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REPORT
ON
PRELIMINARY SURVEY TEAM
ON
PEFORESTATION PROJECT IN COLOMBIA

January 1978

JAPAN INTERNATIONAL COOPERATION AGENCY

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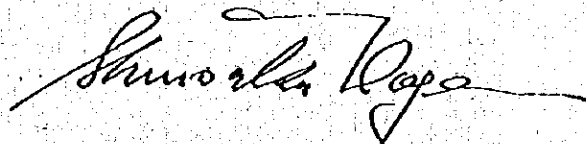
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Foreword

In Colombia, forests account for an area of about 50 million hectares, or 45 percent of its land area. Most of the forests are located in the area of the head-streams of the Amazon, so that there are many non-commercial forests the natural, economic and social conditions of which have yet to be developed. The forests which can be commercially developed total only about 15 million hectares. Felling has been conducted in many wide areas of these forests in the past years, but the reforestation has been made in limited areas. In such a situation, afforestation is essential -- for the sustenance and development of forest resources and the conservation of the national land as well as for the industrial development of Colombia based on development of forestry and forest products.

Against this background, the Japan International Cooperation Agency sent to Colombia a survey team for 17 days from January 21 through February 6 headed by Dr. Taisitiroo Satoo, professor, Department of Forestry, Tokyo University, make a preliminary survey necessary for the technical feasibility study of afforestation project. This was the first survey under an inter-governmental cooperation in forestry between Colombia and Japan. This survey was a preliminary one to be followed by a full-bledged survey, but we hope that this survey will lead to a multifaceted cooperation for the development of Colombia's forestry and forest products industry and the strengthening of collaboration between the two countries. We hope that this report will be put to effective use as a reference material by the people concerned in both countries.

We would like to express our heartfelt appreciation to the members of the Japanese survey team, officials of the Colombian Government and related agencies and those of the Agriculture and Forestry Ministry and Foreign Ministry in Japan and the Japanese Embassy in Colombia for the facilities and cooperation they have extended to the survey team.

A handwritten signature in cursive script, appearing to read "Shinsaku Hogen".

January 1978

Shinsaku Hogen
President
Japan International
Cooperation Agency



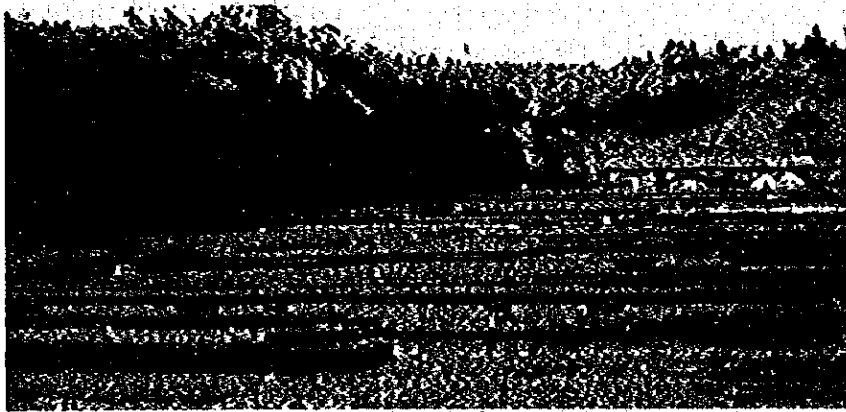
Site of prescribed burning in the City of Cali



