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Bolivian Forest Resource and Forest Industry

By

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BOLIVIAN FOREST RESOURCE AND FOREST

INDUSTRY PROFILE

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CONSULTANT'S REPORT TO USAID

JUNE 1986

Preface

During the period from May 10 to June 7 I spent 18 days in La Paz and 11 days between Cochabamba, Santa Cruz and Tarija and their environs. Most of the time in La Paz was dedicated to interviews with people in national and international agencies whose activities involve them either directly or indirectly with the forest resources of Bolivia. The second group of contacts was with managers and owners of forest industry firms. Members of both groups, without exception, gave generously of their time and answered my requests for information as exhaustively as they were able to do. The attached list of interviews has 44 names, and I want to thank all of them most sincerely.

More information than one would assume at first sight is contained in numerous studies and reports, both by Bolivian and by international organizations. Only those titles which I was able to read and study in their entirety are included in the bibliography. A large number of additional sources exist in the Centro de Desarrollo Forestal Library and in the FAO office in La Paz.

To conclude, I would like to express my appreciation to David Jesse and also to Jorge Calvo from USAID/Bolivia for their generous help on many occasions. Mario Rivero from Capacidad de Uso Mayor de Tierra was my cooperater during this whole period. His exhaustive knowledge of Bolivian forests and forestry, his wide acquaintance with forestry people and his competent advice made my task feasible, and his pleasant companionship made it enjoyable.

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BOLIVIAN FOREST RESOURCE AND FOREST INDUSTRY PROFILE

Bolivian forest resources provide the country with the usual range of products and services - timber, watershed coverage, wildlife, secondary products, such as wild rubber and Brazil nuts. However, both in the administration of the forests and in the processing and use of the outputs there is a series of deficiencies which reduce the benefits that the society receives. More seriously, these defects threaten the capacity to satisfy future demands for forest-based goods and services that are going to increase.

This report summarizes the present status of knowledge about areas under forest, forest types, volumes and growth. It describes the manner under which forest products are harvested. A section deals with the institutions in forestry sector: policy, administration and education. The processing of wood is discussed. Internal and external markets are described and their problems are reviewed.

The development potential of forest resources and of their markets are analyzed in the core part of this report. A short description of current involvement of USAID/Bolivia in forestry is followed by a number of specific recommendations on how the AID Mission could most likely give effective help to forest industry and to rural population dependent upon the continued existence and improvement of forests resources.

Area, growing stock and growth

Bolivia is among the "forest-rich" countries of South America. According to the latest estimate, based on the "Erts-

Bolivia" map (1978) 564,684 square kilometers are under forest, which constitutes 51.4 percent of Bolivia's territory. This figure, and closely similar ones from other sources, simply establish an order of magnitude, since no precise definition of dividing line between forests and other forms of woody vegetation has been applied.

The present forest area is certainly smaller because of ongoing deforestation caused principally by conversion to pasture and cropping, often temporary. No documented data on deforestation exist; normal estimates vary from 80,000 hectares to 100,000 hectares. Figures as high as one million hectares (!) have been mentioned. Even under conservative assumptions, a reduction of 700,000 to 800,000 hectares of forest area must have occurred.

Different authors, using different classification schemes, arrive at divergent numbers of forest types. According to Stolz (1978), highland forests (above 3000 meters above sea level) contain less than one percent of Bolivia's forests, the intermediate elevations (3,000 to 500 meters above sea level) include 16.5 percent, and the lowlands (less than 500 meters above sea level) contain 83 percent. In each category, the forests range from moist evergreen to dry deciduous. More detailed information is contained, besides Stolz (1978) in reports by Haggemiller (1976) and in the USAID Environmental Profile (draft in process).

The most important regions ("Departamentos") are Santa Cruz (260,000 square kilometers), Beni (105,000 sq. kms.) and

the northern part of La Paz (61,000 sq. kms.) There are very few pure stands, and even within each major forest type the numbers of tree species are very high. Haggemiller (1976) has calculated that over 90 species are potentially usable for wood products. Presently more than 20 are generally known and used and 25 or so are locally and occasionally harvested.

Major forest inventories have been carried out in Pando, the Ghimanes Forest Reserve, and in Tariquia. Smaller area inventories are numerous - supposedly 57 - but information on many of them is incomplete and somewhat uncertain. Different volume definitions make generalizations unreliable. Total volumes may be over 300 cubic meters per hectare (d.b.h. over bark from 25 centimeters up, stem volume) in the moist lowland forests, and down to 60 or 70 cubic meters in the dry deciduous forests.

Merchantable or commercial volumes consist of species currently harvested and marketed. According to the Chimanes inventory, potential volumes could be over 60 cubic meters per hectare (d.b.h. > 40 cms). However, under present conditions, no more than three species are being harvested and their volumes (d.b.h. > 60 cms.) reach only 2.75 cubic meters per hectare. It is a reasonable assumption that under best of circumstances - short distances to mills (less than 100 kms.) good sites, and higher than average proportion of commercial species - the commercial volumes will be 10 to 15 percent of total volumes. As the number of commercial species increases, this proportion will go up in previously unlogged stands.

At present (1986) the more valuable forest areas are in the

eastern and northeastern parts of Santa Cruz, as well as an area in the northern tip of this Department, followed by southeastern and northwestern Beni, northern La Paz and smaller areas in southern Pando. The piedmont region of Cochabamba contains temperate forest species, among which are residual areas of the only Bolivian softwoods - two species of Podocarpus, known as "pines".

Southern Santa Cruz, and eastern Chuquisaca and Tarija contain dryland forests which are the main source of railroad ties and charcoal used in the mineral smelters. There is no information on forest growth. The unlogged forests are probably without exception climax formations, and thus their growth will be close to zero. The previously logged areas are often cleared for agriculture. In any case, no growth control plots have been established. As far as could be ascertained, there are also no growth data for the scattered plantations.

Timber Withdrawals

Timber is being harvested under two arrangements. The first, as it were unofficial, way is when either established farmers or, more frequently, recent settlers cut timber in the process of land clearing. The logs are sold to smaller sawmills, and often these sales are not recorded. The rest of the timber is burned in order to make room for agricultural crops. Almost by definition, no statistics on these removals exist. Knowledgeable people estimate the volumes harvested in this manner anywhere between 10 and 20 percent of the officially recorded removals.

The timber concession and permit system, described on page 10 provides official removal data. Table 1 contains such data for the last eight years.

Table 1 Harvests in Bolivia

Timber	
1977 to 1984 (in cubic meters)	
1977	- 377,015
1978	- 354,495
1979	- 499,089
1980	- 445,122
1981	- 334,879
1982	- 226,936
1983	- 138,245
1984	- 157,078

Source: Centro de Desarrollo Forestal, Estadísticas Anuales

Informed opinion is that these numbers significantly understate the real amount of removals, possibly by as much as 50 percent. Thus we can assume that the amounts harvested during the period of 1977 to 1984 were possibly as high as 750,000 cubic meters in 1979, and the lowest harvest in 1983 may have been above 200,000 cubic meters.

