of such export agricultural products as tea, rubber and coconut.

The present state of these major agricultural products are as described below.

(1) Rice

Of all Sri Lanka's agricultural products, rice has the largest output. In 1986, rice production amounted to 1,760,000 tons. The country's production has been increasing steadily in keeping with the expansion of the planted acreage and the increase in the yield per unit area. Most of its rice production is for domestic consumption. On the other hand, however, rice is still one of the country's most important imported agricultural products. In 1986, rice imports totaled 220,000 tons (12.5 percent of total domestic rice production). To reduce rice imports, it is considered necessary to increase the efficiency of rice production through promotion of the use of irrigation technologies and breeding.

(2) Sugar

In Sri Lanka, sugar production has steadily increased and reached 34 thousand tons in 1987. On the other hand, however, domestic sugar consumption has been increasing from year to year. In 1987, 340,000 tons of sugar, which accounted for more than 85 percent of the total domestic consumption, was imported. Therefore, it is necessary to increase the self-sufficiency rate in sugar supply through improvement in the quality of sugar cane.

(3) Major Export Agricultural Products (tea, rubber, coconut)

Tea, rubber and coconut, all of which are the country's major export agricultural products, are produced systematically at plantations. In 1987, tea exports totaled 12,299 million Rs, rubber exports 3,706 million

Rs, and coconut exports 1,538 million Rs. The combined total exports of these three major agricultural products represented about 37.5 percent of the country's total exports (46,928 million Rs). However, the production of these agricultural products is on the decrease or is hovering at a low level. It is hoped that production of these agricultural products will be revitalized for the purpose of acquiring foreign exchange.

(4) Minor Export Agricultural Products

While the exports of major export agricultural products are hovering at a low level, minor agricultural products such as spices, fruits, vegetables and ornamental plants are increasing smoothly. However, the combined total exports of those minor agricultural products account for only about 6 percent of the total exports. Great expectations are placed on an increase in output of these agricultural products as well as on their diversification so that they may contribute to the stabilization of Sri Lanka's economy.

The Government of Sri Lanka has given the top priority in their economic policy to promotion of industrialization and expansion in export of manufactured goods. However, agriculture is still the most important sector of Sri Lanka's economy. It is expected that the economic dependence of Sri Lanka on the agricultural sector will continue. In this connection, the achievement of self-sufficiency in food stuff and the expansion in exports of agricultural products through productivity increases and diversification of agricultural products are important in promoting the sound growth of Sri Lanka's economy.

2-2 The Trends in Export and Import of Plants and their Quarantine

Diversifying the agriculture of the country, increasing agricultural productivity, and particularly expanding exports of agricultural products through improvement of agricultural production are some of the most important political challenges to be overcome in promoting the growth of Sri Lanka's economy. Furthermore, in recent years, the country's economy has become closely linked with foreign economies. In keeping with the increase in the country's international interchange of people, its imports of agricultural products tend to rise. Here, the present state of the country's export and import of agricultural products is analyzed with reference to the quarantine inspection of imported plants and at the same time the future outlook for the export and import of agricultural products is examined.

2-2-1 Imports of Agricultural Products

In 1988, total Sri Lanka's imports stood at 71,200 million Rs (US\$1,665 million), which exceeded the country's total exports of 46,928 million Rs by about 24,300 million Rs. Table 2-2 shows a breakdown of the country's total imports in 1988. The pattern of imports is characterized by the predominance of food stuff such as rice, wheat and sugar. Although Sri Lanka is an agricultural country, the country has not yet achieved adequate self-sufficiency in staple foods. The fact is that importation of major agricultural products is indispensable to the country.

Table 2-2 Total Imports (1988)

Category	Value		Percentage of Total Imports (%)
	Value in Million Rs	Value in Million SDR	
1. Consumer Goods	17,425	407.5	24.5
2. Intermediate Goods	40,508	947.4	56.9
3. Investment Goods	21,081	282.5	17.0
4. Unclassified	1,186	27.7	1.6
Total	71,200	1,665.2	100
Rice	1,795	42.0	2.5
Flour	2,983	69.8	4.2
Sugar	2,927	68.5	4.1

Source: Central Bank of Sri Lanka

Sri Lanka's imports of agricultural products which are subject to plant quarantine are divided broadly into the following three categories.

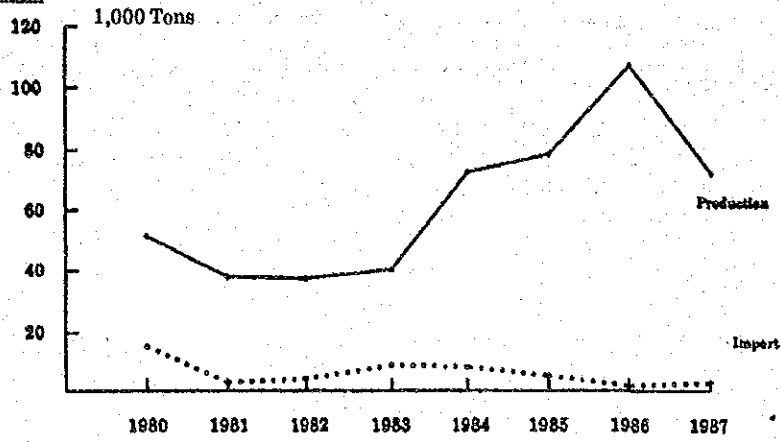
- ① Imports of food crops
- ② Imports of plants for cultivation
- ③ Imports of plants for testing and research purposes

This section deals with the present state of these agricultural products and plants with reference to the current quarantine operations in Sri Lanka.

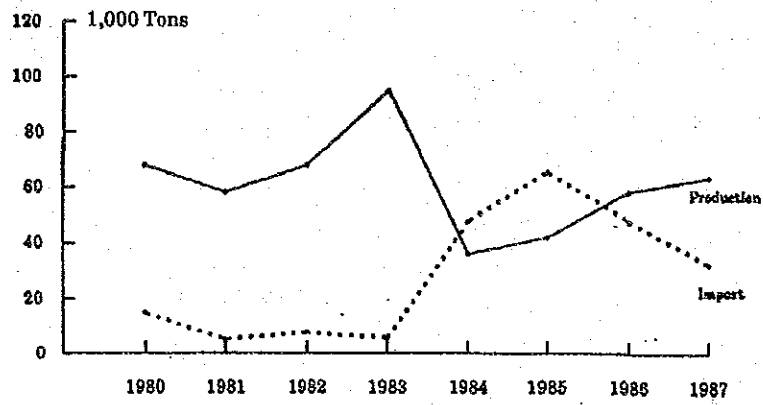
(1) Imports of Food Crops

At present, Sri Lanka is heavily dependent on imports of important food crops, such as rice, sugar, pulses, onions and chilles, all of which are indispensable to the national life. Trends in imports of these major food crops are as shown in Fig. 2-1.

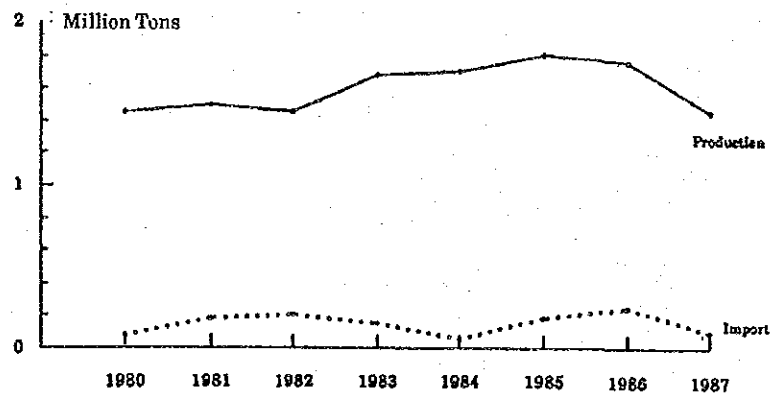
Chilles



Onions



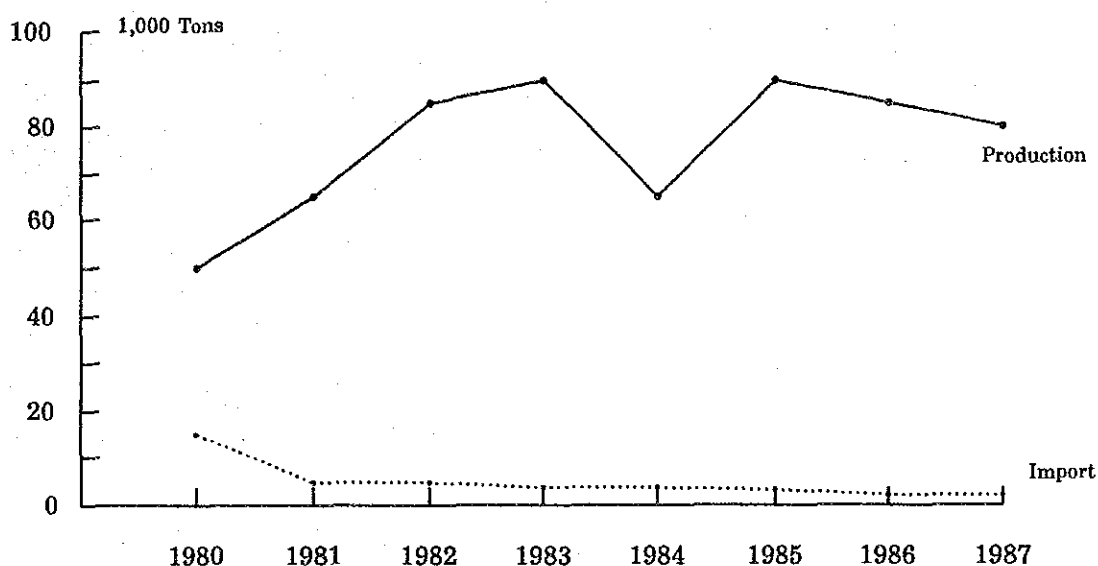
Rice



(Source: Customs Department)

Fig. 2-1 Imports of Major Food Crops

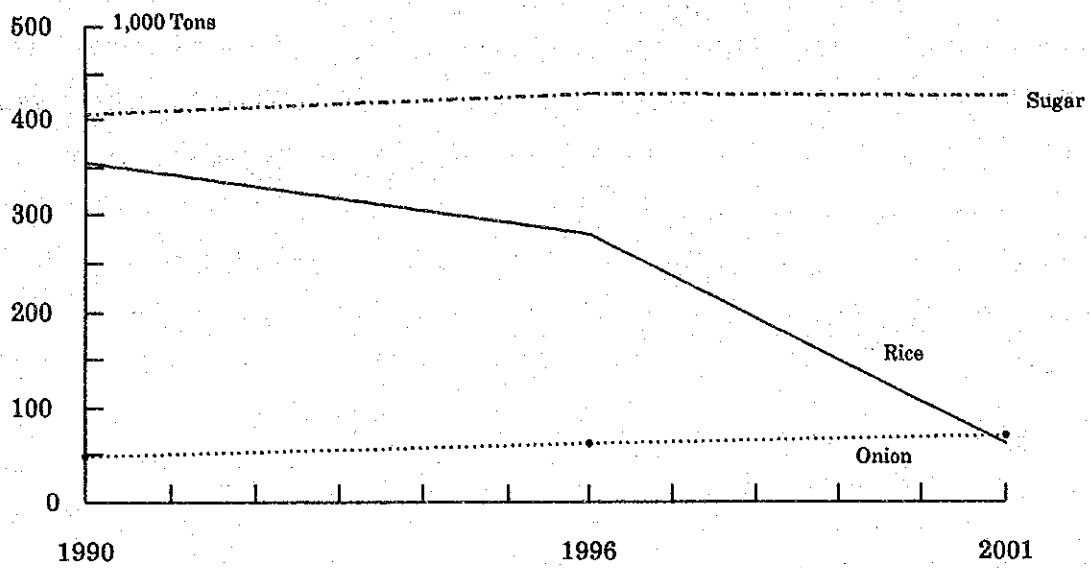
The Government of Sri Lanka is implementing policy measures to promote the production of these food crops, and is also implementing various agricultural development programs aimed at curbing further increases in imports of these agricultural products by increasing domestic production and thereby diversifying its agricultural production to other export products. In the case of potatoes, for example, domestic production has increased in recent years, which has resulted in a sharp decrease in imports. (see Fig.2-2)



(Source: Customs Department)

Fig. 2-2 Trends in Production and Imports of Potatoes

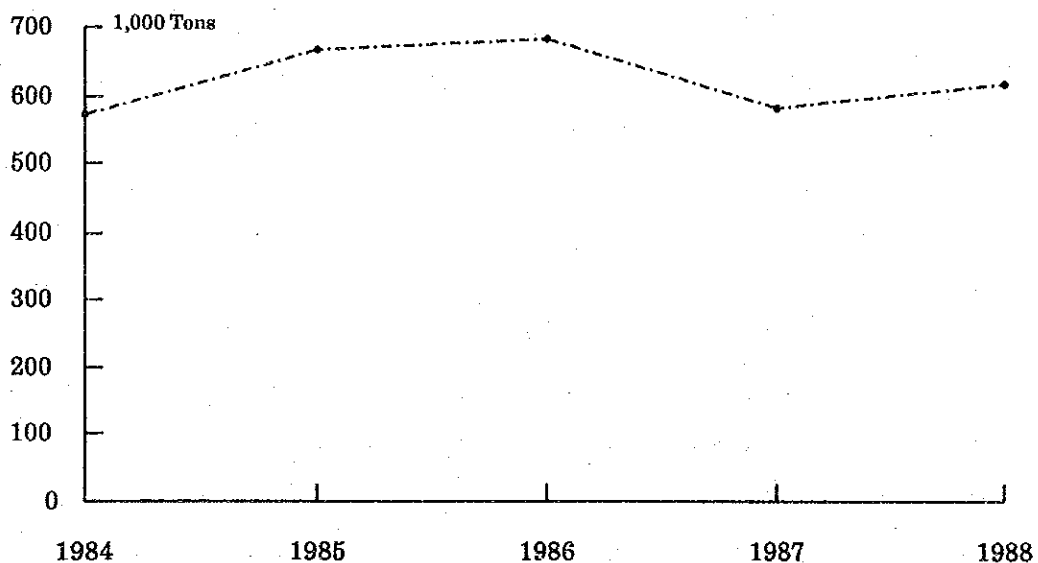
It is expected that these policy measures will serve to drastically decrease imports of food crops in the future. For the time being, however, imports of these food crops can be expected to stay at the present level. Fig.2-3 shows a projection of imports of major food crops made with reference to the population increase rate and the increase in output of these agricultural products.