Talk at the Departamento Nacional de Planeación



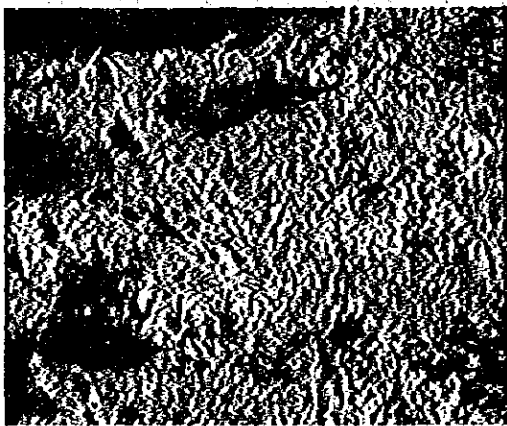
Talk at the INDERENA



Nursery of the Cartón de Colombia y Cia



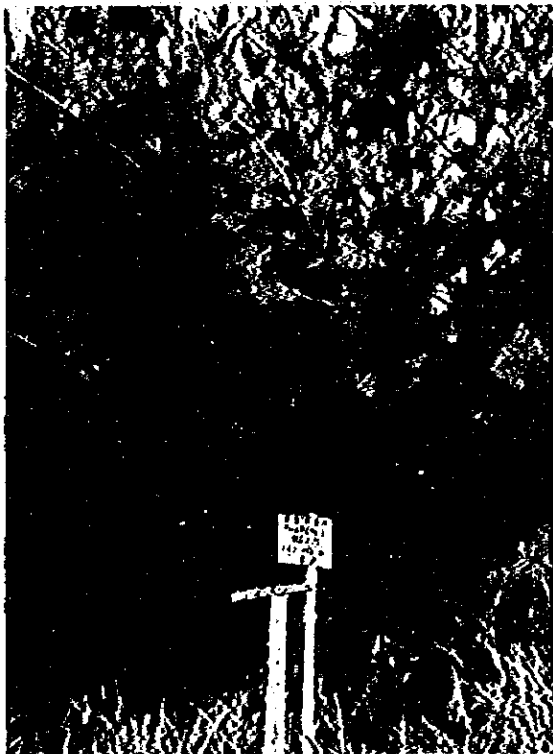
3-years-old plantation of Pinus patula



1-year-old plantation of Pinus strobus



9-years-old plantation of Cupressus lusitanica



6-years-old plantation of Pinus strobus

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1. Preface

In September 1976, the Government of Colombia requested Japan's cooperation in the form of techniques and funds in regard to the development of pulp resources in the Cauca-Valle area. In response to this request, a discussion was carried out between Mr. Katsuhiko Kotari, Special Adviser of the Japan International Cooperation Agency, and the Government of Colombia in November of the same year. On the basis of this discussion, a preliminary survey team was dispatched to make a technical feasibility study on the development of forests of conifer for use in the manufacture of long-fiber pulp.

This survey was performed for 11 days from January 24 through February 3, excluding the days required for the trip to and from Colombia. Members of the survey team are as follows:

Dr. Taisitiroo Satoo (Leader) -- Professor, Faculty of Agriculture,
(University of Tokyo) and Vice President, IUFRO

Ing. Takeo Kuramochi (Cooperation and planning) -- Head,
Development Division, Forestry Development Cooperation Department, JICA

Dr. Iwao Mori (Forest economy) -- Head, Research Department, Forest
Policy Research Institute

Dr. Tomoyuki Sassa (Forest Soils) -- Forester, Soil Survey Section,
Government Forest Experiment Station, Ministry of Agriculture
and Forestry

Dr. Takao Isobe (Forest Management) -- Forest Preservation Division,
Forestry Agency, Ministry of Agriculture and Forestry

An elaborate survey was being carried out by Ortiz Arango y Cia. in the area where the reforestation was scheduled to be conducted, and the survey team was briefed on the plan and method of this survey. The final results of this survey was scheduled to be reported in July this year. After this final report is received, we will be able to arrive at a more accurate conclusion.

Incidentally, cooperation was extended in our preliminary survey by the related agencies of the Government of the Republic of Columbia, central organizations, local organizations in Cauca-Valle area and the Japanese Embassy in Bogota. We wish to extend our heartfelt appreciation to all these institutions. Our many thanks are also due to Colombians of Japanese parentage -- particularly, to Sr. José Tamura for his devoted assistance.

2. Method of Survey

In regard to this project and Colombia's forestry, the following three documents obtained in November 1976 were the only reference materials that were available at the outset of the preliminary survey:

1. Proyecto forestal Valle-Cauca-Nariño. pp. 3+12+11+3.
Fundación para el Desarrollo Industrial, August 16, 1976.
2. Colombia forestry project: memorandum for meeting with government and forestry cooperations, Bogota 20-24 October, 1975.
World Bank, pp. 10.
3. Colombia, la industria de pulpa, papel y cartón, informe para el Gobierno de Colombia i le agencia Canadiense para el Desarrollo International por Proyecto Desarrollo Forestal Costa Pacifico.
Inderena-Canada, pp. 170, 1975.