It is certain that the total growing stock of merchantable species is being reduced by at least 200,000 cubic meters a year during the last three years, even assuming some growth in the previously logged stands.

Forest management means planned application of labor and other inputs to forest land in order to obtain a continuous flow

of products and services, such as timber, wildlife, soil protection and other outputs. If one adheres to this definition, then the inescapable conclusion is that no forest management exists at present in Bolivia. A limited number of landowners have planted eucalypts, and small scale plantation programs in Santa Cruz, Cochabamba and Tarija by official entities continue. However, no management activities of any kind take place in the natural forests. The official establishment of six forest reserves - Chore, Guarayos, Bella Vista, Quimera del Aten, Chimanes and Chiquitania is only a declaration of intent of doing something positive in the future.

Forest Ownership

The forest law of Bolivia determines that "... all forests and forest lands are the patrimony of the state and are goods of public utility whatever the property regime ..." (Vollmer, 1977). Only man-made forests can be privately owned. Thus all natural forests are publicly owned and their use and management is supposed to be controlled and implemented by the public forestry agency - Centro de Desarrollo Forestal (Center of Forest Development. (CDF from here onward). In principle, the owner of private land would have to obtain permission to harvest forest products on his/her own land.

In real life the farm owners or even settlers without clear title treat the timber stands on their lands as private property and sell either standing timber or logs. According to forest law the purchaser in such cases has to pay stumpage fees to the state just as if timber were being harvested on public land, in

addition to payments made to the landowner. In practice, this sometimes happens and often does not happen.

No recorded information about the extension of forests on private lands is available. Knowledgeable persons estimate that about 10 percent of all forests are under private control. The proportion of timber harvests from "private" forests is believed to be somewhat higher than 10 percent.

Forestry Institutions

The modern history of Bolivian forestry starts in 1974, when the Bolivian forest law was passed and the government forest agency was established. There were forest laws before, as well as policy pronouncements and agencies that dealt with forestry matters. These need not concern us in the context of the present situation.

The Forest Law (Decreto Ley 11686, August 1974), is a detailed compilation of prescriptions regarding the protection, management, use, and administration of the Nation's forest resources. It is accompanied by an official forest policy statement which expresses the forestry sector goals and describes the means of reaching such goals.

In summary, both the policy statement and the law define goals and procedures which if implemented will have positive results and are laudable as general principles of resource protection and use. It would serve no particular purpose to use space to summarize them here. The appropriate references (Vollmer, *Politica Forestal en Bolivia*, 1977) are easily accessible in the CDF Library.

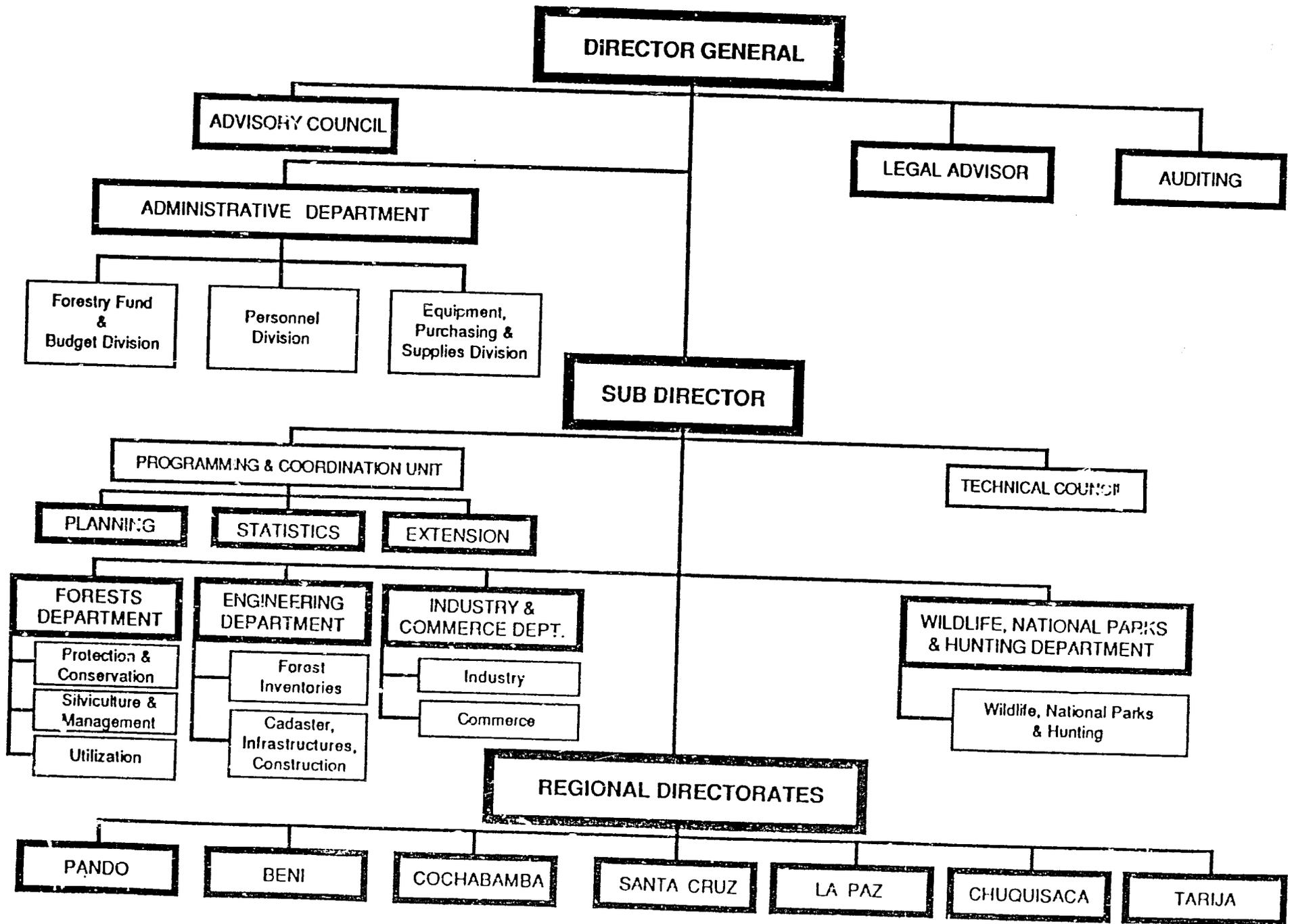
Any policy or law that is not applied once promulgated, soon loses credibility. Exactly that has happened to the policy, the law, and also to the agency that is to take these goals, principles and procedures and transform them into actions and results.

These institutions are not inappropriate or defective by definition. They are largely ineffective, given the Bolivian reality. There are a number of reasons why the good intentions have not led to tangible accomplishments in the forestry sector. Most of the causes are outside the scope of forestry sector: political instability, economic fluctuations and shocks, lack of tradition for demanding and evaluating adequate performance by public employees, inconsistent personnel management and several other factors. Unfortunately, the forestry profession has not taken any known initiatives to improve the situation within its scope of action.

The CDF is a dependency of Ministry of Agriculture and Peasant Matters (Ministerio de Agricultura y Asuntos Campesinos). Its administrative structure is presented in Table 2.