(Source: Draft Final Report for the Development Study on the Port of Colombo, JICA)

Fig. 2-3 Projection of Imports of Major Food Crops

In the case of wheat, which is not produced domestically so that the country is entirely dependent on supplies from foreign countries, it is expected that imports will continue to increase in keeping with the growth in the country's population.



(Source: Food Commissioner's Dept.)

Fig. 2-4 Trends in Imports of Wheat

Under the conditions described above, it is judged that total import volume of food crops, including rice, onions, wheat, soyabeans, pulses and fruits, will stay at the present level or increase gradually. This means that plant quarantine work for food crops which are imported for domestic consumption will also increase.

More than 90 percent of these food stuff are imported to the country via Colombo Seaport. In 1989, Colombo Seaport Plant Quarantine Station quarantined 15,000 tons/month of wheat and livestock feed and 300 vesselfuls/month of rice, potatoes, onions and fruits. In actuality, however, the plant quarantine station has only eight inspectors, and there is a paucity of plant quarantine equipment there. Furthermore, many of the existing pieces of equipment are superannuated. Therefore it is obvious that the plant quarantine station is incapable of fully carrying out inspection of export and imported plants. It is hoped that its facilities be improved to cope with the predicted increase in exports and imports of food stuff.

(2) Import of Plants for Cultivation

In Sri Lanka, the Farms and Planting Materials Division of the Department of Agriculture is wholly responsible for the management of seeds of rice, pulses, chilles, potatoes and other vegetables. The division's activities range from growing seeds at state farms or entrusted private farms to storing and selling of these seeds. Private farms are producing agricultural products by purchasing seeds from the Farms and Planting Materials Division. However, the domestic production of seed potatoes and seeds of other vegetables are in short supply and a considerable amount of them are imported. In the case of seed potatoes, for example, about 4,000 tons of the country's annual requirements of about 6,000 tons are produced at state farms and entrusted private farms, but the remaining 2,000 tons are imported.

These seeds are imported in limited quantities. As they are planted directly in farmland, however, they must be subject to stringent plant quarantine. It is imperative, therefore, to improve and expand a plant quarantine system to cope with the possible increase in imports of these seeds.

It should be noted that imports of seed potatoes have been exempted from the control of the Farms and Planting Materials Division since 1989 and came under private management. This means that there will be an increase in plant quarantine of imported seed potatoes. For this reason, it is important to strengthen the country's plant quarantine system.

Most of the imported seeds/seedlings are subjected to primary inspection at airport or seaport plant quarantine stations. Usually, the inspection is conducted as either observation or random sampling inspection. However, most of the imported seeds/seedlings, subjected to primary inspection at these plant quarantine stations, are allowed into the country without any precise inspection, in actuality. In this context, it is a matter of urgent necessity to strengthen the country's plant quarantine system and as a result tighten surveillance on pests/pathogens attached to imported seeds/seedlings by conducting precise inspection of imported seedlings.

It should be added that the Seed Certification Services is responsible for the control of the quality of seeds produced by the Farms and Planting Materials Division and the Plant Protection Services are responsible for their fumigation treatment.

(3) Import of Plants for Testing and Research Purposes

In an attempt to increase the country's self-sufficiency in agricultural products and promote their export, the Government of Sri Lanka is promoting its agricultural development policies aimed at expanding farmland and at the same time improving the quality of agricultural

products. Of the country's agricultural products, rubber, coconuts, sugar cane and rice are the major agricultural products whose production is expected to increase in the future. In the case of these major agricultural products, various research institutions have been established to conduct specific research and development work. These research and development institutions need to import high-quality seeds and seedlings as well as germ plasms for the purpose of research on the development of new varieties of superb quality. Table 2-3 shows import of plants for testing and research purposes in 1987, all of which were subject to plant quarantine at plant quarantine institutions.

Table 2-3 Import of Plants used for Testing and Research Purposes (1987)

Institution	Imported Item	Amount	Origin
Department of Agriculture	potato	1 box	Peru
	potato	50 kg	Denmark
	potato	10 kg	Israel
	potato (for tissue culture)	1 box	Peru
	seed potato	88 kg	Denmark
	potato	180 kg	Netherlands
Rubber Institute	rubber seedlings	5 box×7times	Malaysia
Sugar Cane Institute	sugar cane	1 kg	Mauritius
	sugar cane	50 cases	Fiji
Horticulture Institute	vegetable seeds	17 kg	Netherlands
	fruit seedlings	5 box	Australia

(Source: Airport Quarantine Station)

As is clear from the above table, plants for testing and research purposes are imported in limited quantities. It should be noted, however, that they are imported from a wide variety of regions and countries. There is every likelihood that alien pests/fungi will invade Sri Lanka from countries where such pests/fungi breed under different conditions from those existing in Sri Lanka. In this connection, it is imperative to establish a facility for post-entry quarantine of seeds and seedlings imported for testing and research purposes.

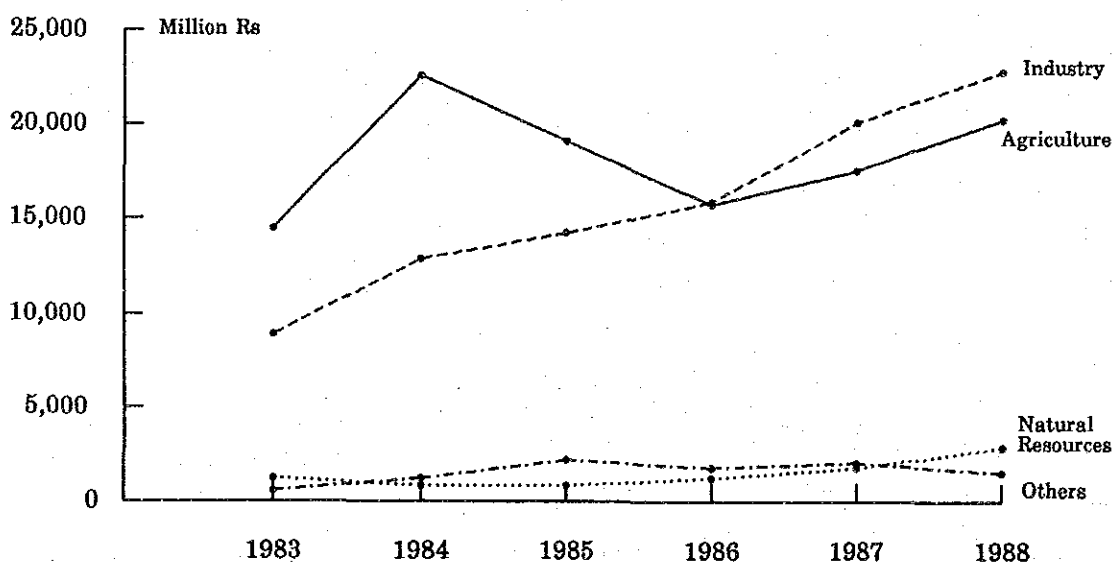
In principle, imported plants for testing and research purposes are

subject to post-entry quarantine at quarantine stations. In actuality, however, imported plants are inspected for specific requirements only and other aspects of their inspection are left to the discretion of individual institutions (four national institutions and two international research laboratories).

As mentioned above, Sri Lanka's imports of plants are on the increase. At the same time, it is expected that the plant quarantine workload will increase in keeping with the increase in imports of plants.

2-2-2 Exports of Agricultural Products

Exports of agricultural products had commanded the largest share of Sri Lanka's total exports before 1986. Since 1986, however, exports of manufactured goods have exceeded those of agricultural products. In 1988, manufactured goods represented 48.3 percent (22,674 million Rs) of the total exports, while agricultural products presented 42.8 percent (20,104 million Rs) of the total (see Fig.2-5).



(Source: Agricultural Statistics)

Fig. 2-5 Trends in Exports by Sector

This is mainly because exports of traditional agricultural products such as tea, rubber and coconuts, which once accounted for the greater part of the country's exports of agricultural products, have stayed at low levels or have been on the decline, while exports of manufactured products have been increasing steadily. In order to promote the exports of agricultural products, it is an urgent necessity for the country to expand exports of new agricultural products to replace these traditional ones.

In the sections that follow, the present state of Sri Lanka's exports of agricultural products is reviewed in relation to plant quarantine.

(1) Expansion in Exports of Agricultural Products

Trends in exports of agricultural products in Sri Lanka are shown in Fig.2-6. As can be seen from these figures, minor agricultural products, which are produced mainly at small-scale farms, have been increasing smoothly, while exports of plantation crops such as tea, rubber and coconuts have been hovering at low levels.

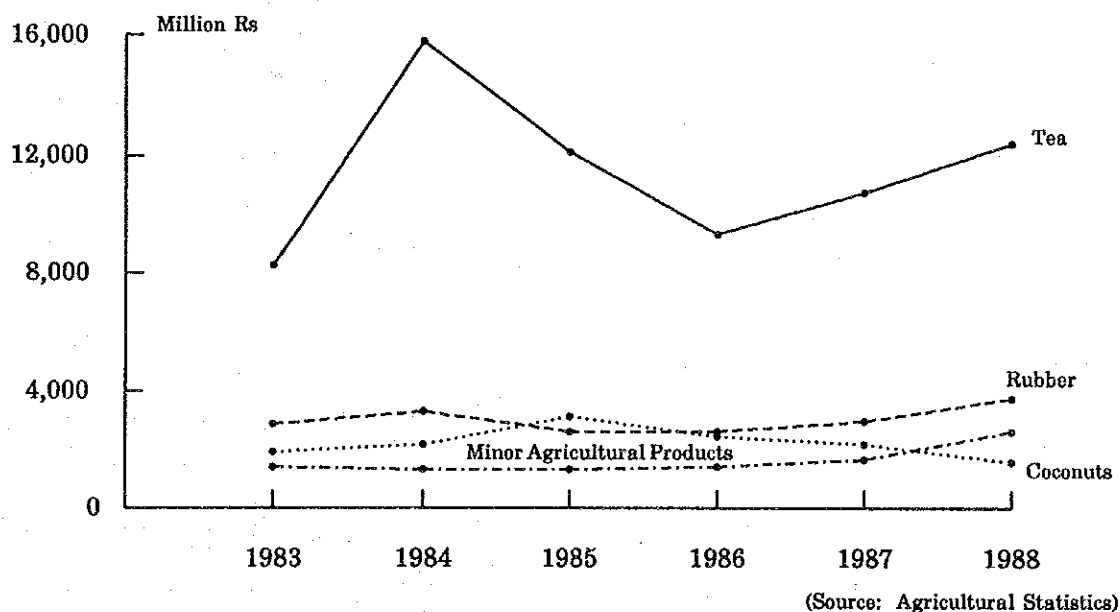


Fig. 2-6 Trends in Exports of Agricultural Products

"Minor agricultural products" include vegetables, fruits, ornamental plants and spices. The Government of Sri Lanka is implementing policy measures to promote the production of these minor agricultural products for the purpose of increasing small-scale farmers' incomes and thereby achieving social stability. At the same time it is aiming to increase the country's exports of agricultural products by that. The minor agricultural products and their major export destinations are tabulated in Table 2-4.

Table 2-4 Classification of Minor Agricultural Products and their Major Export Destinations

Category	Item	Destination
Vegetables	ginger, garlic, carrot, cucumber, cabbage, radish, pumpkin, tomato, lettuce, strawberry	Maldives, Oman, Saudi Arabia, Singapore, Bahrain, UAE, Kuwait
Fruits	pineapple, papaya, mango, orange, mandarin, avocado, banana, lime	
Flowers	foliage plant, orchid, flower	Switzerland, Sweden, West Germany, U.K., France, Denmark, Belgium, Norway, Greece, Italy, Poland, Malaysia, Hong Kong, Singapore, Indonesia, Saudi Arabia, Dubai, USA, Australia
Spices Others	cinnamon, pepper, clove, cashew nut, coffee	

(Source: Plant Quarantine Div.)

"Minor agricultural products" include many agricultural products, which are produced by small-scale farmers. These products are purchased by local exporters and are mainly sent to the cargo terminal of Katunayake Airport, where they are transported by air to their respective destinations. On the other hand, about 30 of the countries which import agricultural products from Sri Lanka demand a "certificate of export quarantine" issued by the Government of Sri Lanka. For this reason, quarantine of export agricultural products is conducted mainly at the plant quarantine station of Katunayake Airport. In 1987, about 888,000 consignments of fruits and vegetables and about 18,961,000 consignments of foliage plants were quarantined at the plant quarantine station. In order to expand exports of "minor agricultural products", it is essential to

carry out quarantine of these agricultural products more accurately and more quickly at the plant quarantine station.

(2) Plant Quarantine of Export Agricultural Products

Export agricultural products need to meet the plant quarantine requirements specified by the countries which import them. For this reason, it is impossible to export any agricultural product if it is not treated properly prior to shipment, when required. Furthermore some foreign countries demand every agricultural products be accompanied by a "certificate of export plant quarantine" issued by the Government of Sri Lanka. Thus the quarantine inspection is essential to increase the country's export of agricultural products.