Therefore, this report reflects the view of the preliminary survey team's views formed after a series of analyses and discussions based primarily on the information secured during its stay in Colombia. The information obtained during its stay in Colombia may roughly be classified into the following four kinds.

- 1) The information obtained during a four-day on-the-spot survey in the provinces of Valle (Eyesokep, Yanaconas area and the basins of the Amaime and Nime rivers) and Cauca (San José and Cascada), including nurseries, experimental plantations, plantations for production purposes, natural forests, potentially developable areas currently with no trees (including pastures and farms).

2) The information secured from talks with staffs of local agencies (FDI, CVC, Cartón de Colombia, Caja Agraria, INDERENA, etc.), primarily based on the "Plan de reforestación para los Departamentos del Valle del Cauca," Documento F.D.I.-DT, 01-77,1977.

3) The information obtained from visits to central Governmental agencies and various other organizations in Bogota (Departamento Nacional de Planeacion, INDERENA, CONIF, Instituto Geografia "Agostin Codazzi," CORFORESTAL, FEDECAFE, and School of Forestry Bogota City University.

4) The information secured from the documents made available from the aforementioned agencies and the books purchased during the stay of the preliminary survey team.

3. Study of Project Program

3.1 Purpose of Program

In regard to the purpose of this program, emphasis is placed on the necessity of developing forests of conifers for the self-sustenance of resources which are to be used in the manufacture of long-fiber pulp. When it is taken into consideration that Colombia's paper and pulp production complexes are concentrated in Valle Province the center of which is the city of Cali, the necessity of making plans for the reforestation of conifers in Cauca and Valle Provinces is well justifiable. Along the Pacific coast of the two Provinces, vast tropical rain forests spread, sufficient resources of broadleaved trees for the production of paper and pulppare expected from these areas depending upon their comprehensive development programs. Therefore we would consider it appropriate to go in for the development of coniferous plantations in the subject area for the time being.

Under the existing program, however, so much emphasis is placed on the stable supply of long-fiber resources that little is mentioned of functions of forests for the conservation of soils, water resources and quality of environment. In our on-the-spot survey, we came to realize that many steep lands exist in the potential reforestation areas. There, extremely extensive grazing and farming are conducted, and the ruins caused by burning and fires were observed. Our attention was drawn to erosion of treeless slopes and desolated rivers. For these areas, therefore, it was considered to be a more urgent task to develop forests for the conservation, than the development of forests for the production of raw materials.

Judging also from that fact that pasturage and farming are performed in potential forest areas, it was considered important to solve the problems associated with the acquisition of lands or the adjustment of land utilization between reforestation and pasturage and farming, before any discussion is to be unfolded in regard to the technical aspect of the reforestation.

3.2 Technical Aspect

3.2.1 Differences due to topography in Technical System

What we would like to point out here first is referred to neither in the program nor in the survey guideline of Ortiz Arago y Cia. That is, the necessity of broadly classifying the reforestation project area into two roughly different types in terms of forest management system, by its topography. In so far as the area we have surveyed is concerned, the two types are steep mountainous areas, as observed in Valle Province, and flat, undulating lands, as observed in Cauca Province. This difference in topography brings about big differences in the forest management system which starts with planting and ends with harvesting. A technical system which is employed in mountainous countries, such as Japan, is usable for the former, whereas a technical system known as industrial plantation, which is extensively employed in the flatland or undulating land in the southeast of the United States, Australia, Brazil, Argentina and African countries, for example, is usable for the latter. In the former, therefore, the mechanization of work is extremely restricted, whereas this type of work may be carried out without restriction in the latter.