CDF's single major function is the processing of requests for timber harvesting permits and concessions, control of the approved ones, and collection of data on timber harvests. In theory CDF checks the inventories, feasibility studies for concessions, and supervises the concessionaires' management plans. CDF maintains eight nurseries in different regions of the country and cooperates with the Program of Forest Plantations in Santa Cruz and the National Program of Forest Plantations. The latter,

TABLE 2: CENTER OF FORESTRY DEVELOPMENT (CDF) ORGANIZATIONAL CHART



in spite of its name, operates almost exclusively in Cochabamba.

The logging permits have a volume limit of 200 cubic meters and a time limit of one year. The timber concessions can be short, medium, or long term. The short-term concession volume limit is 10,000 cubic meters and the time limit is three years. A medium-term concession runs up to 10 years and its volume can go up to 100,000 cubic meters. Finally, long-term means up to 20(?) years and volume over 100,000 cubic meters.

The concession applicant has to carry out a series of steps in order to have it granted. A map of the solicited area, results of the forest inventory, and a feasibility study of the logging and milling enterprise as well as a forest management plan have to be presented and approved by the CDF. The logging and management activities are to be periodically controlled by the CDF.

This logical procedure suffers from inadequacies at almost every step. Although lack of qualified personnel is a drawback, the major obstacles are inadequate supervision and follow-up, unavailability of CDF's own transportation (vehicles), carelessness which is tolerated, and bribe-taking. This latter aspect taints unfairly the honest employees of the CDF, but unfortunately it is a generally common view of the CDF agency by general public.

CDF is an organization that suffers from its poor

its staff for the most part show little initiative and little pride in their work. To improve it will be a long term effort and the outcome will depend to a considerable extent

on how the Bolivian society will deal with its public administration. Mere name changes and internal restructuring will have no significant effect on the performance.

The recent "deconcentration" movement in the country's administrative structure also affects the CDF. The purpose seems to be to enable regional units to make more decisions on their own. Thus, stumpage fees collected by the regional (departmental) offices will be retained and spent by these offices to the maximum of 75 as 80 percent. Only the residual will be transferred to the Treasury. This change will affect the departments unequally: for example, Santa Cruz will become prosperous and able to engage in projects such as reforestation, while at the other extreme Potosi or Oruro will have to rely almost entirely on allocations from the Central Office which itself will be strapped for budget funds.

Other organizations that either deal with forestry matters or have some effect on the sector are the National Colonization Institute, forestry chambers (Camaras Forestales), other industry associations and the Environmental Defense League.

The National Colonization Institute affects the forestry sector by the choice of locations for their settlement programs. The foresters complain that this Institute frequently disregards existing logging concessions and in general shows little cooperative spirit.

Forest industry owners have grouped themselves into forestry chambers (Camaras Forestales). Four of those chambers are active: La Paz, Cochabamba, Chuquisaca, and Santa Cruz. Their members

are firms with sawmills and their costs are covered by the members contributions. The Santa Cruz Chamber publishes detailed lumber output and sales figures, and since about 70 percent of Bolivian lumber is produced in the Santa Cruz Department, it has a leading role in the nation's lumber industry. The main functions of these Chambers are to keep the members in touch with each other, to collect information on lumber market situation and to represent the industry's interests with the appropriate government agencies. They do little product promotion and do not provide technical services to the members.

Small furniture industry firms are represented in the Federacion Boliviana de Pequeñas Industrias (FEBOPI), and as the name indicates, its membership consists of small firms. Its Santa Cruz Branch - Apiacruz - contains over 90 furniture makers and carpentry shops and is getting ready to act in order to bring down lumber, veneer and plywood costs to its members.

Asociacion de Productores Exportadores de Muebles (ASPEM) in Santa Cruz is a group of nine larger firms which try to promote furniture exports. It holds an annual furniture exhibition and tries to improve the efficiency and reduce costs to their members. Their plans are to acquire a dry kiln, increase number of species used, distribute information on foreign markets and to serve as a clearing house for information to their members.

There are a number of environmental/ecological groups such as:

- Sociedad Boliviana de Ecologia (Bolivian Ecological Society)

- Asociacion Pro Defensa de la Naturaleza (PRODEMA)
(Nature Defense Association)
- Instituto de Ecologia (Institute of Ecology)
- Centro de Estudios Ecologicos y de Desarrollo Integral
(Center of Ecological Studies and Integrated Development)
- Museo de Historia Natural (Museum of Natural History)
- Centro Interdisciplinario de Estudios Comunitarios
(Interdisciplinary Center of Community Studies)
- Estacion Biologica Beni - (Biological Station of Beni)
- Proyecto Capacidad de Uso Mayor de la Tierra (CUMAT)
(Project of Major Land Use Capacity)

These are grouped together under the name of Liga de Defensa de Medio Ambiente (LIDEMA) whose objective is to "promote the conservation, protection, improvement and an adequate administration and utilization of the environmental and the natural resources of Bolivia..."

It has functioned only since August 1985, and claims as its major accomplishment the participation in the campaign to achieve a ban of exporting a number of threatened animal species. This ban was established by a Presidential Decree in early May 1986.

Forestry Education

The professional and technician level education in forestry occurs at three institutions. The forestry school at the University of Tarija was established in 1967. It has a five year curriculum which is similar to that of most Latin American forestry schools. The graduates receive the degree of "Ingeniero Forestal", and the curriculum does contain a fair number of

engineering courses. The intake of students has stabilized at 15 to 20, and a surprising high proportion (about 90 percent) graduate. There are laboratories for wood technology, dendrology, botany, etc. These are frugal to say the least. Textbooks are lacking in most forestry courses and students use only lecture notes supplied by the instructors. Several field trips lasting from two days to two weeks are made, but no practical work experience during vacations is available. The school has 14 full time faculty and 14 part time instructors who teach one course each. The program suffers from the general problems of Bolivian public universities by having become a microcosm of political tensions.

A one hour visit is not enough to make definite judgements, but conversations elsewhere lead one to agree that the quality of professional preparation of the graduates is fairly low. There are no signs of any near term improvements.

The University in Santa Cruz (Universidad Autonoma Gabriel Rene Moreno) has completed the first year of a new forestry program. The faculty insists that they will avoid the mistakes made elsewhere in establishing new forestry programs. A strong factor to their benefit is the proximity of logging and processing of wood products, thus making it easier to provide students with field experience and establish themselves as a center of expertise.

In 1979 a forest technicians' school was established in Cochabamba with the help of German Technical Cooperation Agency. It has had the usual growing pains compounded by the difficulties

of Bolivian government to meet its commitments to the establishment of this school. It has now been attached to the University of Cochabamba and apparently is negatively affected by the usual university politics. The number of graduates is around 15 and their employment chances are not good. The employment prospects make the outlook for the school uncertain. Apparently most of the instructors lack practical experience which is essential for a technicians' school.

In conclusion, the two levels of forestry education are in place, but both suffer from inadequacies and no near-term improvements are to be expected.

There are no specific forestry research units in Bolivia. The universities are not producing published (or probably any) research results. There are other institutions which occasionally engage in forestry related research, such as taxonomy, soil science and ecology.