Some of the export agricultural products are treated at Colombo Seaport Plant Quarantine Station. But most of them are treated at private organizations or the facilities of other entrusted government organizations. And the fact is that the quality of treatment is generally poor, so that it sometimes happens that those agricultural products exported from Sri Lanka are unable to pass the customs of their destinations. The reasons for the poor treatment are described as follows;

Treatment problems

1. Shortage of effective treatment equipment and technical staff who operate the treatment equipment.
2. Shortage of information on pests/pathogens.
3. Shortage of information on treatment.
4. Improper transportation and packing.

Table 2-5 shows examples of agricultural products exported from Sri Lanka being unable to pass the customs of their destinations.

Table 2-5 Export Agricultural Products found unable to pass the customs of their Destination

Destination	Item	Certificate issued or not	Types of pests	Treatment
APPPC	betel tea (in wooden boxes)	yes	Coleoptera	destroyed
		yes	Coleoptera (breeding in boxes)	treated
EPPO	foliage plants	yes	Nematode	destroyed
	foliage plants	yes	Phytophthora blight	destroyed
	foliage plants	yes	Mite	destroyed
	foliage plants	yes	Clubroot	destroyed
	rambutan	no	Cockere	destroyed
	pineapples	no	Maskel	destroyed
	pineapples	no	Technomyrmes Albipes	destroyed
NEPPO	tea (in wooden boxes)	no	Coleoptera	destroyed

(Source: Plant Quarantine Div.)

- APPPC : Asia & Pacific Plant Protection Commission
 EPPO : European and Mediterranean Plant Protection Organization
 NEPPO : Near East Plant Protection Organization

In order for Sri Lanka to increase exports of agricultural products, it is essential to conduct complete plant quarantine of export agricultural products and at the same time to improve the treatment techniques.

2-2-3 Export and Import of Plants due to Economic Uptrend

The Government of Sri Lanka is in the process of actively implementing economic policy measures to attract tourists and foreign enterprises, including incentives for foreign enterprises operating in the country, as part of its policy measures for acquiring foreign exchange. As a result, there has been a significant increase in international physical interchange by means of mail and through emigration and immigration of Sri Lankan people and foreigners. In keeping with this trend, plant imports are also on the rise.

(1) Increase of Travelers utilizing Air Transportation

Most of the travelers entering or leaving Sri Lanka use Katunayake International Airport. As shown in Fig. 2-7, the number of the travelers who use the airport is on the increase, although it has stayed at low levels in recent years.

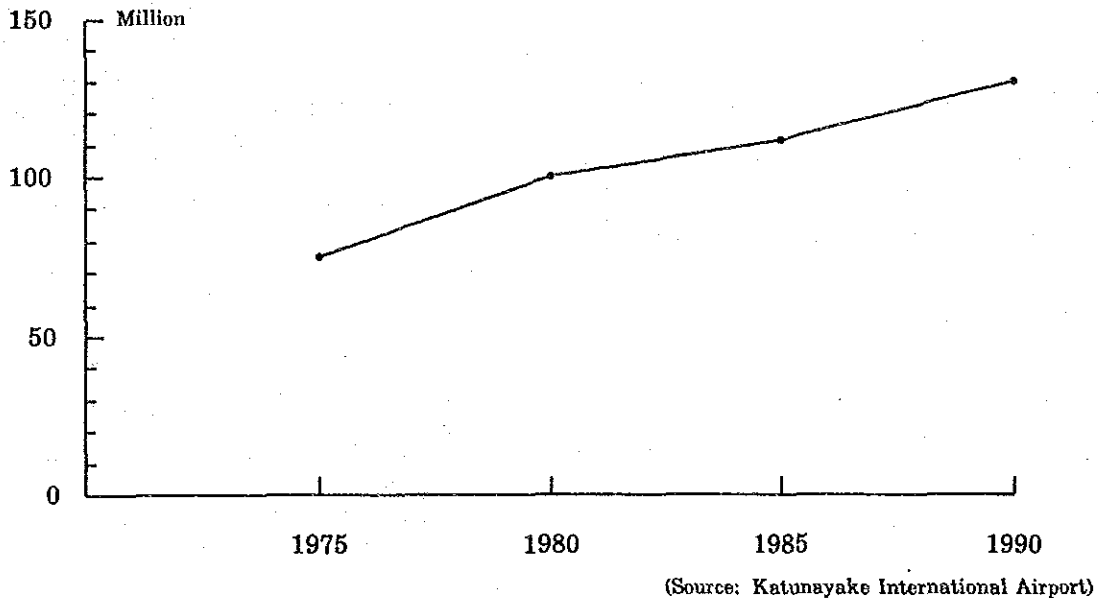
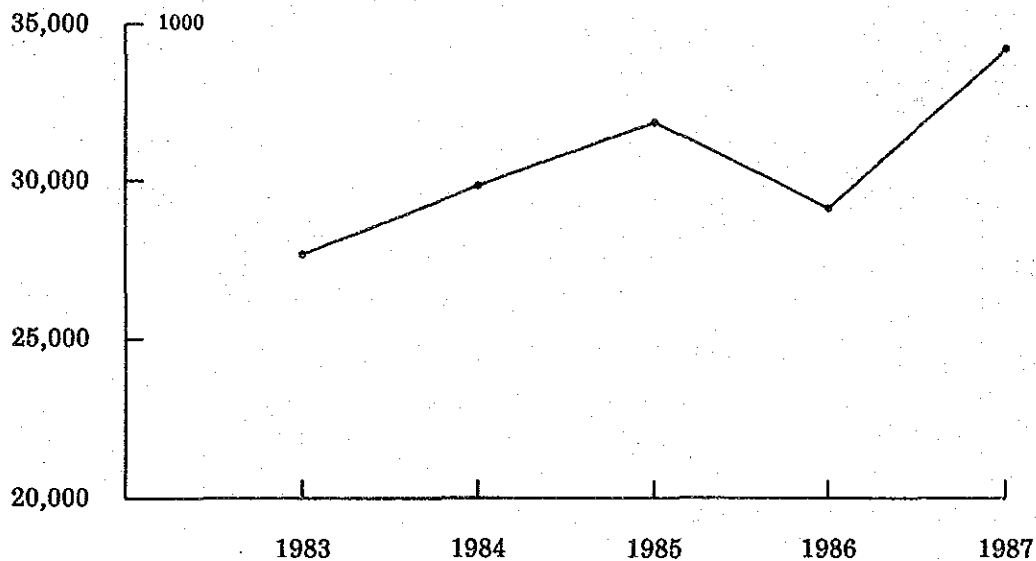


Fig. 2-7 Trends in the Number of Travelers

The number of plants and plant products being brought to Sri Lanka is increasing in accordance with the increase of travelers entering Sri Lanka. In 1985, about 40,000 plant quarantines (mostly quarantines of fruits brought by travelers from India and Thailand) were conducted for about 1.1 million travelers. At present the number of tourists is staying at a low level, but it is expected to increase sharply in the near future with background of an increasing number of foreign enterprises starting operations in Sri Lanka and the uptrend of Sri Lanka's economy. Accordingly, it is predicted that plant quarantine for tourists' belongings at the airport will sharply increase.

(2) Increase in the Volume of Mail

Reflecting the uptrend of Sri Lanka's economy, the volume of both outgoing and incoming mail is on the rise. Fig.2-8. shows trends in the volume of international mail handled at the Central Post Office of Sri Lanka.



(Source: Dept. of Posts and Telecommunications)

Fig.2-8 Trends in the Volume of International Mail

Postal packages containing seeds or the like which need to be quarantined are forwarded to Colombo Seaport Plant Quarantine Station for plant quarantine. In keeping with the increase in the volume of mail, the quarantine workload is increasing at the plant quarantine station.

As the above review of the present state of export and import of plants in Sri Lanka clearly indicates, it is expected that there will be further increases in the whole quantity of plants and plant products to enter or leave Sri Lanka, although the quantities of individual plants and plant products vary in terms of items or transportation means. This implies possible increases in the plant quarantine workload in the country. It is essential, therefore, to establish a plant quarantine system capable of effectively and quickly coping with such increases in the plant quarantine workload.

2-3 Pests/Pathogens Invasion

Although situated in the tropical zone, Sri Lanka has great a variety of climatic conditions ranging from dry low-temperature highlands to humid high-temperature lowlands. Taking advantage of such natural conditions, Sri Lanka's economy has developed with agriculture as its key sector. Thus agriculture is the largest sector of Sri Lanka's economy in terms of both production and employment.

On the other hand, Sri Lanka is encircled by the sea. Therefore, the country has a quite different chorological feature from continental countries. Once pests/pathogens invade such a country, there is every likelihood that they will cause greatly adverse effects on the ecosystem as well as on the export of agricultural products. In particular, they are most likely to deal a deadly blow to the country's agriculture. In order to ensure the smooth growth of the country's agriculture, and the country's national economy, for that matter, hazardous pests/fungi must be prevented from invading the country by all means.

2-3-1 History of Invasion of Pests/Pathogens into Sri Lanka

Sri Lanka used to be famous for its production of "Arabica" coffee. Coffee production was brisk with coffee plantations in operation in various parts of the country. Coffee was one of the country's important export agricultural products.

In the latter half of the 1860s, however, "Coffee Rust Fungus" (scientific name: *Hemileia vastatrix* B. & Br.), one of the world's most dangerous plant disease, invaded Sri Lanka, which gave the deathblow to coffee production in the country. As a result, the country's commercial coffee cultivation was forced to discontinue and give way to tea growing.

As the case of "Coffee Rust Fungus" illustrates, invasion of pests/pathogens caused serious damages to the country's agriculture in the past. Table 2-6 shows past cases of invasion of pests/pathogens into the

country.

Table 2-6 Past Cases of Invasion of Pests/Pathogens

Year	Scientific Name	English Name	Damaged Plants
1860	<i>Hemileia vastatrix</i> B. & Br.	Coffee rust	Coffee
1890	Banana bunchy top virus	Bunchy top of banana	Banana
	Cocoa swollen shoot virus	Swollen shoot of cocoa	Cocoa
1920	Citrus tristeza virus	Quick decline of citrus	Citrus
	<i>Phthorimaea operculella</i> Zeller	Potato tuberworm	Potato
	<i>Hypothenemus hampei</i>	Coffee berry borer	Fruit
1970	<i>Promecotheca cumingii</i>	Coconut leaf miner	Coconut
	<i>Nezara viridula</i> L.	Green vegetable bug	Vegetable
	<i>Eichhornia crassipes</i> Solms	Water hyacinth	Rice, water grass
	<i>Eupatorium odoratum</i> L.	Eupatorium	Upland plants
	<i>Achatina fulica</i> Ferussac	Giant African snail	General plants

(Source: Plant Quarantine Div.)

Sri Lanka is encircled by the sea, which means that invasion of insect pests can be prevented by plant quarantine. In order to protect Sri Lanka's agriculture against pests/pathogens, it is necessary to improve the country's existing plant quarantine system so that more stringent plant quarantine may be ensured.

2-3-2 Prevention of watched Pests/Pathogens from Invasion

Based on the past experience of invasion of pests/pathogens, the Government of Sri Lanka keeps a strict watch on invasion of such pests/pathogens as are listed in Table 2-7. The Government of Sri Lanka's concrete measures to prevent invasion of these hazardous pests/pathogens include improvement of the country's plant quarantine system and prohibition on importation of agricultural products which may most likely contain these pests/pathogens.

For example, in principle, importation of strawberry seedlings is prohibited. Even when their importation is permitted for specific

reasons, only those grown in areas which are not contaminated by Longidorus sp., Xiphinema ortrichodorus are imported in limited quantities.

Table 2-7 Watched Pests/Pathogens that could Invade Sri Lanka

Category	Names of pests/pathogens		Damaged Plants
	English Name	Scientific Names	
Insect pests	Mexican fruit fly	Anastrepha ludens	fruit
	Natal fruit fly	Ceratitidis rosa karsch	fruit
	Mediterranean fruit fly	Ceratitidis capitata	fruit
	Japanese orange fly	Dacus tsunsonis	citrus
	Sugarcane borer	Diatraea saccharilis	sugar cane
	Colorado potato beetle	Leptinotarsa decemlineata	potato
	Andean potato weevil	Premnotrypes	potato
Disease	Potato viruses	Virus	potato
	Cassava virus disease	Mosaic & leaf curls of cassava	cassava
	Nematode vectored viruses	NEPO & NETO groups	
	Rice viruses	Viruses (hoja blanca, tungro)	rice
	Onion rusts, smuts	Urocystis cepulae Puccinia allii	onion
	Coconut lethal yellows	Mycoplasma	coconut
	Coconut cadang cadang	Viroid	coconut
	Moko disease in banana	Pseudomonas	banana
	South American leaf blight of rubber	Microcyclus ulei	rubber
Citrus stubborn	Mycoplasma	citrus	
Nematode	Potato Cyst nematodes	Globodera rostochiensis G. Pallida	potato
Weed	Parthenium weed	Parthenium hysterophoru	
	Cocklebur	Xanthium pensylvanicum	
	Southern sandbur	Cenchrus echinatus L.	

(Source: Plant Quarantine Div.)

With regard to the importation of individual agricultural products, however, the following problems are involved in the administration of the country's plant quarantine system. Sri Lanka is still in grave danger of being invaded by very hazardous pests/pathogens.

(1) Import Quarantine of Food Stuff

In the case of import quarantine of food stuff, it is necessary to promptly quarantine large quantities of products. In actuality, however,

insufficient quarantine facilities and staff numbers may cause unsatisfactory results of the quarantine services. For instance, pests/pathogens as listed in Table 2-8 have been discovered in Sri Lanka. In this context, it is considered necessary to improve the country's import quarantine system as quickly as possible.