Again, this difference in topography affects the necessity of soil conservation as well as the degree of freedom in forest management. Not so much consideration is required for the conservation of soils in conjunction with the management of forests on flatland, whereas on steep slopes, it is necessary to work for soil conservation by developing forest covers. In other words, the present situation which excessive pasturage and careless tilling are left as they are must be rectified with the development of forests. From this point of view, there is a need to classify the land by use of aerial photographs and topographic maps to adopt a technical system suitable for each topography.

3.2.2. Technical System for Steep Mountain Areas

The reforestation on a steep slope is just as significant for the protection of the environment as for any lumber production project, and it is an urgent task to improve by reforestation the present situation in which excessive pasturage and careless tilling are left as they are. The necessity of this rectification is indeed great, even if there arises a doubt about the feasibility, when viewed solely from the profitability of a reforestation project which after all is designed for lumber production. The projected rotation of 15 years, even if it is considered reasonable in terms of output and profitability, could be described as too short at least from the viewpoint of soil conservation. In the same vein, the studies thus far performed in Japan which have many forests in its steep slopes suggest that in case a natural forest is felled and reforestation is carried out, it will take at least 60 years for the content of organic matter in the soils to return to normal

level, and that the repetition of a short rotation (40-50 years) results in reducing the productivity in many instances. Whether it takes a long period for the content of organic matter to restore to normal level in the districts where the temperature and turnover rate are high is a question that calls for a study, but the speed at which organic matter in the soils decomposes as the result of felling of a forest is normally faster in the tropical zone than in the temperate zone. From this point of view, too, the adoption of a short rotation is risky and should be avoided. Judging from the present situation, however, it may be considered far more advisable to work for the development of forests for the time being for the sake of soil conservation, even if a short rotation is to be adopted. In any event, there is a need, as far as this problem is concerned, to make a comparative study, more than anything else, on the soils of the existing natural forests, planted areas and areas without any standing trees.

Moreover, systematic small-area operations with due attention paid to the topography is important for steep slopes. For this kind of operation, there is a need for the availability of an elaborate network of forest roads. The forest roads are really indispensable for planting, tending and harvesting. As steep slopes cannot accept vehicles, harvesting must depend upon skidders and transport vehicles, the role of the forest roads is of much significance. For the construction of forest roads in a steep slope area, the forest road network planning and construction technologies in which full heed is paid to the forest management program and the conservation of the environment are required. In regard to the technical system of forest management usable for

steep slopes, the technology of Japan, a mountainous country, whose vegetation is far richer in kind and vigor compared to Europe will presumably be of use.

3.2.3 Technical System for Flatland and Undulating Land

These types of land are close to the pattern in which industrial plantation is performed in various parts of the world. In this type of land, it is not so urgent a task to pay heed to the conservation of the soils as in the case of steep slopes, and the main purpose of reforestation is the production of resources, rather than the conservation of the environment. There are many places in which machines can be moved, and the degree of freedom in forest management is great. In this topographic situation, positive steps should be taken for the use of machines in planting, tending and harvesting.

3.2.4 Reforestation and Related Environmental Survey

An environmental survey of this area is carried out by Ortiz Arango y Cia. The preliminary selection of suitable sites is performed, depending on the altitude, precipitation and vegetation zone. For the development of a forest, a survey on the topography for the determination of a system of forest management (analysis of slope, valley density, etc.), a survey on local natural vegetation (vegetation types, indicator plants, etc.) and a survey on the local prevailing winds associated closely with the drying of soils and the transpiration of forest trees are required along with a soil survey. A soil survey is carried out on forests in conformity with the seventh approximation of the U.S. Department of Agriculture. However, this method, which was originally worked

out for agriculture, may not be considered suitable for forests. There is a need to establish a survey system suitable for the soils of Colombia's forests.

3.2.5 Selection of Tree Species and Breeding

Thus far, the principal tree species has been cypress (Cupressus lusitanica), which will presumably remain as such for some time. As for this species, there have been many years of experience in Antioquia. In this area, too, there have been many years of experience, albeit not so many as in Antioquia, and the technical knowledge about the plantation of this species has been accumulated. There seems to be no risk, as this species proves suitable for the climatic conditions of this area, suggesting that cypress will be the principal species for the time being. However, selective breeding will produce greater effects, as this species features great variations not only in growth rate but in tree form and degree of spiral grain. The fact that this species features great variations in growth was ascertained by an experiment carried out by Carton de Colombia with grafted clones. A re-introduction after a provenance test is as much necessary as selective breeding from domestic plantations.