Forest Policy

There is a formal forest policy statement for the country published in 1977. (Vollmer, 1977; Stolz, 1977) The policy goals are as follows:

1. Encourage the development of forest products industry and increase its output.
2. Improve the foreign trade balance of forest products.
3. Contribute to integrated regional development, especially in rural areas.
4. Achieve an equitable distribution of forestry derived benefits.

5. Rationalize forest land use and the use of available forest resources.
6. Insure an adequate supply of forest products for the internal market.

Anyone with the desire to study the policy statement in detail should consult the report "Mision Forestal Alemana/Centro de Desarrollo Forestal, Politica Forestal en Bolivia, La Paz, 1977".

To ascertain what forest policy is being followed, one must observe and interpret what is actually being done in regard to forest resources. The conclusion reached by this procedure is that the country's forest policy since the official statement in 1977 can be summarized under the following points:

1. Dedicate funds and manpower to carry out the stated policy. If budget pressures reduce the required means, accept these reductions without changing the official policy goals.
2. Maintain the administrative means of policy implementation - CDF - but do not create tensions with interest groups by demanding high level performance.
3. Accept tacitly - even though this process contradicts the official policy - that settlements in forest areas are made without evaluating consequences of land clearing and do not actively oppose illegal land clearing.
4. Do not try to enforce the forest law in its entirety because of weak enforcement agency and because assumptions on which the law is based are to a considerable extent unrealistic.
5. Use controls over logging to receive the established

stumpage fees but do not aggravate the forest products industry by demanding compliance with all legally required rules.

6. Promote the idea of conservation by exhortations more than by deeds with the hope that society's changing attitudes will in time help to achieve the desired outcomes.
7. Accept the fact that forests being used as an exhaustible resource, hoping that enough time is available to eventually achieve protection and management.
8. Don't rock the boat.

It may be somewhat unfair to summarize the "real" forest policy in the above manner. There are no organized centers of influence behind the stated policy. Certainly the CDF cannot be blamed for all the shortcomings in the implementation of stated policy. However, in the end the unavoidable conclusion is that the Bolivian forest policy is to allow the unregulated use of its forests reacting to pressures and trusting that there is no major problem in the near future.

Forest Industry

The Bolivian forest products industry consists of sawmills, veneer mills, combined veneer and plywood mills, one particle board manufacturing firm, several small paper mills using waste paper and some imported pulp. There are producers of railroad ties, of mining timbers and of charcoal for mineral smelters. Besides wood products, wild rubber and brazilnut producers (harvesters) belong to the forestry industry subsector.

The number of sawmills is not precisely determinable,

because of a number of small unregistered mills. However, the discrepancies between the official records and the total number of mills is not of major significance, since the annual output of a typical small mill is well below 500 cubic meters.

The geographical distribution by department of the registered mills is as follows:

La Paz	17 sawmills
Cochabamba	42 sawmills
Santa Cruz	179 sawmills
Beni and Pando	11 sawmills
Tarija and Chuquisaca	51 sawmills

TOTAL 300 sawmills

The sawmill associations group their members into the following categories:

Large	- annual capacity over 5,000 m ³
Medium	- " " from 3,500 to 5,000 m ³
Small	- " " from 3,500 to 1,500 m ³
Very small	- " " below 1,500 m ³

The number of employees is estimated at 90 for large mills, 35 for medium mills and 15 per small mill. The total sawmill employment is probably between 12,000 and 14,000 men, including the unregistered very small mills.

No data were available on logging employment, but some 10,000 men are probably employed during five months of the logging season or part of it. Wages for unskilled labor are around US \$50 per month and go up to \$150 for skilled personnel.

There are seven firms that produce either veneer alone or both veneer and plywood. With exception of one mill in Cochabamba, the rest are in the city of Santa Cruz or its vicinity. Their annual capacity varies from 500,000 to 3,000,000 square meters. The largest plywood mill is capable of producing 3,000 cubic meters annually.

The first particle board mill in Bolivia, in combination with sliced veneer and lumber mill has begun production in late 1975.

A small match factory with low quality product functions in Santa Cruz.

Five small paper mills operate in Bolivia: three in La Paz, one in Santa Cruz, and one south of Tarija near the Argentinian border. They use waste paper and two of them also import woodpulp from Chile (?).

Domestic Forest Product Markets

The lumber grading for the domestic market is exceedingly simple: the first grade (primera-larga) consists of boards over seven feet long; everything else is second grade (segunda-corta).

There is a group of so-called fine hardwoods (maderas finas) that are largely exported, but about 20 percent of these go to the domestic consumers. The major species of this fine hardwood group are:

- | | | |
|--------|---|------------------------------|
| Mara | - | <u>Swietenia macrophylla</u> |
| Morado | - | <u>Machaerium sp.</u> |
| Roble | - | <u>Amburana cearensis</u> |
| Cedro | - | <u>Cedrela sp.</u> |

The local buyers of fine hardwoods are furniture makers and house builders who use these woods for interior work in form of parquet and panelling. They buy in individual lots and select according to their quality requirements.

Some 20 species are consumed almost exclusively in the country and are referred to as construction lumber.

The main consumption centers are the cities of La Paz, Santa Cruz, Cochabamba, Sucre, in that order. The rest is spread through the other departments, although Beni and Pando, being sparsely populated are insignificant consumers. The most recent statistics on sales have been provided by the Forestry Chamber of Santa Cruz and have been adjusted by information from the Chambers and other sources in La Paz and Cochabamba, and are shown in Table 3.

Table 3

Lumber Production (in cubic meters) in 1983 and 1984

Region (Department)	1983	1984
Santa Cruz	46,312	37,652
La Paz	17,670	24,740
Cochabamba	9,066	9,970
Beni	4,975	4,941
Tarija	1,758	2,683
Chuquisaca	1,549	711
TOTAL	81,430	80,707

Source: Centro de Desarrollo Forestal

Note: 1 cubic meter of lumber = 424 board feet

Lumber is sold green and rough (unplaned) and is not dried

when used by builders and inexpensive furniture manufacturers. Most of lumber is sold directly from the sawmills to established clients, but a number of sawmills maintain "barracas" (deposits) where more casual buyers are served.

Veneers in the domestic market are sold to furniture makers, as is mostly plywood, and the locations of their markets are the same as for lumber. In-country produced particle board has just come on the market, and its potential customers are mainly in Santa Cruz and La Paz.

Mining timbers, of which 95 percent are from eucalyptus, originate in the departments of Cochabamba, La Paz and Chuquisaca and are sold to government and privately owned mining operations. The quantity consumed during 1974 was 27,000 cubic meters. In 1984 the CDF data show that only 4,000 cubic meters of mining timbers were harvested. Unofficial estimates for production during the eighties are of 15,000 cubic meters annually.