Table 2-8 Pests/Pathogens discovered during Import Quarantine

Category	Damaged Plants	Pests
Insects	crops	Trogoderma granarium Rhizopertha dominica Oryzaephilus surinamensis
	pulse	Trilobium confusum
	rice	Dicladispa armigera
	tobacco	Lassioderma serricorne
Mite	fruit	Panonychus citri
	vegetable	Brevipalpus phoenicea Tetranychus sp.
Germ	seeds	Phytophthora
	vegetable	Ceratocystis paradoxa
	coconut	Colletotrichum lindemutheanum
	crops	Macrophomina phaseolina Fusarium
Bacteria	bean	Pseudomonas phaseolicola Pseudomonas lachrymans
	orange	Xanthomonas citri
	cotton	Xanthomonas malvacearum
	rice	Xanthomonas oryzae
	bean	Xanthomonas phaseoli
Nematode	rice	Aphelenchoides besseyi
	onion	Ditylenchus dipsacii
	root	Meloidogyne
Virus	seeds	Bean mosaic virus Cowpea mosaic virus Mung crumple virus Tobacco ringspot virus

(Source: Plant Quarantine Div.)

(2) Import Quarantine of Vegetables and Fruits

Vegetables and fruits imported into Sri Lanka pass the customs after undergoing plant quarantine. However, about 75 to 80 percent of the imported vegetables and fruits do not meet the country's import

requirements. Few of them are accompanied by sufficient records of treatment.

In practice, it is difficult to obtain public consent to the immediate return to places of shipment or disposal of these unqualified imports. It is also difficult to discover hazardous pests/pathogens during plant quarantine because the facilities, equipment and staff are insufficient at quarantine stations. The fact is that most of the imported food stuff pass even if they are accompanied by insufficient records of treatment.

As is clear from the above description, Sri Lanka is in grave danger of being invaded by hazardous pests/pathogens in light of the predicted increase in imports of plants and plant products. It is imperative to conduct more strict plant quarantine.

2-4 Present State of Plant Quarantine in Sri Lanka

In Sri Lanka, the uptrend of plant imports is expected to continue reflecting the remarkable economic development in recent years. As past examples indicate, on the other hand, Sri Lanka's agriculture has been hard hit by invasion of pests/pathogens. Thus prevention of invasion of such pests/pathogens through improvement of the country's plant quarantine system is very important from the stand point of promotion of its agricultural industry and stable supply of food.

This section deals with the present state of plant quarantine in the country, in terms of the country's laws and regulations applicable to plant quarantine, organizational characteristics of the country plant inspection facilities and plant quarantine-related technologies.

2-4-1 Laws and Regulations applicable to Plant Quarantine

The laws and regulations which form the basis of plant quarantine operations in the country are divided broadly into domestic laws and regulations, the central government's notifications and the international conventions to which Sri Lanka is a signatory.

(1) Plant Protection Ordinance

The law that forms the legal basis for plant quarantine in Sri Lanka is the Plant Protection Ordinance No.10, 1924 which was enacted in 1924. This basic law provides for the legal authority concerning plant protection operations, including plant quarantine. Government ordinances and notifications which stipulate details of plant protection work are issued in accordance with the provisions of this law. It should be added that this law was revised in 1950, 1954 and 1981.

(2) Legislative Enactments of Sri Lanka, 1956, Vol.12, Chapter 447

As shown in Fig.2-9, Legislative Enactments of Sri Lanka, 1956, Vol.12 Chapter 447 stipulates details of the plant protection organizations and their legal authority in accordance with the provisions of the aforementioned Plant Protection Ordinance No.10, 1924. This enactment consists of two parts, Part 1 plant quarantine and Part 2 plant protection, stipulating the responsible agencies, contents of services, methods of plant quarantine and protection, and basis of penalties. Matters involved in plant quarantine, such as plant quarantine forms, import-ban articles, quarantine charges, requirements concerning quarantine facilities and procedures for revising laws, are stipulated in accordance with the provisions of this enactment.

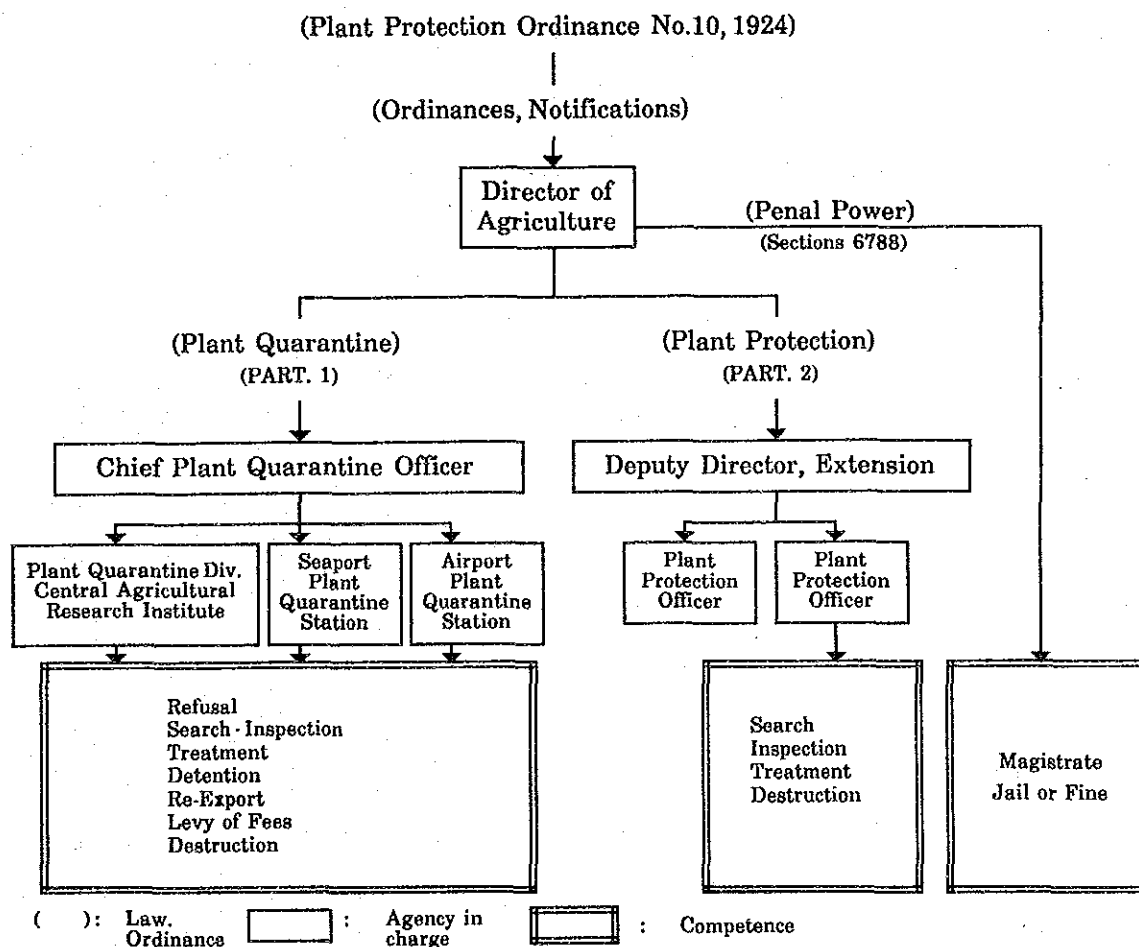


Fig. 2-9 Legal Authority under Plant Protection Ordinance

(3) Other Related Laws and Regulations

Although not directly related to the Plant Protection Ordinance, various laws were enacted in the field related to plant quarantine. Neither the plant quarantine inspectors nor the plant protection inspectors are entitled to exercise the authority stipulated in these laws, but they may sometimes be involved in matters which relate to the plant quarantine/protection through their work to identify pests/pathogens and export/import quarantine of agricultural products. The following laws are the ones which are likely to affect their activities.

- Fauna & Flora Protection Act
- Endangered Species Act
- Wild Life Act
- Environment Protection Act

Those plant quarantine inspectors who conduct quarantine inspection at airports and seaports are required to have a thorough knowledge of not only the laws applicable to plant quarantine/protection but also these laws.

(4) International Conventions

Sri Lanka is a signatory to international conventions on plant protection and those expressly stipulating regional cooperation in plant protection. The major international conventions to which the country is a signatory are outlined below.

1) International Plant Protection Convention (IPPC)

This is an international convention aimed at establishing a system for international cooperation concerning laws and regulations, technologies and procedures for prevention of pests'/pathogens' invasion into the signatory countries. It stipulates the methods of export and import of plants to be employed by the signatory countries. In the case of export and import of plants between the signatory

countries, for instance, plants and their containers/packages must be inspected in the exporting country and a certificate of inspection as specified in the annex to the convention, which is issued by the government authorities of the exporting country, must be attached to the export plants. At present 94 countries are the members of this international convention. Sri Lanka became a member of this convention in 1952.

2) Asia and Pacific Plant Protection Commission (APPPC)

This international convention stipulates measures to be taken by the signatory countries concerning pests/pathogens peculiar to the Asia and Pacific region. It also defines pests/pathogens which could be particularly hazardous in the region (*Microcyclus ulei*, for an example) and gives guidelines on preventive measures, applicable plant quarantine methods and legal measures.

Sri Lanka became a member of this international convention in 1956.

2-4-2 Outline of Plant Quarantine Organization in Sri Lanka

(1) Administrative Organization

In Sri Lanka, plant quarantine activities are carried out under the control of the Department of Agriculture, Ministry of Agricultural Development and Research. More specifically, several different plant quarantine stations are organized under the supervision of the Chief Plant Quarantine Officer who serves concurrently as the director of the Plant Quarantine Division, the Central Agricultural Research Institute, which is under the direct control of the Research Division, the Department of Agriculture.

The figure below gives a graphic representation of the above-mentioned administrative organization.

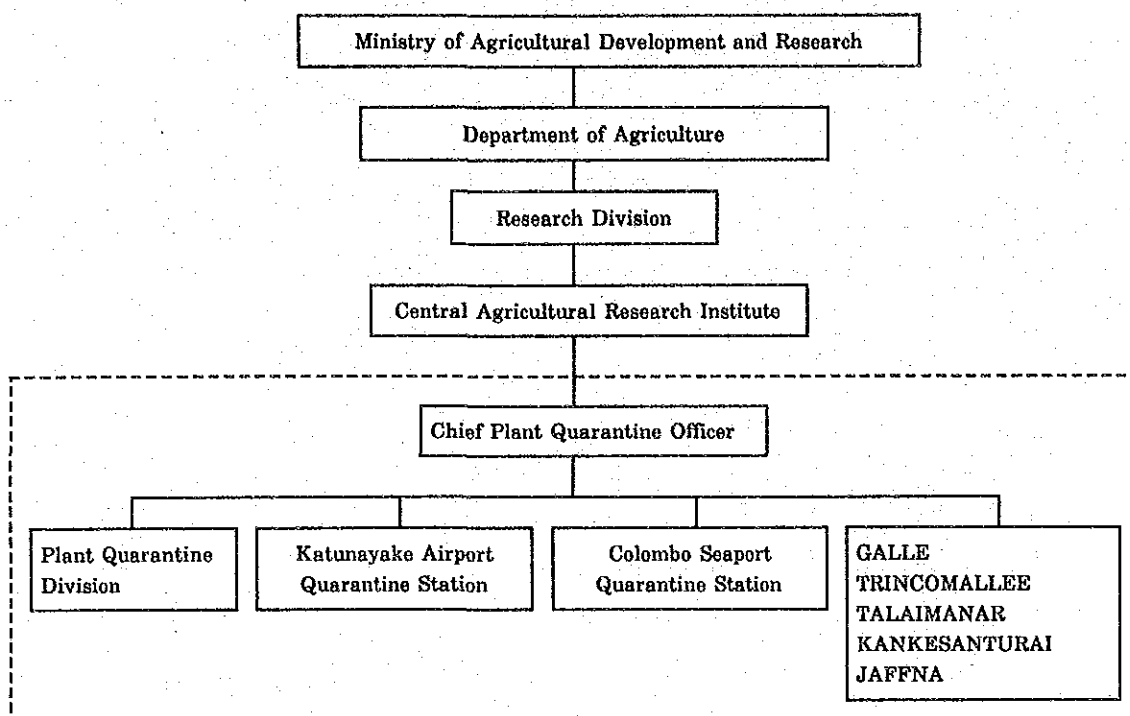


Fig. 2-10 Administrative Organization for Plant Quarantine

The following table and figure give an outline of the geographical distribution of the plant quarantine service network in Sri Lanka and the contents of the plant quarantine services being carried out under the aforementioned administrative organization.