In regard to species other than cypress -- particularly, pines, many are still in an experimental planting phase in this area, but the plantation of Pinus patula is considerably widespread in Colombia, its area being the second largest only next to cypress. With respect to other pine species, species elimination tests are being performed on different climatic zones, but it is necessary to further replenish this experiment and couple it to provenance test. It has been clarified as a result of the tests with

tropical pine species, conducted in many countries that the result greatly vary with provenance. Pine species have been introduced by many other tropical countries, and it is important to introduce the technical knowhow on reforestation which has been experimented by these nations. Exotic species have been introduced by many countries because it is possible to make use of the knowhow. However, it would be risky to rely solely on the experience of other countries. It is necessary to introduce an exotic species after it has been experimented. Particularly, any provenance test is affected by even a slight difference in the environmental conditions. For the introduction of an exotic species, therefore, it is necessary to carry out a systematic provenance test.

Many issues are pointed out in regard to the introduction of exotic species on the basis of experience of many countries.

1) Manpower: In a large and elaborate test for the introduction of an exotic species, a greater degree of care must be exercised and a great range of things dealt with, than in an ordinary reforestation project, so that the question of manpower to be used in the test is of great importance. In regard to the species that have proved disappointing or turned out to be complete failures, there are cases in which the real reason is attributable to not fully trained manpower or incomplete work supervision. There also are many cases in which work is done by workers who have never seen a given species before.

2) Technology: Even though it might be said that the general questions associated with the planting of an exotic species have been solved to some extent in its mother country, it is true that there has been no experience on this species in the imported

country, so much so that it is necessary to come out with the best methods suitable for the given local conditions in regard to nursery practice, dimensions and types of planting stocks, planting method, and timing and method of tending. It is also to be noted that only a single unsolved question will sometimes hold sway of the success or failure of a test. Even when all these questions have been solved, there are cases in which some errors are observed in the plant introduction test. There are cases in which the reason for a failure in the breeding of a given species is attributed to the local climatic or soil conditions and a subsequent test is called off, but the real reason is found somewhere else. For such a special species, however, the experience of other countries is of value.

3) Supply of seeds: Normally, the seeds which will be in an introduction test are imported from the natural range or a country where the plant has already been successfully introduced, but a number of questions are posed.

- a. There is no standerdized assurance for seeds.
- b. The source of seed supply may vary for each phase of a plant introduction test.
- c. It is difficult to get seeds from a specific provenance
- d. There is no assurance that the seeds have been collected from the best tree.
- e. A necessary amount of seeds cannot be secured whenever necessary.
- f. During a plant introduction test, there will sometimes appear a lean year for the seeds, making it impossible to carry out the test as originally planned.

For safety, the number of species for reforestation should be increased, and the reforestation of a single species should be avoided. There also is a need to consider the development of forests of native broad-leaved trees between plantations of conifers. It will not only augment the safety of a reforested area but also be important for the preservation of genes and future studies to leave as many natural forests as possible. This problem will become more and more important with an increase in the area of reforestation in the future.

3.2.6 Nursery practices

There will presumably arise no specific major questions with respect to nursery practices, but it is necessary to work out a program which will cope with an increase in the area of reforestation under this project, including in this conjunction, acquisition of the land for future nursery, training of personnel, studies of mechanization, etc. There will be no problems on the supply of cypress seeds, but there is a need to work for a stabilized supply of pine seeds and establish a system to secure it. In regard to imported seeds, the aforementioned problems are posed, and there will be a need for the conclusion of a supply contract with the country of its origin and other steps. Now that the imported seeds are high in cost and their stabilized supply cannot be assured, it will be necessary to select individuals and populations of the species the reforestation of which has proved successful to collect seeds, and it will also be necessary to make a study on flowering and fruiting habits and to develop seed orchards. The seed supply is the first step toward a success of any reforestation program.