Railroad ties originate in the eastern Santa Cruz, Chuquisaca and Tarija from dense hardwoods (mainly quebracho) and their wood waste is transformed into charcoal. The tiemakers buy stumpage from land owners and sell ties to the state owned railroads and charcoal to the tin smelter in Vinto. The tie production is estimated at 20,000 cubic meters per year (Haggenmiller, 1974, V. Borries, 1986)

Charcoal is produced in the Southeast from dry deciduous forest species. Its production is linked to the manufacturing since residuals are converted to charcoal. In addition, harvesting for charcoal as such also occurs. The average annual

production in the years 1983 to 1985 has been estimated at 23,000 metric tons (OAS, biomass study draft report, 1986). The uncertain future of the Vinto smelter will significantly affect the charcoal market. On the supply side there is a serious threat to the future existence of the forests which are now being exploited. Natural regeneration is difficult to obtain and the harvested areas are, in effect, lost for timber growth.

Secondary Products

There are two non-wood products that have significant regional impact. Wild rubber tree (Hevea brasiliensis) occurs in the northern lowlands (Beni and Pando). The tapping is not controlled, transportation is by rivers and almost all processing is done in Riberalta. Most of the production crosses the border to Brazil without going through customs. It is estimated that about 2,000 persons earn their income through rubber tapping (Flores, 1983).

Brazil nut (Bertholetia excelsa) occurs mainly in Pando and Beni. There are some 10 processing plants, and the 1981 official statistics indicate a harvest of over 2,000 metric tons of unprocessed nuts. As in the case of rubber, it is considered that the major part of production is exported illegally to Brazil. The employment was estimated at close to 10,000 in 1974, and has dropped significantly since then (Flores, 1983).

Imports of Forest Products

The data that could be obtained do not provide much detailed information. The information obtained from the Camara Agrogecuaria Boliviana, Centro Nacional de Forestacion (?) show

imports of "Wood products" slowly decreasing from 1,837 tons (metric) to 1.485 tons in 1985.

The 1984 FAO Yearbook of Forest Products gives the total value of forest product imports at US \$12.4 million. This figure is broken down to \$2.9 million for newsprint, \$5.8 million for printing and writing paper and \$3.7 million for other papers and paperboard. These figures are all unofficial FAO estimates. The general trend of imports except for newsprint, has been downward and the reason is the general malfunctioning of Bolivian economy. In all likelihood, except for printing and writing papers and newsprint, the imports will stay down because of scarcity of foreign exchange and the desire to substitute local production, wherever possible.

Forest Product Exports

The export picture of Bolivian forest products is dominated by fine hardwood lumber. Sliced veneers and plywood are exported; some rubber, brazil nuts and logs go to Brazil avoiding the customs, but their role is minor compared to lumber. The principal export species are

Mara - Swietenia macrophylla

Roble - Amburana cearensis

Morado - Machaerium sp.

Almendrillo - Taralea apositifolia

Laurel - Nectandra spp.

Tarara - Myrosporum sp.

Table 4 lists importing countries and volume by species for each country in 1985.

TABLE 4
BOLIVIAN LUMBER EXPORTS IN 1985
(BOARD FEET)

Importing country	Species							Totals
	Mara	Roble	Morado	Tajiba	Pino	Tarara	Others	
Argentina	4,653,886	487,554	-	40,000	-	-	11,000	5,192,440
United States	3,736,690	-	66,863	-	-	23,343	1,820	3,828,716
West Germany	40,653	23,444	4,240	-	33,469	-	-	101,806
Italy	-	-	52,581	-	-	-	-	52,581
Japan	-	-	22,406	-	-	-	-	22,406
Great Britain	-	-	4,252	-	-	-	-	4,252
Chile	2,000	-	-	-	-	-	-	2,000
Peru	-	-	1,141	-	-	-	-	1,141
TOTALS	8,433,229	510,998	151,483	40,000	33,469	23,343	12,820	9,205,342

Source: Camara Nacional Forestal, Santa Cruz; "Pino" is Podocarpus spp.

Because of the extreme fluctuations of Bolivian economy and recessions in the USA and Europe in the early eighties, there is no clear trend in the statistical data. The exports shifted drastically over short periods of time in response to Bolivia's foreign exchange policies and rate changes and other economic policy measures taken by the government.

The present situation, according to the Bolivian exporters, shows improvements since export prices have increased, and the Argentinian market has expanded since 1985.

Of the eight species exported in 1985, jichiturique is insignificant. Mara (Mahogany) represents 88 percent, followed by roble (5.5 percent) and morado (1.7 percent).

The main export markets in terms of volume are Argentina (55 percent), next is United States with 40 percent, and the residual is split among West Germany, Brazil, Italy, Japan, Peru, United Kingdom, Switzerland, France and Chile. Except Germany, all of these countries buy less than one percent of Bolivia's lumber exports.

The exporters' preferences are somewhat split: they find the Argentinians less demanding on the fine points of grading, but occasional delays of payments occur because of government banking regulations in Argentina. The United States buyers are preferred because of their punctuality in paying, but are considered to be sticklers for detail in inspecting the shipments. The European market pays high prices for specific sizes and qualities ordered.

Since the lumber production in the Santa Cruz region is

principally export oriented - 55 percent in volume terms - and substantially more in value measure, the functioning of the industry and its wellbeing is strongly dependent on developments abroad. The import markets in the United States and Argentina decide how good a year or otherwise will the Santa Cruz lumber industry have. The lumberman in Santa Cruz follows developments in these countries with great interest, but it seems that the buyers assume the initiative in negotiating the sales.

The exporters are larger and well established mills, and a mill deals with the same buyer on a continuing basis.

The main complaint of the exporters are the high transportation costs from the mill to the transshipment points.

Brazil is the main transshipment country through its ports on Paranagua and Santos. ~~As~~ small amount is shipped through Arica in Chile. The costs of transportation from mill to ports like Paranagua are at present US \$65/cubic meter of lumber.

The sawmills claim that the ton/mile freight rate is six times that of the Brazilian railroads, that the availability of freight cars is very uncertain and that "gifts" to railroad personnel are a requirement to receive any kind of service.

Since only a small number of species is exported, this increases the unit logging and transportation costs. The characteristics of the export markets contribute to a considerable extent to the advance of high-grading of newly accessible areas of forest. The higher prices in the export markets compared to the ability of lumber consumers in Bolivia to pay competitive prices, makes the local market a residual and

reduces the incentives to higher standards and more efficient processing.

The veneer and plywood industry has gone through a particularly wrenching cycle, reducing its present output to 20 percent of capacity. The largest firm employs 180 persons compared to 600 in 1982.

In 1985 the Santa Cruz veneer/plywood mills exported 321,000 sq. ft. of veneer and 17,000 sq. ft. of plywood. Except for the small share of veneer to Japan which is composed of two Japanese owned small mills, veneer and especially plywood exports have fallen off drastically since 1982 to a great extent with the loss of the Venezuelan market. Their prospects, based on present international prices and the high costs of transportation are uncertain. The high quality logs have to be brought from increasing distances, and this moves up the break-even price.

The United States imports essentially two products: mahogany lumber and hardwood veneer; other products are insignificant. The exports to the United States as to most of the other markets decreased in 1982. Export prices have been increasing since late 1985 and the short-term prospects look promising.