Table 2-9 Plant Quarantine Services provided at Port of Export and Import

Name of Place	Category		Quarantine Service	User		Remarks
	Seaport	Airport		Passenger	Cargo	
Colombo	○		PQS	2 %	90 %	Around-the-clock basis
Katunayake		○	PQS	90	(3)	Around-the-clock basis
Galle	○		OP	0	1	
Trincomalee	○		OP	1	5	
Point Pedro	△		OP	0	1	Closed when southwest monsoon (4m) blows
Kankasanturai	△		OP	0	1	Closed when southwest monsoon (6m) blows
Jaffna		○	OP	0	0	
Talaimanar	○		OP	7	2	closed when northeast monsoon (3m) blows

(注) PQS : Quarantine stations where service is always available
 OP : Ports where provisional on board service is available
 △ : Out Port

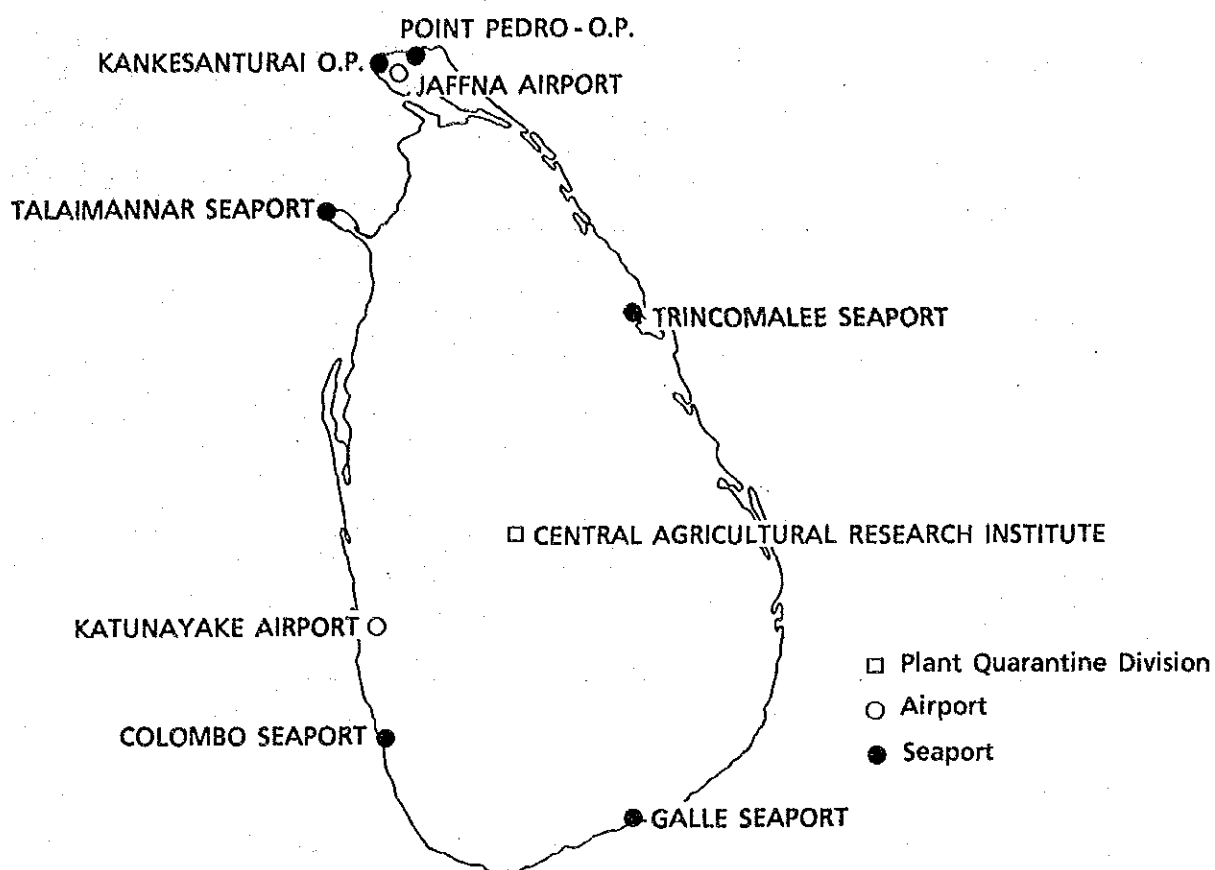


Fig. 2-11 Locations of Seaports and Airports

(2) Staff Numbers

The staff as of 1989 of each of the administrative organizations involved in plant quarantine services are as shown in the following table.

Table 2-10 Staff Numbers of Administrative Organizations involved in Plant Quarantine Services

Agency	Staff Number	Staff numbers of Quarantine Sect.	
		Technical staff	General staff
Ministry of Agricultural Development and Research	175	Total	2 (2)
Department of Agriculture	14,083	Total	25 (35)
Central Agricultural Research Institute	17	7	10
Katunayake Airport Quarantine Station	17	10	7
Colombo Seaport Quarantine Station	8	6	2
Local Seaport - Airport			
New Plant Quarantine Facilities		(15)	(50)

() indicates scheduled staff number for the project

At some local seaports and airports no full-time plant quarantine inspectors are stationed. In such cases, researchers from the nearest local offices of the Extension Division, the Department of Agriculture are dispatched to carry out plant quarantine inspection.

(3) Budgeting

The annual budgets for the Ministry of Agricultural Development and Research and the Department of Agriculture are shown in Table 2-11. When this project is implemented, funds for this project will be additionally appropriated from the annual budget for fiscal 1991 and after.

Table 2-11 Annual Budget

Agency	1987	1988	1989
Ministry of Agricultural Development and Research	1,201,202,000	1,160,496,000	1,469,841,000
Department of Agriculture	328,084,000	397,987,000	493,866,000
Central Agricultural Research Institute			14,300,667

(Unit: Rs)

In Sri Lanka a fiscal year commences in January and ends in December. The annual budget for the next fiscal year is approved and decided by the Parliament in mid-November.

2-4-3 Present State of Government Institutions responsible for Plant Quarantine

Government agencies directly responsible for plant quarantine in Sri Lanka are the Plant Quarantine Division of the Central Agricultural Research Institute, Katunayake Airport Plant Quarantine Station and Colombo Seaport Plant Quarantine Station. Their respective organizations and facilities are as outlined below.

(1) Plant Quarantine Division of Central Agricultural Research Institute

1) Organization and Activities

The Plant Quarantine Division of the Central Agricultural Research Institute is responsible mainly for precise inspections of germ plasm imported from foreign countries in the field of agriculture, horticulture and forestry. This division only covers inspections of germ plasm which has high quarantine risks or high commercial value. Other activities in this division include inspection of the facilities of other government agencies and provision of guidance when they import germ plasm.

As shown in Fig. 2-12, the Plant Quarantine Division is a part of the Central Agricultural Research Institute. And at present they conduct precise inspections with the aid of experts from other divisions of the institute.

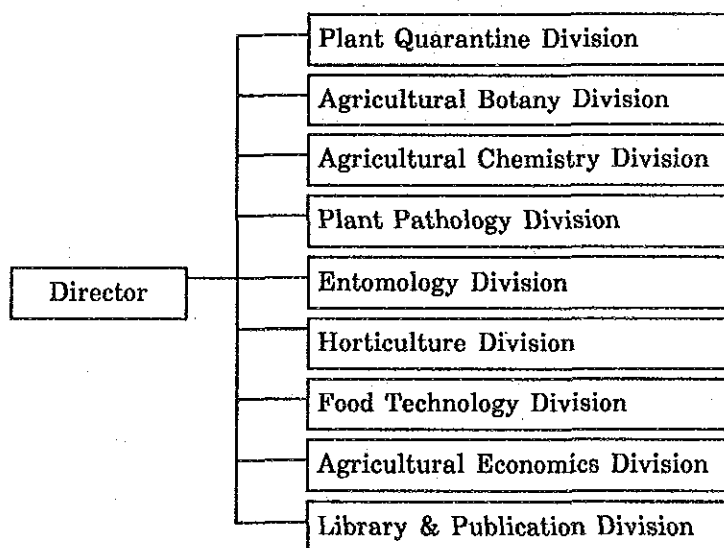


Fig. 2-12 Organization of Central Agricultural Research Institute

The Plant Quarantine Division is operated under the organization shown in Fig.2-13.

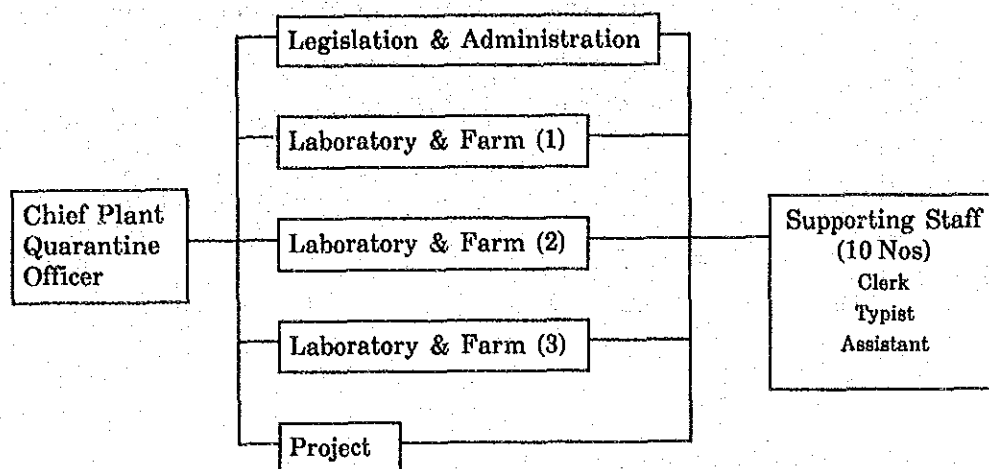


Fig. 2-13 Organization of Plant Quarantine Division

The Chief Plant Quarantine Officer, who serves concurrently as director of the Plant Quarantine Division, is responsible for coordination of plant quarantine activities throughout Sri Lanka. Issuance of certificates of import quarantine, certificates of export quarantine and other certificates are conducted under the responsibility of the Chief Plant Quarantine Officer.

2) Facilities and Equipment

The facilities and equipment belonging to Plant Quarantine Division are as summarized in the following table.

Table 2-12 Facilities and Equipment of Plant Quarantine Division

Category	Facility · Equipment		Remarks
	Name	Area · Nos	
Main Building	Director's Rm Staff Rm Treatment Rm Workshop		Partly as microscopic room Clean Chamber
Outdoor Facility	Net House Insectarium Field	10m×18m 2bldg.	No electric wire is supplied Sugar cane is presently planted
Equipment	Microscope (low magnification) Microscope (high magnification) Autoclave Clean Bench Constant Temp. Water Bath Dry Heat Sterilizer Incubator Fumigation Equipment (1m ³) Mist Incubator pH meter	1 1 1 1 1 1 1 1 1 1	(out of order) (out of order)

As can be seen from the table, the equipment installed at this division is not enough to cope with the scope of services. The equipment of the Central Agricultural Research Institute, which is located adjacent to this division, is utilized to make up for the deficiency.

(2) Katunayake Airport Plant Quarantine Station

1) Organization and Activities

Katunayake International Airport is the largest airport in Sri Lanka, where 90 percent of the annual total number of travelers and 3 percent of the annual total cargo volume pass. The Plant Quarantine Station located within this airport provides the primary quarantine services to the plants passing through this airport on an around-the-clock basis. In 1987, the total number of plant quarantine inspections carried out at this station was about 3,000 at the cargo division and 40,000 at the passenger division. In addition to the routine plant quarantine, the station also conducts inspections of plantations located within 50km range of the airport as part of its work to quarantine export ornamental plants. Currently, this plant quarantine station has a staff number of 17, and is carrying out its activities with the following organization.

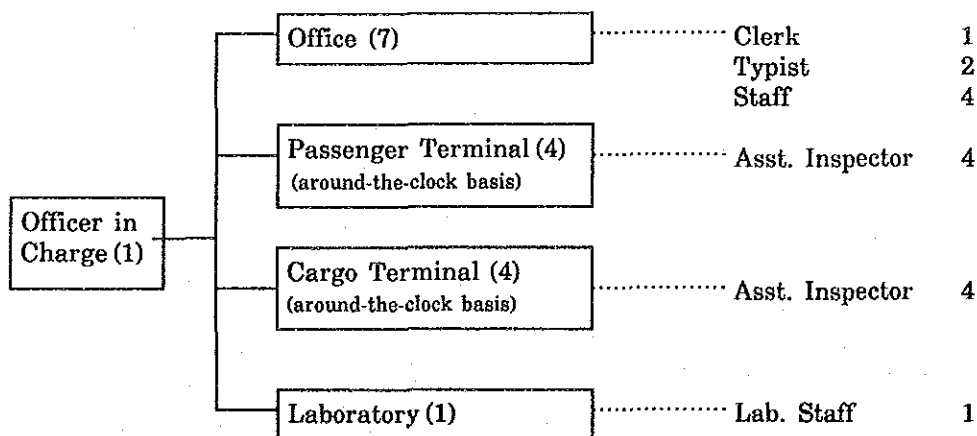


Fig. 2-14 Organization of Katunayake Airport Plant Quarantine Station

2) Facilities and Equipment

The facilities and equipment belonging to this station are as summarized below.

It is considered that it is impossible to carry out the precise inspection with the equipment shown in the table. In actuality, import-banned articles and those which are considered likely to contain very hazardous pests/pathogens are transported to the Plant Quarantine Division of the Central Agricultural Research Institute for precise inspection, after reporting to the Director of the Department of Agriculture.

Table 2-13 Facilities and Equipment of Katunayake Airport Plant Quarantine Station

Category	Facilities - Equipment		Remarks
	Name	Area - Nos	
Cargo Terminal	Director's Rm Inspector's Rm Admin. Office (Headquarter)		
Passenger Terminal	Reception Counter Inspector's Rm	2 Nos.	
Inspection Section	Laboratory (1) Laboratory (2) Office Inspector's Office		
Equipment	Microscope (1) Microscope (2) Balance Balance (Lever type) Autoclave Refrigerator Filter Dry Heat Sterilizer Incubator Fumigation Chamber Motorcycle	1 1 1 1 1 1 1 1 1 1 1	Binocular type Monocular type Portable (out of order)

(3) Colombo Seaport Plant Quarantine Station

1) Organization and Activities

About 90 percent of the total ship cargo volume is handled at Colombo Seaport Plant Quarantine Station. In 1988, 5,885,322 packages were quarantined at this seaport, of which about 90 percent were export and

about 10 percent were import.

Fumigation treatment is conducted mostly for export plants and plant products. In 1988, 190,265 packages were fumigated. The fumigation rooms of this station are not used very often. In most cases, the station's quarantine inspectors are dispatched to private fumigation facilities for verification of fumigation treatment. Upon request, inspection and confirmation of treatment of export plants and plant products are conducted and the certificate of plant quarantine or plant treatment is issued. In this case, the following fees are charged in accordance with the plant quarantine rules of the Department of Agriculture.