3.2.7 Planting and Determination of spacing

For planting in an undulating land, there is a need to explore the possibility of using machines. However careful study is necessary, because a number of questions are likely to crop up in regard to the training of personnel, maintenance of machines, and supply of parts.

The planting of conifer seedlings is performed at a density of 1,500-2,000 trees per hectare, but there is a need to carry out a test on their relationship with the site quality and the density control system associated with a thinning regime.

3.2.8 Tending

In regard to thinning, it appears that reference is made to the examples of cypress in Antioquia, but there is a need to perform a systematic study. For the pine species, too, experimental plots for thinning must be prepared in conjunction with progress in the reforestation program.

3.2.9 Protection

Up to now, there appears to have been no serious damage caused by pests and weather, but there will arise a need to pay heed to these factors with increase in the large-areas planting of a limited number of species. As for forest fires, reference will be made later.

3.2.10 Harvesting

In the present phase, practically no regeneration cutting is done in the man-made forests, but is necessary to construct networks of forest roads, make a study on the harvesting method and train technicians and skillful workers in mechanized harvesting,

by making use of thinnings and final cut of the existing planted areas.

3.2.11 Forest Management Planning

In order to develop 65,000 hectares of forests over a short span of time, it is necessary to formulate annual programs for the location of areas of reforestation and harvesting programs from the beginning, and the training of personnel in this sector is also required. For a systematic management of the forests, there is a need to prepare a regional yield table, albeit temporary in nature, on the basis of the existing areas of reforestation.

3.2.12 Researches, Experiments and Training of Technicians

In conjunction with development of the reforestation project, it is quite possible that there would arise a variety of problems which would have to be solved on the spot. To solve them, there would be a need to establish a research center for a study on establishment coniferous plantations. According to a recent FAO study, the number of persons engaged in forestry research in this country is by far smaller than in many other tropical countries. It is also understood that there is an acute shortage of research and education facilities, equipment and teaching staffs at universities. A replenishment of these research and education facilities is extremely important for the training of personnel required for the execution of the reforestation programs as well as for the solution of all the problems associated with them.

3.3 Socioeconomic Aspect

The survey carried out by Ortiz Arango y Cia. for the selection

of planting areas covers various items, such as land ownership, land prices, road conditions, distances to consumption areas, wages, living environment and organizations for the reforestation program. However, the 65,000 hectares of reforestation targeted in this project is about eight times the total area of reforestation both in Cauca and Valle Provinces as of 1974, and a sharp rise in the area of reforestation is likely to pose a variety of issues. For this reason, some of the problems to which consideration ought to be given for the development of a forest are given below:

3.3.1 Adjustment of Land Use

An area of reforestation, once determined, will remain as such over a long span of time, so that there is a need to examine the relationship between the reforestation and other forms of land use from a comprehensive point of view, while paying heed to the direction of local socioeconomic development. Particularly, as reforestation is likely to compete with pasturage and extensive agriculture, there is a need for a study, involving improvement of pastures and forms of pasturage.

3.3.2 Stabilization of Land Rights

In order to put a forest development project on the right track, there should be adequate assurances for land ownership, rights of land use and other rights. The system of management in which forests are developed, whether the development be under a rental or yield sharing system, in the areas heretofore owned by others cannot be considered generalized, so that there is a need to study this problem.

3.3.3 Ban on Prescribed Burning and Disaster Prevention

In order to put the development of a forest on an economic footing, the practice of prescribed burning which would often result in a spread of the fire must be restricted or prohibited. For this purpose, it is an urgent task to adjust the legislation and the system of supervision. We had a chance to observe the fire lookout which was established by CVC and considered it necessary to create fire fighting teams along with such watch towers. It is also required to prepare a insurance system or a series of relief measures. Particularly when foreign capital is to be introduced, it is indispensable to work out measures to prevent an accident and compensate for a loss, if any.