Constraints Faced By the Forest Products Industry

The industry's main input-timber-is publicly owned, is in principle renewable, and yet is being gradually exhausted.

The raw material situation is not going to improve for a long time. Since all timber with the exception of limited harvests of eucalyptus for poles and mining timber is being cut

without regeneration steps, successive withdrawals can come only by moving into new areas. Transportation distances over bad roads become longer, and automatic cost increases are built in. At present there is no realistic way for any firm to escape this situation, unless it has recently received a concession in a favorable location.

One industry complaint is the complexity and slowness of the process of concession granting. It consists of a fairly long number of steps and the inertia in public administration (CDF) certainly does not help. On the other side, non-industry sources insist that the industry is not making any real efforts to manage the concession areas more intensively, since they find it cheaper to live with the present inefficiency of concession granting, by making payoffs, and knowing that new logging areas will be available for some time to come.

Another obstacle to taking a longer term view have been the frequent and recent shifts and contradictions in government's economic policy measures. While these uncertainties do not affect forest products industry alone, its export part was particularly inconvenienced by the monetary policy and foreign exchange regulations. A result of this experience is reluctance to make financial commitments for longer periods of payoffs.

The lumber and plywood industry does not suffer any disadvantages because of building codes or safety rules. No changes in this regard are expected. While standard sizes and quality specifications would make the industry more efficient and

lower their costs per unit of output, there was little interested response by the people interviewed. Although the advantages are readily acknowledged, in the opinion of the industry people the consumers are not insisting and expecting quality standards. The only way to achieve improvement in this matter would be by concerted producers' action if a substantial part of the buyers (furniture, carpentry, and interior construction) would be willing to pay a premium at least initially on previous prices.

The general opinion of both primary and secondary processing managers is that the consumers are conservative in their habits, that they do not expect steady improvements, and that in this present period of economic stagnation the concern about prices almost always prevails over considerations of quality.

The usual complaints about the existing credit policies and procedures were expressed by almost everyone interviewed. The frequent changes in requirements and procedures, the complexity of requirements being in no reasonable proportion to the magnitude of credit, unkept general promises made in public statements by high government officials, make planning of firms' activities less reliable.

Because of rapid expansion of construction in Santa Cruz, the logging and milling labor has high turnover rates, since living and working conditions out in the woods are clearly more difficult than construction work in the city. Because of the recent slump and slow recovery in the lumber and veneer/plywood industry, wage rates have not increased much. Another labor problem is the relatively high accident rate in the logging

phase. Apparently there are no legally enforced safety procedures. This fact reduces employment stability and creation of more experienced labor force.

Furniture industry has a series of demands upon the primary forest products industry, which are not being met. Guaranteed quality of lumber which the furniture industry requires to meet its customers expectations of quality is one such claim. Lack of a sufficient number of lumber kilns and relatively high prices of dried lumber are also obstacles for making higher quality furniture.

The small number of plywood and veneer mills raises suspicions of price collusion or at least of price leadership. However, no clear proof could be cited. The single particle board producer is distrusted by some as a potential monopolist. On the other side, both the plywood makers and the furniture producers question the probability of easy acceptance of particle board by the furniture makers, builders and by the consumers.

Since there is no brand identification of lumber, veneer or plywood, and no mill stands out in size compared to the rest, one can look upon the primary processors as functioning in an almost perfectly competitive market. More limited access to supplies of timber could change this picture. In the future, long distances and quality of roads may create local advantages to some producers. One constraint which has not been widely felt because more immediate problems have overridden it, is the absence of an applied research and extension unit with advising capability that the more progressive firms would welcome.

In conclusion, there are two basic problems that delay progress in wood using industries. One is the unavoidable uncertainty and frequent shocks in the country's economy. The other is markets and consumers who do not motivate the industry to upgrade its performance.

Analysis of Development Possibilities for Private Enterprise:
Present Situation

Forest products industry consists of private firms. The four mills run by the settlement agency and the development corporations are of no significance. The possibility of expanding the share of wood products in competition with steel, aluminum and plastics is not threatened by existing or expected regulations and codes. For example, there are no requirements for treated mine timbers and demands for treated power line poles are imposed by the buyers but not by government regulations.

It does not appear that any potential expansion of wood products use will be hindered or helped by changing regulations. It is also unlikely, at least in the short run, that the Bolivian public administration will have the human and financial resources to engage in introducing more detailed rules for construction and for use of materials in general.

The traditions of wood products use have developed in Bolivia based on climate and on timber availability in smaller areas due to extremely difficult transportation conditions until the advent of trucking. The imitation effect has been minor because only a very small part of population has been able to

change its housing habits, furniture and the use of other wood products by following foreign examples. Since the relative prices of wood have not changed much there has been no particular incentive to increase the consumption of wood products by substitution.

With the gradual expansion of veneer and plywood production, considering that the present slack will be taken up as the economy begins its modest growth, it can be expected to displace some lumber consumption. Sceptics doubt that the Bolivian builders, carpenters and furniture makers will respond quickly. However, with the increasing costs of fine hardwood lumber, the pressures for using blockboards or lesser quality lumber with face veneers, will lead the consumers in this direction.

Particle board ought to have a bright future because of the expected price increases of lumber. If the next mill, as can be expected, starts producing in 1987, competition among the two producers ought to prevent a monopoly situation. A major factor that makes particle board competitive with lumber and plywood are the high transportation costs of fine hardwood logs. Use of sawmill and veneer residuals in addition to logging of secondary species close to the mill makes particle board a very cost effective product.

Wood products could gain a larger marketshare if quality standards could be raised. Reduction of multiple size products (seven different sizes of doors in one house!) would allow cost reductions to manufacturers and builders. However, the educated guess, reinforced by opinions of people from the industry, is

that the Bolivian economy and the majority of consumers do not consider the standardization an urgent matter. It is uncertain whether both the producers and the intermediate users could be persuaded to take this initiative through joint action by Camaras Forestales and Camaras de Mueble. Lumber of the well known species such as mara, roble, and a few others needs no advertising since the users are well familiar with their products. To the extent possible face veneers rather than lumber should be manufactured from these species.

There are several major approaches to encourage a wider and more efficient use of wood products. Kiln-dried lumber is known to all users and they express preference for it. The obstacles noted are too high prices that the kiln owners expect, scheduling problems and reluctance to dry small lots. The furniture manufacturers association intends to sponsor a kiln that would be collectively owned by its members and also promote kiln-dried lumber in exhibitions and in its advertising.

The use of face veneers on less well known species would reduce costs for each member of the producer-consumer chain. It is not certain how strong the consumers' preference for solid wood furniture and other products is, but it does not seem to be in any sense extreme. The introduction of less well known species into the market is going on in most countries with mixed tropical forests. While knowledge of physical and mechanical properties is important, the critical factor is a price difference which has to be somewhat larger than what the consumers consider to be the value of quality difference for a

given purpose. The introduction of more species will occur faster if some sawmills will experiment with small lots of a few species and make sure that the lumber is carefully sawn and handled. This process will be best tried under the sponsorship of the Camaras Forestales. Modest subsidies for this purpose would be well advised.