Table 2-14 Quarantine Fee

Service	Fees
Inspection	130Rs/time
Issuance of Certificate	10Rs/time
Treatment	25Rs/m ³
Treatment (cyanide)	200Rs/0.5kg

The export/import plant quarantine of postal packages is also carried out at seaport plant quarantine stations.

Colombo Seaport Plant Quarantine Station has a staff of eight (8) and is carrying out its activities with the following organization as shown in Fig.2-15.

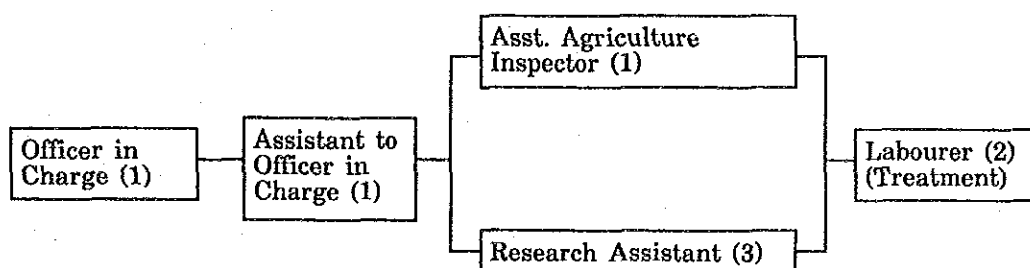


Fig. 2-15 Organization of Colombo Seaport Plant Quarantine Station

2) Facilities and Equipment

This seaport plant quarantine station has the following facilities and equipment.

Table 2-15 Facilities and Equipment of Colombo Seaport Plant Quarantine Station

Category	Facility, Equipment		Remarks
	Name	Area · Nos	
Quarantine Building	Director's Rm Admin. Office Inspection Rm Staff Rm	Total 120 m ²	
Fumigation Building	Fumigation Rm(1) Fumigation Rm(2) Fumigation Rm(3) Fumigation Rm(4)	12,500 cuf 12,500 cuf 8,000 cuf 1,500 cuf 800 cuf	Large size Fumigation Rm (One Rm type) Small size Fumigation Rm(2 Rms) Fumigation Chamber (2 Nos.)
Equipment	Microscope (1) Microscope (2) Gas Detector Gas Density Measurement Equipment Mimeograph Motorcycle	1 1 2 1 1 1	Binocular type Monocular type

This station has three large-size fumigation rooms. But they are seldom used because of being too old and are very likely to cause gas leaks. Only two small-size fumigation rooms and two fumigation chambers are used for fumigation by means of methyl bromide and hydrocyanic acid.

At present, a project for the improvement of Colombo Seaport is under way, which is scheduled to be completed in the year 2001. When the project is completed, the facilities of the seaport plant quarantine station will have been completely renovated.

As outlined above, the facilities and equipment owned by the quarantine institutions, namely, the Plant Quarantine Division, Katunayake Airport Plant Quarantine Station and Colombo Seaport Plant Quarantine Station, are insufficient and superannuated. Therefore, these institutions have not been able to handle the increasing volume of quarantine demands. And it is desirable to improve the facilities as well as equipment.

2-5 Background and Contents of the Request

2-5-1 Background of the Request

In Sri Lanka, agriculture accounts for about 24 percent of the country's GDP and 43 percent of its total exports. Thus agriculture is the largest sector of Sri Lanka's economy. Furthermore, agriculture represents more than 46 percent of the country's employed work force. And most of the country's industrial and commercial sectors are also closely related to agriculture. Accordingly, agriculture is also an important sector in terms of employment.

With such a background, the Government of Sri Lanka has concluded that increased agricultural productivity is essential to the advance of Sri Lanka's economy, and has established the following two main agricultural policies and worked for their realization.

- To achieve self-sufficiency through increased production of rice, sugar and pulses.
- To expand exports of agricultural products.

As it is necessary to import germ plasms and introduce new varieties for realization of the policies, it is expected that there will be an increase in imports of seedlings, seeds, germ plasms and plants for breeding purposes.

On the other hand, the country is becoming active in its international economic activities in keeping with the progress of industrialization and the positive implementation of policies to promote acquisition of foreign exchange. It is expected that exports and imports of agricultural products will dramatically increase in keeping with the expansion of the scope of international exchange of human and physical resources.

Export and import of agricultural products require plant quarantine. But the trade volume of agricultural products has already grown beyond the

total capacity of the existing plant quarantine facilities. The result is that surveillance over invasion of pests/pathogens is not properly done and that agriculture, the key sector of Sri Lanka's economy, is always at risk of invasion of noxious organisms and plant diseases.

Under such circumstances, the Government of Sri Lanka decided to implement a project to strengthen the country's plant quarantine system and construct new plant quarantine facilities. In October 1988, the Government of Sri Lanka requested the Government of Japan to provide grant aid for the construction of the new plant quarantine facilities and the improvement of the equipment for Colombo Seaport Plant Quarantine Station and Katunayake International Airport Plant Quarantine Station.

In response to the request from the Government of Sri Lanka, the Government of Japan decided to conduct a basic design study on Project for the Establishment of the National Plant Quarantine Services and the Japan International Cooperation Agency (JICA) dispatched a basic design study team to Sri Lanka.

2-5-2 Contents of the Request

(1) Outline of the Contents of the Request

Through the discussions held in Sri Lanka between the Government of Sri Lanka and the study team, the contents of the request for grant aid was confirmed by the Government of Sri Lanka as follows.

1) Objectives

1. To construct new plant quarantine facilities.
2. To reinforce the equipment of Colombo Seaport Plant Quarantine Station and Katunayake International Airport Plant Quarantine Station.

2) Implementing organization for the project

Department of Agriculture,
Ministry of Agricultural Development and Research

3) Contents of services

1. Precise inspection and post-entry quarantine of imported plants as well as export plants

Plants which are found to require detailed inspection as a result of primary quarantine at the airport or the seaport are subject to precise inspection or port-entry quarantine.

2. Development of plant quarantine treatment technology and reinforcement of treatment equipment

The quarantine technology and treatment technology which shall match the imported/export plant situation will be improved. And minimum treatment equipment for imported/export plant quarantine will be reinforced.

3. Centralized administration of plant quarantine services

The planned plant quarantine facilities are to carry out management of the plant quarantine services, research and public relations activities and training in plant quarantine as the center of the country's quarantine administration.

4) Project site

Katunayake, Gampaha District (Katunayake International Airport; site of ex-airport)

5) Facilities

1. Precise inspection room and quarantine treatment room

- Pathological inspection
 - Virological inspection
 - Tissue culture
 - Entomological inspection
 - Nematological inspection
 - Treatment
2. Quarantine rooms
 3. Administration office
 4. Director's room, meeting room, staff room, others
 5. Outdoor ancillary facilities
 - Glasshouse ● Net house ● Fumigation room
 - Post-entry quarantine field ● Incinerator
 - Garage ● Small-sized fumigation room
 - 6) Equipment
 1. Equipment for use in precise inspection and development of treatment technology.
 2. Ancillary equipment for improvement of seaport and airport stations.
 3. Equipment for use in clerical work and information management.
 4. Motor vehicles and others

(2) Differences from the Contents of the Original Request in October 1988

The contents of the request presented by the Sri Lankan side during the discussions held in the basic design study were different from the contents of the original formal request presented in October, 1988 in the following respects.

1) Project site

The project site was changed from Makandura (about 60km north of Colombo City, about 20km northeast of Katunayake International Airport) to Katunayake (about 40km north of Colombo City, adjacent to Katunayake International Airport) for the following reasons.

- As the planned plant quarantine facilities is closely related to the export and import of plants, they had better be located near Colombo City; the country's agricultural products distribution center.
- Various related research institutions are concentrated in and around Colombo City and the planned plant quarantine facilities' proximity to these institutions will make it easier for the facilities to obtain technical assistance from these institutions.

2) Contents of the services

In the original formal request, precise inspection and post-entry quarantine were the main pillars of the project. As a result of the change of the project site, however, it was decided to make the plant quarantine facilities as an independent organization and to add a centralized administrative function.

Addition of this function will help to strengthen the country's plant quarantine system, to improve export quarantine operations in the country, and thereby to promote the export of agricultural products.

3) Quarantine technology department

The weed inspection section which was included in the request as a part of the quarantine technical division is omitted. Since weed inspection overlaps pathological inspection in many aspects, it shall not be established as an independent section.

During discussions held in the basic design study in Sri Lanka, representatives of the Government of Sri Lanka stressed the following two points which are its strong demands concerning this project.

1. When it is decided to implement this project, the Government of Sri Lanka plans to implement this project within the framework of its appropriations for 1991 and after.
2. For the purpose of making this project contribute to the promotion of exports of the country's agricultural products as well as safe import of agricultural products, small-sized fumigation rooms and vapour heat treatment equipment should be included in this project.

CHAPTER 3 CONTENTS OF THE PROJECT

CHAPTER 3 CONTENTS OF THE PROJECT

3-1 Objectives of the Project

This project is aimed at effective and efficient implementation of plant quarantine in Sri Lanka by means of improving its plant quarantine system, as well as plant quarantine and treatment technologies, in order to cope with both quantitative and qualitative growth in the export and import of agricultural products. This project will contribute to the protection of agricultural production from the disasters caused by pests/pathogens, weeds, etc., and also contribute to the expansion and diversification of agricultural production as well as to the increase of exports along with the improvement of self-sufficiency in production of food stuff to replace imported agricultural products. The project is to construct a new plant quarantine facilities necessary for improving the plant quarantine system and also to improve the equipment of the existing plant quarantine stations located within Colombo Seaport and Katunayake International Airport.

3-2 Examination of the Contents of the Request

3-2-1 Examination of Appropriateness and Necessity of the Project

The appropriateness and necessity of the project are examined below mainly from the standpoint of the export and import trends in agricultural products and the present condition of plant quarantine.

(1) Import of Agricultural Products

- 1) Prevention of invasion of pests/pathogens caused by importation of agricultural products

Sri Lanka is an agricultural country, but is forced to import agricultural products, including food and feed, because of its short supply. This is one of the reasons why the country is suffering from trade deficits and shortages of foreign exchange. Although the country can expect certain improvements in the future as a result of the central government's policy measures to achieve self-sufficiency in food, it will have to keep imports of agricultural products at the present level for the time being. Therefore, it is an urgent necessity to improve the accuracy of quarantine by reinforcing the the plant quarantine system, and to enrich the treatment facilities for disinfection and inactivation.

2) Import of plants for cultivation

Due to climatic or technical constraints, Sri Lanka is mostly dependent on the importation of potatoes and other plants for planting purposes. Seeds/seedlings of these plants are directly introduced into the country's farming land. If the seeds/seedlings are contaminated with pests/pathogens, there is a strong possibility of invasion and infestation by them. Therefore, efficient and effective import quarantine and post-entry quarantine are crucial upon importation of plants for planting purposes to the country.

3) Introduction of plants for research purposes

In order to expand exports of agricultural products, it is necessary to introduce new varieties or varieties which excel in quality, productivity and tolerance against diseases and pests. However, when introducing such new varieties, it is essential to conduct precise inspection using scientific methods of quarantine, since introduction of new varieties is always accompanied with the possibility of introduction of exotic pests/pathogens.

(2) Export of Agricultural Products

1) Expansion in exports

In Sri Lanka, export of agricultural products is indispensable not only for the promotion of agriculture but also for the growth of the national economy. Countries importing agricultural products demand every imported agricultural products to be accompanied by a certificate of export quarantine. In order to expand and smooth the exportation of agricultural products, it is necessary to conduct export quarantine precisely and quickly.

2) Development of treatment technologies

The development and practical use of safe and reliable treatment technologies which comply with the requirements of countries importing agricultural products from Sri Lanka are indispensable for expanding exports of agricultural products.

(3) Present Situation of Plant Quarantine Operations in Sri Lanka

In Sri Lanka, plant quarantine is conducted under the jurisdiction of the Department of Agriculture. Actual plant quarantine operations are carried out mainly by the Plant Quarantine Division of the Central Agricultural Research Institute, Katunayake Airport Plant Quarantine Station and Colombo Seaport Plant Quarantine Station. However, the plant quarantine facilities and equipment of these institutions are unsatisfactory both qualitatively and quantitatively. As a result, the trade volume of agricultural products has already exceeded the capacity of these institutions. In addition, the facilities of both the Department of Agriculture, which is responsible for plant quarantine administration, and the Plant Quarantine Division, which is responsible for precise inspection, are located in Peradenia. It means that those institutions

are three hours' car ride away from Katunayake Airport and Colombo Seaport, which are located in Colombo City, and where most of imported or exported agricultural products are collected. Due to such geographical restrictions, plant quarantine is not conducted smoothly in Sri Lanka.

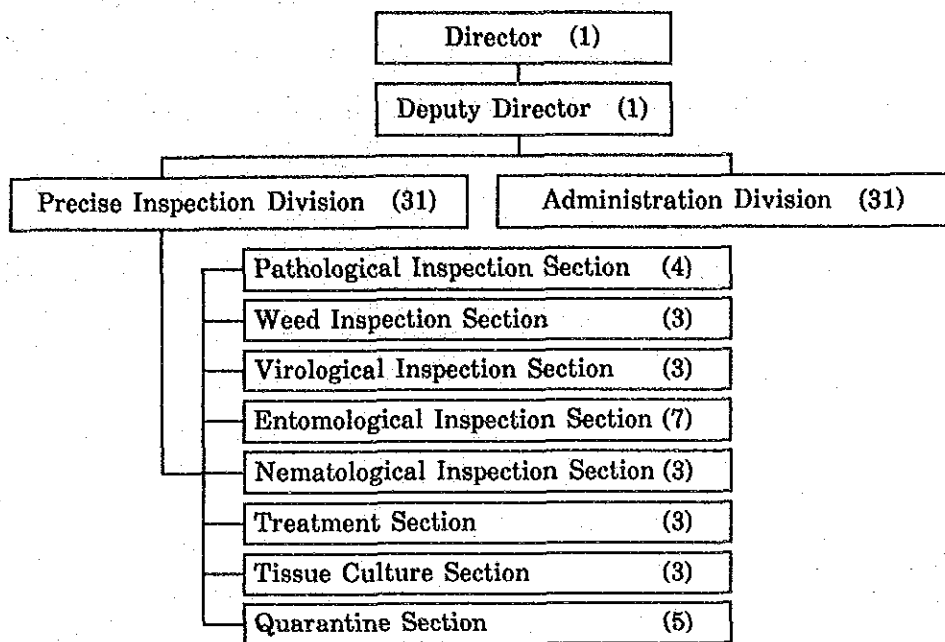
The facilities to be established under the project are intended to serve as the central plant quarantine facilities in Sri Lanka. The three main functions, namely, central plant quarantine administration, precise inspection and research and development, will be concentrated in the facilities which are to be constructed near Colombo City. The implementation of the project will result in smooth plant quarantine operations, which in turn will contribute to the stabilization of agricultural production and expansion in the exports of agricultural products. Therefore, it is considered very reasonable and necessary to implement this project.