3.3.4 High Land Prices and High Interest Rates

In conjunction with the rapid socioeconomic development of the survey area in recent years, there must be remarkable rises in land prices. Naturally, the inflation works on the land price rises and the improvement of infrastructure, such as the redevelopment of roads, has a part in raising the land prices. We also understand that the public announcement of a development project results in exorbitantly raising the prices of the land which is scheduled to be developed. To cite an extreme case, the price of the adjacent area takes a sudden sharp turn when a reforestation project is to be developed. The excessive rises in land prices endanger the profitability of the reforestation project and make it impossible to place the project on the right track. Therefore, it is necessary to pay heed to the tendency of the price of the land where a reforestation project is scheduled and take measures

to curb down the land prices as much as possible.

The fact that Colombia's general interest rates are considerably high is of disadvantage to the realization of a reforestation project which requires a long period of production. Although it is a fact that measures for loans relatively low in interest and long in period are taken to encourage the development of forests, the interest rates still remain by far higher than those of developed countries. The reforestation should not be looked upon as a mere economic activity. In view of the fact that the reforestation has an important part in the cause of public good, such as the conservation of soil, fostering of water resources and conservation of the natural environment, it is necessary to work for the establishment of low-interest loans for the reforestation and to formulate a tax system for the compensation of high interest rates and other assistance measures from a national point of view.

If the stabilization of land prices and the replenishment of the loan system for the development of forests are realized, the socioeconomic conditions for reforestation projects will be improved to a remarkably great extent.

3.3.5 Supply of Foresters

A sharp rise in the area of reforestation results in raising the demand for the number of foresters as a matter of course. There is a need to study measures for the training of skillful foresters well accustomed to the local conditions and for the extension of due privileges to them. For this purpose, the replenishment of training systems and university education is required.

3.3.6 Supply of Skillful Manpower

It is understood that sufficient manpower is available in the survey area. Under this program, too, a raise in the availability of job opportunities is cited as one of the purposes. However, when the possibility of introducing mechanization in some part of the reforestation sector and in the harvesting sector is taken into consideration, there is a need to make available correspondingly skillful manpower. Therefore, it is necessary to study measures for the upbringing, training and constant supply of qualitatively skillful manpower.

3.3.7 Subjective Conditions for Program Implementation

The most essential factor for the success of a given project is the capabilities of the entity which takes charge of the project -- above all, its internal developing power. However, favorable the external conditions may be, the lack of a positive posture for the appropriate combination and management of principal factors, such as capital, labor and land, will not assure a success of the project. Fortunately, insofar as the subject area is concerned, the Government agencies and business community display a positive response to the reforestation project both at national and local levels. Moreover, the establishment of CORFOSOC (La Cooperación Forestal del Suroccidente), the entity to implement this project, is under study. Judging from the prospective participating organizations and manpower combination, CORFOSOC is expected to play an effective role.

4. Cooperation in Immediate Future

It is conceivable that Japan's immediate cooperation in this project should be stepped up by upgrading the level of technologies in the basic phase and then emphasis placed on the systematization of technologies to clarify various technical issues. Therefore, the immediate start of fund cooperation in putting the reforestation on a business basis would be problematical.

1) Enforcement of Feasibility Study

Now that a feasibility study is being carried out by Ortiz Arango y Cia. for the reforestation program in the subject area, the results of this survey should be examined to the full extent. In the event that there are some factors that should be supplemented, it will be desirable, on condition that there is a request from the Government of Colombia, that a Japanese survey team be dispatched to complete a more sophisticated feasibility study. On the basis of the results of the survey of this team, the possibility of Japan's cooperation may be explored in accordance with the substance of a request, if any, from the Government of Colombia.

2) Acceptance of Trainees

For Colombia which intends to step up the development of forests in an aggressive manner, it would be worthwhile to familiarize itself with the present situation of Japanese forestry which is sustained on the basis of many years of experiences on steep mountainous areas. Particularly, it would be quite significant to acquaint on the spot with the standards of individual technologies for the reforestation and the methods for their systematization. Moreover, in order to organizationally step up the

development of forests, the laws and regulations will have to be readjusted, the administrative structure replenished, considerations given to the financing and tax systems, and the entities for the enforcement of reforestation projects reasonably organized. Therefore, it is desirable to receive trainees not only in the sector of technology but to strive to accept as trainees administrators, so that personnel both in the sectors of forestry administration and forestry technology may be trained.