Poles for power lines are in continued demand, and now impregnated poles are required. According to unconfirmed information, impregnated eucalypt poles have been recently imported from Brazil at very high prices (U.S. \$50?!) Whatever the quantity and price of imported poles, a significant part of the demand can be satisfied from Bolivian sources. There is one small treatment plant in Cochabamba, and there is room for another either in Santa Cruz or in Chuquisaca.

Mining timbers are produced almost exclusively from eucalypts and are used untreated, thus having a lifetime of two to three years (Shand, 1981). Even though the demand for these timbers is expected to decrease, savings through preservation treatment are obvious and a treatment plant in Oruro (?) would be a justified investment.

Railroad ties are produced mainly from quebracho (Schinopsis sp.), and are not treated because of its high natural durability, up to 20 years. The supply situation can turn critical in a not too distant future because of the slow growth rates in the dry deciduous forests. This situation calls for a treatment plant in a location that would allow previously unused species to be harvested, treated and distributed at the lowest

cost possible.

Future Possibilities

The growth of forest products industry-including harvesting of wild rubber and of brazilnuts - is not as yet threatened by scarcity of raw materials. According to educated guesses by several foresters and mill owners approximately 200,000 square kilometers contain presently commercial volumes at rates of 2 to 20 cubic meters per hectare. Even if this is a substantial overestimate, we are dealing with total commercial volume of certainly more than 100 million cubic meters. As was pointed out, the number of commercial species is going to increase because of increasing cost of logs at mill sites. Even if harvested volumes would double, assuming that deforestation rates do not increase above 100,000 hectares per year, the date of "timber famine" for Bolivia is far in the future. Nevertheless, this diagnosis does not lead to the conclusion that the future supply situation is without serious problems.

Selective logging, poor quality roads, and increasing distances combine to create higher costs and thus increasing product prices. The introduction of additional species into the merchantable category may well not be rapid enough to avoid these permanent price rises and may result in lower quality products. These trends will lead to relative advantages for particle board, blockboard and face veneers in combination with less appreciated species. However, these compensating developments require additional investments and a progressive attitude in the wood products industry, as well as effective promotional steps. It is

difficult to forecast at this time whether the future state of Bolivian economy will enable the wood products industry to progress in the desired direction.

There does not seem to be a problem of labor availability for timber growing and processing. Nursery and plantation work require skills that can be learned on the job. Rural underemployment will provide enough of unskilled and semi-skilled labor. Technician and professional level employee bottlenecks would occur if plantation activities increased rapidly on a large scale. This is unlikely. Management projects in natural forests will not come into being very soon, unless specific and persistent action is taken; again, odds are not favorable of this happening through government action. Unskilled labor will not be a limitation in logging and milling as long as the firms are also able and willing to pay competitive wages.

At the skilled labor level there is certainly room for improvement. If growth in the internal market resumes and the export markets continue to grow with price increases for a longer period, skilled labor salary increases will have to occur. Some organized training would become necessary.

No specific comments on requirements for management skills in wood products industry can be made at this time. As is often the case for family firms, which dominate in the industry, management skills are acquired in an informal way. It is difficult to say how much improvement is necessary in the short term.

Nothing precise can be said about investment requirements

either since no definite projects are known at this time. For the near future no expansion will occur in the veneer/plywood industry because of high idle capacity, and the lumber mills are also working well below capacity.

There is no expected large or medium scale sawmill establishment. An experienced mill owner in Santa Cruz calculates that a 5,000 m³/year mill with its logging operation would require US \$ 1,000,000 to the point of startup.

USAID/Bolivia Activities in Forestry and Related Fields

1. PL 480 Funding

Under the Community Conservation program five forestry subprojects have been funded. From 1981 to 1985 over nine million seedlings have been produced in five nurseries and 2,839 has. have been planted in 236 communities.

In 1985 for the first time Title III funding was given in support of a non-governmental voluntary organization - Centro para el Desarrollo Social y Economico with good results. In consequence, support for similar organizations is being considered.

The other nursery and plantation activities are carried out in cooperation with several regional (departmental) development corporations - CODETAR, CORDECO, CORDEPO, and until last year with the CDF. In the future funding of reforestation with NGVO's will be emphasized. The Programa Ejecutivo de Recuperacion de Tierras de Tarija (PERTT) has received support for two larger nurseries and 30 community nurseries.

Initiatives for the protection and administration of

renewable natural resources can be funded as Title I programs, if justifiable proposals are received.

A Title III program for 1986 of Planning and Administration of Renewable Natural Resources has a maximum funding of \$1,000,000 and will consider proposals within its scope.

There has been at least one credit to Asociacion de Pequenos Industriales Artesanas Productores de Santa Cruz (APIACRUZ) of \$ 10,000 to finance acquisition of lumber more than a year and a half ago(?).

At present, USAID/Bolivia supports the Capacidad de Uso Mayor de la Tierra (CUMAT) which carries out mapping and classification of both actual and recommended uses of land in selected areas. This activity is to be expanded in the future.

Another organization that receives financial support is Liga para la Defensa del Medio Ambiente (LIDEMA) which has been established in 1985 and is a "roof" organization of several institutions and groups that support environmental concerns.

Recommendations

The potential contributions of USAID to the improvements in the Bolivian forestry and forest industry sector through private initiatives depend on the present state and the expected trends in the sector. The recommended activities are based on the following expectations:

1. The forest area will be reduced each year at annual rates of about 100,000 hectares.
2. Private forest plantations, in absence of incentives to landowners, will continue to expand at modest rates.

3. Tree plantations by public agencies, with some help from international sources, will continue to expand at moderate speed primarily for soil conservation and watershed protection and both directly and indirectly for rural community development.
4. There are significant opportunities to use forest industry associations for improving their efficiency both in use of their raw material - wood - and in the improvements of their product quality, distribution and marketing.
5. The government forestry agency - Centro de Desarrollo Forestal - will not be able to become more active and efficient in the near future.

The recommendations presented below are based on the assumption that no immediate large scale forestry projects are justified, mainly because of lack of well functioning institutions, public or private, that could efficiently administer such projects. It is quite evident that there are a number of undertakings that can be started on a modest scale and have the potential for expansion as experience and confidence are created.

The recommendations are not necessarily listed in chronological sequence or in order of priority. The choices should be based on the willingness and readiness of participants and on expectations of positive short-term results in order to establish credibility for USAID participation in forest-based activities.

1. Establish a mechanism to provide information and advice to forest products industry. Sawmills, veneer and plywood mills, particle board producers, railroad tie manufacturers, power line pole suppliers, mine timber sellers and charcoal manufacturers, furniture makers and construction industry will all benefit from this process.

The procedure would be initially to provide short-term specialist services to provide information on additional export opportunities to the United States, advice on kiln-drying, standardizing and grading for the internal markets, impregnating of ties and poles, yield enhancement in charcoal making, equipment purchases in the United States, workshops for technical and managerial personnel and related matters.

The example of Iniciativa Forestal Privada para el Desarrollo (INFORDE) in Ecuador cannot be duplicated immediately, but Vicente Molinos should be invited to set up the first activities. Representatives of the industry should be invited to visit Ecuador in order to observe the INFORDE in action and convince themselves through contacts with their Ecuadorian colleagues of the usefulness of this approach.