3-2-2 Examination of Project Implementation Plan

The planned plant quarantine facility is to be operated under the direct control of the Department of Agriculture, Ministry of Agricultural Development and Research. The results of an examination of the personnel and budget required for the operation of the plant quarantine facilities planned by the Sri Lankan side, measures to be taken to meet these prerequisites and their feasibility are described as below.

(1) Personnel

The organization and personnel placement proposed in the formal request by the Government of Sri Lanka are as outlined in Fig. 3-1. According to the plan, the plant quarantine facilities are to start operations with a staff number of 64.



() shows number of staffers

Fig. 3-1 Proposed Organization and Personnel Placement

The required qualifications and number of technical staff for the Precise Inspection Division are as summarized in Table 3-1. Those technical staff having professional knowledge and skills are in short supply in the country.

Table 3-1 Required Qualifications and Staff Number of the Request

Section	Qualification · Staff Number					Total
	Dr.	Ma.	Al.	OL.	Experience	
Pathological Inspection Section	1	1	1	1		4
Weed Inspection Section		1	1	1		3
Virological Inspection Section		1	1	1		3
Entomological Inspection Section	1	2	2	2		7
Nematological Inspection Section		1	1	1		3
Treatment Section		1	1	1		3
Tissue Culture Section		1	1	1		3
Quarantine Section					5	5
Total	2	8	8	8	5	31

Most of these technical staff will be assigned from the present staff of the Plant Quarantine Division, Central Agricultural Research Institute, and the shortage will be filled with others transferred from other related organizations. However, it will not be easy to secure the necessary number of technical staff who have advanced professional knowledge and play central roles in various sections of the division. And transfer of such technical staff from other research institutions may cause negative effects on those research organizations. Therefore, this personnel plan is thought to have many problems. Based on the above examination, the plan has been modified to include adjustments in the planned scope of activity of each section, while allowing this facilities to operate basically with the personnel as planned by the Sri Lankan side in the request. More specifically, adjustments have been made on the basis of the following criteria. As a result, the total number of technical staff of this facilities will be 20.

1. In principle, a team of three, namely, a head (master's degree holder), an AL and an OL, will work at each plant inspection section.
2. As regards the Entomological Inspection Section, a team of four, namely, a head (doctor's or master's degree holder) and three other staff members, will work at this section since the scope of the work to be carried out at this section, which will include the supply and mass production of insects, will be very wide.
3. As for the Pathological Inspection room, into which the Weed Inspection Section is to be integrated, a team of four, namely, a head (doctor's or master's degree holder) and three other staff members, will work at this room.

The number of general staffers has been also re-examined with the aim of reducing the personnel cost. The conclusion is that it will be possible to manage the facilities with a staff of 20.

Thus, it is considered appropriate to start the actual operation of the facilities with a total staff number of 46; 40 (technical staff 20, administrative staff 20) plus 1 director and 5 plant quarantine inspectors for Plant Quarantine Division.

(2) Budget

The Government of Sri Lanka requested that this project be started in or after fiscal 1991. The Government of Sri Lanka seems to have decided on this arrangement in order to secure the budget for the project. As this project is indispensable for stable agricultural production in Sri Lanka and promoting exports of the agricultural products, they regard it as one of the most important projects. It is certain, therefore, that the budget for this project will be secured in fiscal 1991 and after. In view of the fact that the planned staff number of 46 accounts for only about 0.3 percent of the staff number of 14,083 of the Department of Agriculture, which will be the implementing organization of this project, it is considered relatively easy to secure the budget for the operation of this facilities.

3-2-3 Examination of the Project Site

During the basic design study the Sri Lankan side presented a lot with an area of about 8ha, which used to be a runway and is located about 500 meters west of Katunayake Airport, as an alternative to Makandura, the project site proposed in the request. As a result of the survey and examination conducted by the basic design study team, however, it was found that the alternative project site has the following problems.

1. It is located in an area regulated under the Air Navigation Act. In this area, the building height and land area where buildings can be

constructed are restricted. (Max. building height to be 8m, Max. construction area of land to be 70m×70m)

2. Furthermore, when the airport is expanded, the construction site will be right below the new approach line. In such a case, there is a strong possibility that the facilities could be a major obstacle to safe control of the airport.

In response to the above report submitted by the basic design study team, the Government of Sri Lanka recognized the unsuitability of the land and selected a new project site, a lot with an area of about 8ha which is located at the western end within the premises of Katunayake Airport, and notified the Government of Japan. As a result of an additional survey by the basic design study team, it was found that Airport & Aviation Services Ltd. had transferred this lot to the Ministry of Agricultural Development and Research and that this lot is satisfactory in terms of the land area and the height for construction of the proposed facilities.

As a result of the above examination, the above-mentioned lot on the premises of Katunayake Airport was concluded to be suitable for implementation of the proposed project. Thus, it was finally decided to designate this lot as the project site.

3-2-4 Examination of the Facilities and Equipment requested

(1) Facilities

The facilities include plant inspection rooms for the six plant inspection technical fields, a plant quarantine room with outdoor facilities and rooms for the administration division. The contents of the facilities requested were examined in the light of the following examination items.

- 1) Function as an organization responsible for the country's centralized plant quarantine administration

The Sri Lankan side stressed that the function as the organization responsible for the country's plant quarantine administration shall be placed in the plant quarantine facilities in terms of improvement of the country's plant quarantine system. In Sri Lanka, the plant quarantine administrative agency is located far away from the country's major plant quarantine stations, the former being located in Peradenia and the latter in Colombo City. This has resulted in insufficient communications between them. So the present organization for plant quarantine services will be incapable of coping with the increasing workload. In this context, it is considered reasonable to include a centralized plant quarantine administrative function in this project. Incorporating such a centralized administrative function in this project is expected to make a significant contribution to the strengthening the country's plant quarantine system. However, the facilities necessary for this function are not special ones and not so many additional facilities are required. Additional facilities for research and public relations activities and data stockrooms are needed.

2) Plant inspection division

It is reasonable for this division to be comprised of 4 plant quarantine sections, namely, pathological, virological, entomological and nematological inspection sections, and 2 sections related to treatment, namely, tissue culture and treatment sections. The inspection rooms for these sections will be located independently from each other in order to prevent their mutual contamination. In this connection, a "common preparation room", in which equipment for the common use by the staffers of the six sections is installed, will be provided to avoid duplication of an unnecessary number of identical items of equipment.

On the basis of the above examination, necessary facilities and items of equipment, including inspection rooms, outdoor facilities and an isolated farm, will be planned. It should be noted, however, that the

facilities proposed hereby indicate the results of modification on the request from the Sri Lankan side at the following points.

- Weed inspection room

"Weed inspection room" was included in the original request, but this room was eliminated because most of the equipment necessary for weed inspection will be installed at the pathological inspection section for common use and it was considered unnecessary to secure full-time staff or space exclusively for weed inspection.

- Glasshouse

Of the outdoor ancillary facilities, the glasshouse is indispensable in conducting inspections by isolated plant culture. There is a danger, however, that the temperatures inside the glasshouse will rise sharply as a result of exposure to direct sunlight which will hamper plant cultivation as well as virus inspection. An air conditioning system could be used to keep the temperature inside the glasshouse at appropriate levels, but such an arrangement should be provided in a limited area from the standpoint of saving operation expenses.

- Closed circuit room

The Sri Lankan side requested closed circuit rooms which completely shut off micro-organisms from the outside in order to ensure safe introduction of imported germplasm. But such a facility will require additional machinery operating expenses and advanced maintenance and management technologies. It is also eliminated because the facility does not match the present condition of Sri Lanka.

3) Plant Quarantine/Treatment Division

As the facilities are to be constructed on the premises of the airport, it will be advisable for the plant quarantine/treatment

division to carry out a part of the operations of the airport's plant quarantine station. Namely, this division will be responsible for conducting additional quarantine of the export agricultural products which have been judged to require further inspection after primary inspection at the airport's plant quarantine station. Furthermore, this division will carry out, if necessary, treatment of a limited quantity of export and imported agricultural products.

The facilities, which this division will require to fulfill the above-mentioned functions, include a plant quarantine room, a reception, a treatment room, etc.

4) Training of quarantine inspectors

In order to reinforce the country's plant quarantine system, it is necessary to enhance the abilities of the quarantine inspectors who carry out primary quarantine at airports and seaports. For this reason, training of quarantine inspectors is an important role which the planned plant quarantine facilities is expected to fulfill. As most of the quarantine inspector training programs can be implemented within the inspection rooms and the number of quarantine inspectors to receive training will be limited, it is not necessary to provide special training facilities such as a lecture room. Simple audio-visual equipment will be installed in the meeting room for that purpose.

(2) Equipment

The selection of equipment shall be done, basically, according to the request. The contents of examination for the selection of equipment are as follows.

1. Electron microscope

Although observation and photographic analysis by an electron microscope are vital measures for identification of viruses, it is excluded from the plan for the following reasons.

- Continuous air-conditioning needed to prevent condensation on its lens would make high operating expenses.
- Difficult to cope with the troubles because of the limited budget for maintenance and operation.
- Possibility of not functioning properly because disturbance from vibration and magnetic variation from the aviation facility might occur.

2. Fumigation facility

The mobile fumigation chamber is eliminated from the plan because of its maintenance. Instead, a small fumigation house and vacuum fumigation chamber have been selected.

3. Vapor heat treatment unit

The vapor heat treatment units and its related facilities shall be selected for the establishment of treatment technology on fresh fruits and vegetables because of strong request from the Sri Lankan side.

4. High-tech apparatus

High-tech apparatus such as a Nucleic Acid Hybridization Unit and HPLC are eliminated from the plan, because of not only the difficulties in operation and maintenance but also because they are not necessarily consistent with Sri Lanka's basic concept for this project to establish a practical plant quarantine system.

5. Other equipment

Although they are not in the request, the following equipment are added to the plan in order to achieve properly the purpose of this project.

- Seed separator : Separation of weed seeds.
- Soft X-ray apparatus : Inspection of parasitic larvae in beans and caryopses.
- Nematode separator : Separation of nematodes and cysts
- Inactivation equipment : Production of virus-free growth points by heat inactivation treatment
- Farm machinery : Cultivation and management of isolation field.
- Meteorological instrument : Meteorological data collection for isolation field.
- Office machine : Smooth and efficient clerical work.

3-2-5 Basic Principles of Implementation of the Cooperation

As a result of the above examination, the expected effects and the practicability of this project, as well as the implementing ability of the Sri Lankan side for this project have been confirmed. And the expected effects of the project matches Japan's grant aid system. Therefore, it is considered reasonable and advisable that this project should be implemented with grant aid from the Government of Japan. Thus, the outline of the project will be examined, and the basic design will be carried out on the premise that this project will be implemented with grant aid from the Government of Japan. As to the contents of the project, however, part of the request from the Government of Sri Lanka was modified, as described in "Examination of the Facilities and Equipment requested."

3-3 Outline of the Project

3-3-1 Implementing Organization of the Project and the Project Management System

The Department of Agriculture, Ministry of Agricultural Development and Research is the implementing organization for the project. After completion, the National Plant Quarantine Services will belong to the Department of Agriculture, and will be operated on an equal basis with the Central Agricultural Research Institute, and other related institutions.

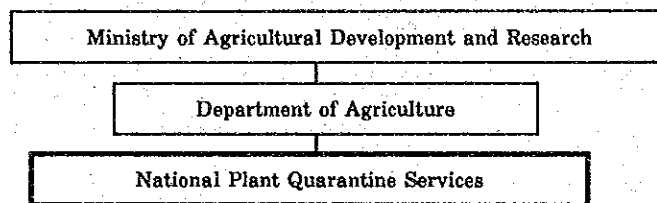


Fig. 3-2 Implementing Organization of the Project

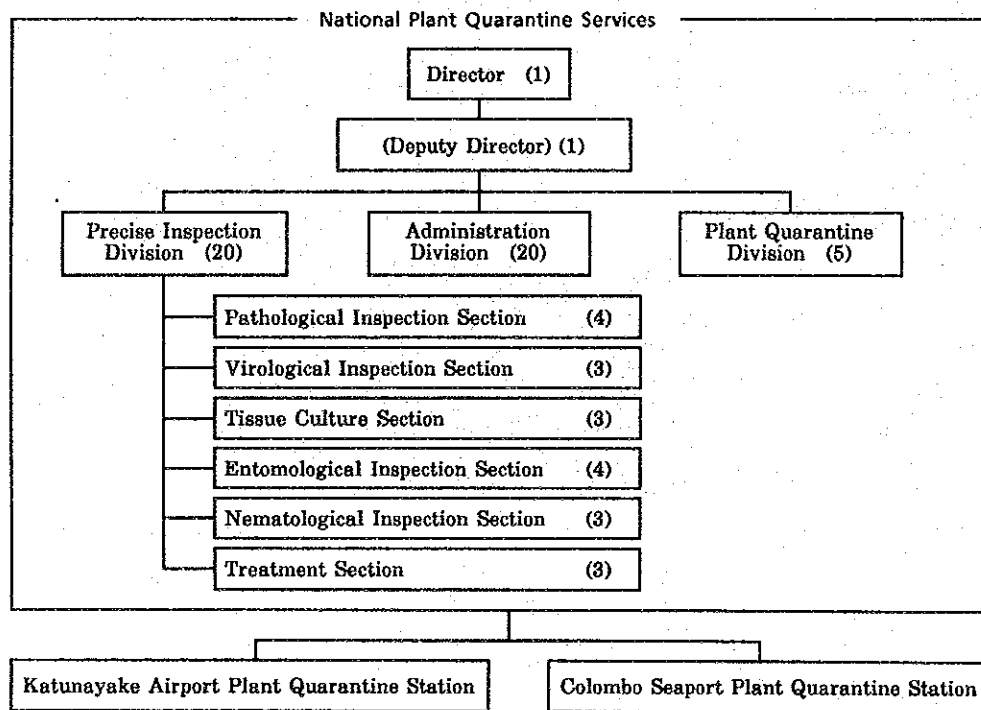


Fig. 3-3 Operation · Management Organization

The National Plant Quarantine Services are to start operations with a staff number of 46 as shown in Table 3-2

Table 3-2 Personnel Plan

Division/Section		Position	Qualification	No.	
		Director	DR	1	1
		Deputy Director/Head of Entomology	DR	(1)	
Precise Inspection Division	Pathological Inspection Section	Head (Bacteriology)	MS	1	4
		Fungus Expert	MS	1	
		Asst. Inspector	AL	1	
		Assistant	OL	1	
	Virological Inspection Section	Head (Virology)	DR/MS	1	3
		Asst. Inspector	AL	1	
Assistant		OL	1		
Tissue Culture Section	Head (Horticulture)	MS	1	3	
	Asst. Inspector	AL	1		
	Assistant	OL	1		
Entomological Inspection Section	Head (Entomology)	DR/MS	1	4	
	Insect Expert	MS	1		
	Asst. Inspector	AL	1		
	Assistant	OL	1		
Nematological Inspection Section	Head (Nematology)	MS	1	3	
	Asst. Inspector	AL	1		
	Assistant	OL	1		
Treatment Section	Head (Physicochemistry)	MS	1	3	
	Asst. Inspector	AL	1		
	Assistant	OL	1		
Plant Quarantine Division		Manager/Head of Pathology Inspector		(1) 5	5
Administration Division		Manager		1	20
		Clerk		3	
		Assistant		2	
		Typist		2	
		Telephone Operator		1	
		Receptionist		1	
		Equipment Maintenance		1	
		Facility Maintenance		1	
		Driver		4	
		Guard		4	
Total					46

3-3-2 Service Plan

The National Plant Quarantine Services are to provide three types of services, namely, precise inspection of plants exported and imported, quarantine of plants exported and imported and centralized administration of plant quarantine operations in the country.

(1) Precise Inspection of Plants exported and imported

This service is offered in the following six specific fields.

1) Pathological inspection

Pathogenic germs and bacteria are separated from plants and cultured for the identification of the causes of plant diseases in the following ways.

1. Microscopic observation
2. Antiserum inspection
3. Electrophoretic inspection
4. Bacteriophage inspection

2) Virological inspection

Symptoms of plants with diseases are observed to determine viruses or viroids. At the same time, viruses are made to proliferate and purified in order to determine the types of viruses.

1. Inoculation inspection
(sap inoculation, grafting inoculation, vector inoculation)
2. Antiserum inspection
(ELISA method and other methods)
3. Electrophoretic inspection
4. Inspection of physico-chemical characters of viruses

3) Entomological inspection

Identification and classification of insects, mites and small animals are conducted in the following ways.

1. Morphology examination (Preparation of specimens and their verification)
2. Physiological and ecological examination

Laboratory rearing is necessary in conducting physiological and ecological examinations. For this reason, it is necessary to establish a method of laboratory rearing (rearing environment, artificial feed, etc.). For the purpose of establishing disinfection techniques, the supply and mass production of insects and mites to be used for examination, as well as preparation of artificially infested fruites are included in the scope of work.

4) Nematological inspection

Identification and classification of nematodes will be conducted in the following ways.

1. Separation of nematodes from samples and microscopic examination of specimens.
Baermann method, sieve method, mixer method, centrifuge method, Fenwick method, extraction method and other methods are used for separation of specimens.
2. Examination of infestation with inoculation

5) Research of treatment technology

It is necessary to treat any consignment which was found to be contaminated by pests as a result of inspection. Research for

technologies of two type of plant treatment, chemical treatment and physical treatment, will be conducted.

1. Chemical treatment

Fumigation is the most common method of chemical treatment. The treatment effect varies according to various fumigating conditions. It is necessary, therefore, to research into the following aspects of fumigation technology.

- Confirmation of disinfection effect of fumigation

Amount of chemicals used, fumigating time, temperature, diffusion and permeation of gas, gas absorption and separation, and pests' resistance to gas in various stages.

- Confirmation of impediments to plant fumigation

Amount of chemicals used, fumigating time, impediments caused by differences in temperature, impediments caused by differences in plant's physiological conditions.

2. Physical treatment

There are a number of methods of physical treatment, namely, high-temperature (dry heat, wet heat and hot water) method, low-temperature method, immersion method, pulverization method, selection method, radioactive treatment method, etc. It is necessary to examine each method in terms of its disinfection effect and any impediments caused on various types of plants.

6) Tissue culture (including isolated cultivation)

1. Inactivation treatment of virus on plants
2. Management of cultivation of tissues under tissue cultured plants
3. Management of cultivation of test plants
4. Management of plants for isolated inspection cultivation

5. Other items related to management of plant cultivation

(2) Export and Import Plant Quarantine

While seaport and airport plant quarantine stations are responsible for primary inspection of plants exported and imported, plant quarantine and issuance of phytosanitary certificates, the following services will be conducted by the planned plant quarantine facilities.

1. Post-entry quarantine of imported plants
2. Treatment of small-quantity air cargoes and issuance of phytosanitary certificates
3. Incineration of plants which were found illegally imported and accumulated at the airport plant quarantine station
4. Inspection of growing plants for export (excluding areas covered by seaport plant quarantine stations)
5. Inspection of export plants brought and issuance of phytosanitary certificates

(3) Centralized Administration

The planned plant quarantine facilities are to engage in the following activities as an organization responsible for centralized administration of plant quarantine in Sri Lanka.

1) Plant quarantine management

The organization will manage plant quarantine across the country under the control of the Ministry of Agricultural Development and Research, and the Department of Agriculture. It will also keep in contact with domestic organizations responsible for control of agricultural

chemicals and seeds, as well as foreign or international plant quarantine organizations.

2) Personnel management

It will be responsible for personnel management for plant quarantine-related organizations, including nine seaport and airport plant quarantine stations. It will also be responsible for organizing programs for educating and training quarantine inspectors. Although no concrete training programs for quarantine inspectors have been presented by the Sri Lankan side, it is expected that training programs for beginners and middle and advanced courses for approximately five trainees at one time will be implemented by utilizing the equipment to be installed at the precise inspection division of the planned facilities. In these training programs, on-the-job training will be given with the division staff acting as instructors.

3) Research and survey

It will compile various statistical data on plant quarantine and also collect and sort out related data and information available at home and abroad. Establishing a legal system related to plant quarantine is also one of the important activities.

3-3-3 Outline of the Project Site

(1) Location

The project site is located at the west end of the premises of Katunayake Airport, about 30km north of Colombo City. It is an about 45 minutes' car ride from Colombo City. It borders the premises of Katunayake Airport on the north and the east, and on the south it borders the trunk road

connecting Colombo City and the airport. On its western side runs a rainwater draining route from the airport's runway. Beyond the draining route privately owned housing areas are spread. The areas around the project site were developed as tax-free industrial areas, and increasing numbers of foreign companies are moving their production bases to these areas.

(2) General Condition

The project site used to be swampland where rain water and drainage water from the airport was discharged and it was prepared by raising the ground level by about 1.5 meters. The site is diamond-shaped and has an area of about 8ha, measuring 200 meters east to west and 400 meters south to north. As a result of the reclaiming, the project site is generally level. Therefore, it is not necessary to take level differences into consideration for architectural planning. However, the surrounding housing areas are temporarily flooded when it rains heavily. Therefore, careful attention shall be paid upon setting the ground floor level.

(3) Infrastructure

1) Electricity

No power line is installed near the project site. But there is an 11kV overhead power line of CEB on the opposite side of Canada Friendship Road, which is located southeast of the project site, near the free trade zone. It is possible to supply electricity with construction of a new extension power line from the existing line to the site. However, the maximum electric power available is 600 kVA.

2) Telephone

An underground telephone cable (COL) is laid along the opposite side of Canada Friendship Road. It is possible to get telephone COL with construction of new telephone cable from the existing telephone cable to the site.

3) Water Supply

No public water pipe is laid near the project site. As in the case of the airport facilities, wells can be used as sources of water supply. As many of the surrounding areas are swamplands, there will be no problem with the quantity of water supplied. But water analysis data on the wells now in use on the premises of the airport shows that the well water is high in iron, etc. This means that it will be necessary to install a well water treatment device.

4) Drainage

No public sewer pipe is laid near the project site. In addition, the project site and the surrounding areas are swamplands. Therefore, it will be very difficult to have waste water penetrate into the ground. In case the waste water is to be discharged into the surrounding swamplands, Central Environmental Authority's regulations on the quality of discharged water will be applied. To comply with the regulations, it will be necessary to install a sewerage treatment facility. It is possible to discharge rain water into the surrounding swamplands.

(4) Legal Controls

The project site is located near the airport's runway and is, therefore, subject to legal controls under the international air traffic control law.

The height restrictions range from 10 to 45 meters. Therefore, the height of the facilities as well as construction machinery used must be within this range.

Furthermore, the general building regulations imposed on the facilities are of the same conditions as for other buildings built in Colombo City.

A permit to use the project site for the implementation of the project has already been issued by the Department of Civil Aviation, Ministry of Defence.

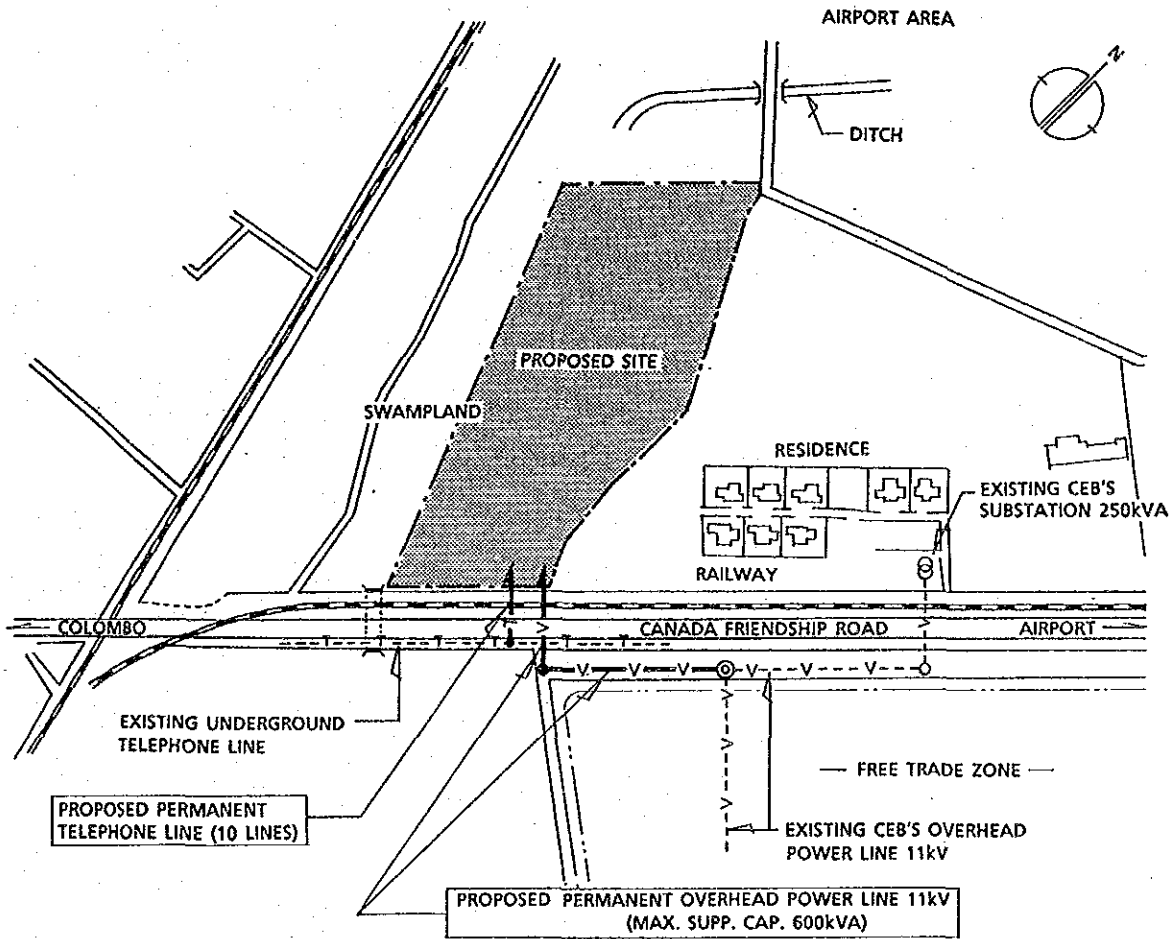


Fig. 3-4 Project Site