2. Identify a competent sawmill or veneer/plywood firm which would be willing to comply with all the official requirements in order to obtain a timber concession. The payoff for this obligation and for the commitment to carry out the required management activities during the concession period would be the forest inventory, the feasibility study and the management plan, provided at no cost to the firm. At least initially, the

technical personnel expenses necessary to carry out the management activities (essentially regeneration) should also be provided in order to make the whole deal more attractive to the firm.

This is an unusual suggestion, because such a procedure has not been followed elsewhere in Latin America. It will require not only the acquiescence of CDF but its good will and cooperation. However, the benefit to the CDF would be the first example of forest management actually functioning after 12 years of supposedly required and implemented activities.

If this procedure becomes successful, the benefits will be substantial. Not only will the professional experience be valuable but a way to ensure sustained timber production in Bolivian natural forests will have been shown.

3. Plantation and harvesting of eucalypts for mining timbers and poles by private landowners in the eastern piedmont (valles mesotermicos) principally in Cochabamba has been occurring on a small scale. This is technically a fairly simple procedure whose viability has been established. Supervised credit to expand such plantations and to manage them more intensively should be a realistic undertaking. The length of production period for these products will not exceed ten years, which in forestry terms is a very short rotation. In economic terms, the internal rate of return can be expected to be satisfactory in comparison with other forms of land use.

4. Equipment for a small wood testing laboratory was donated by the Canadian International Development Agency in 1980.

According to CDF information the laboratory will open soon in

Santa Cruz. In order to ensure a successful start, the forestry chamber and CORDECRUZ should participate in its administration. Personnel selection and training will be more important than the size and sophistication of the equipment. USAID should try to help out by providing a reasonably experienced applied research person, possibly from U.S.D.A. Forest Service Forest Products Laboratory in Madison, Wisconsin.

The quality of work performed during the initial period and the responsiveness to customers' - forest products industry - needs will decide whether this undertaking will be a success. In addition to the services of a research administrator, some equipment donation and funding for small special projects could make for a relatively small outlay a significant contribution to Bolivian forest products industry.

5. The recent forestry components of community development programs similar to those in Cochabamba, by the development corporation and Swiss foreign aid (CORDECO/COTESU), and in Tarija show some success. The participation of three non governmental voluntary organizations is contributing to this success. USAID can use the existing projects in Cochabamba and Tarija as bases for expanded size and scope of forestry components. New projects in other parts of the country become more feasible because of experience gained and also because trained and experienced personnel can now be recruited.

6. Firewood costs are increasing in all settled areas, especially in the Altipano. Because of its strategic role as predominant energy source in rural areas, continuous firewood

production is important for success of any rural development effort. A supply and demand survey in a selected region should be carried out as soon as feasible. The results would be then used to decide on a firewood project, similar to that of USAID project in Central America, although much smaller in size. An additional reason for USAID to promote firewood production is the fact that no other agency is planning any activities in this essential field.

7. CUMAT is doing good quality work in land use classification and part of its work should be extended to identify and survey areas where forest production is the preferable form of land use. This work would help to select an area for continuous forest maanagement (see under 2).

Syracuse, NY

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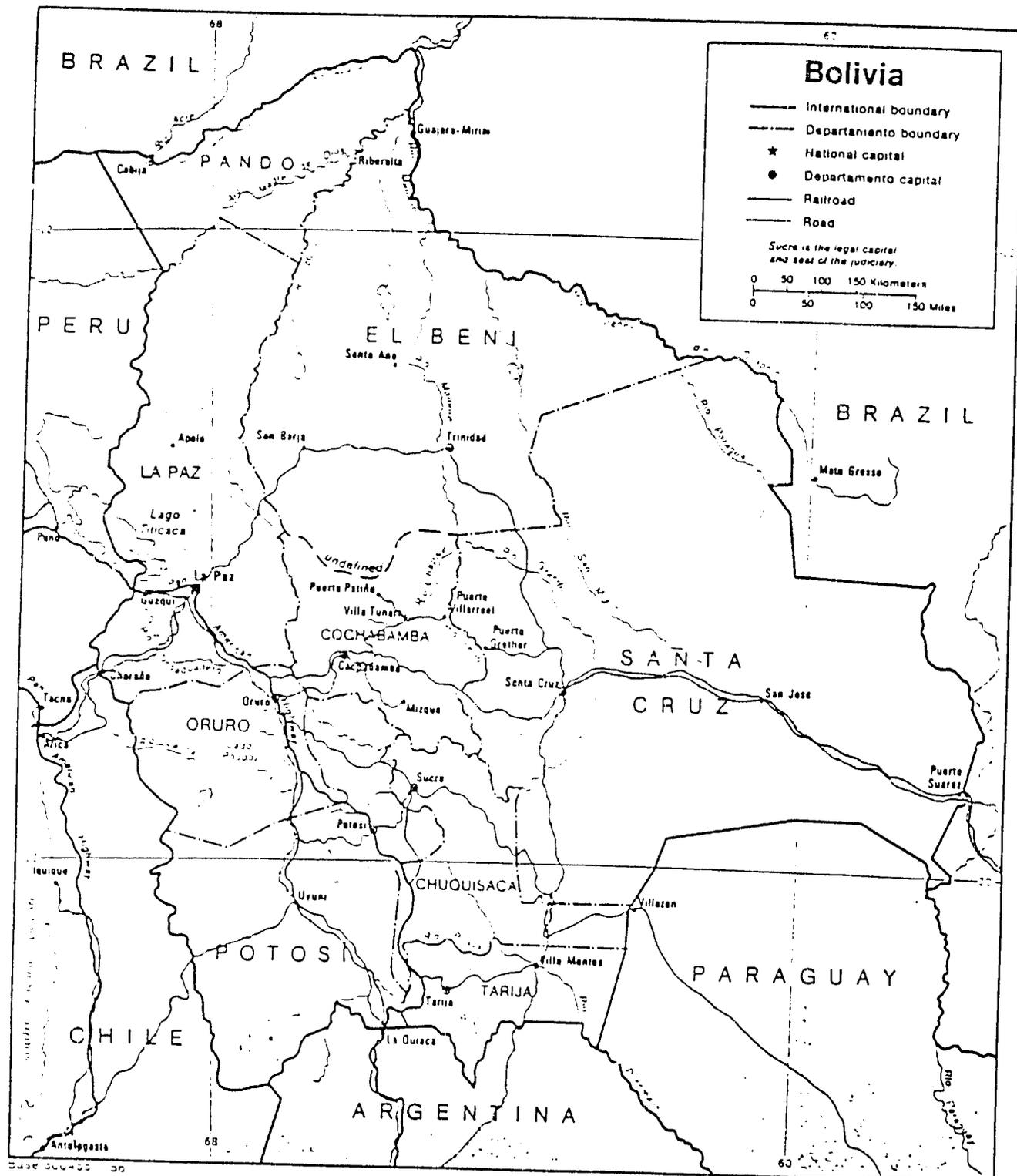
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