RESTRICTED

Report No. WH-170a

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

INTERNATIONAL DEVELOPMENT ASSOCIATION

ECONOMIC DEVELOPMENT AND PROSPECTS OF CENTRAL AMERICA

(in eight volumes)

VOLUME V

FORESTRY AND WOOD-USING INDUSTRIES

June 5, 1967

Western Hemisphere Department

EQUIVALENTS

Currencies	=	1 Central American peso (a unit of account)
)	=	1 Guatemalan quetzal
1 U.S. dollar)	=	2.5 Salvadorean colones
)	=	2.0 Honduran lempiras
	=	7.0 Nicaraguan cordobas
	=	6.62 Costa Rican colones

Weights and Measures

1 manzana	=	1.727 acres = 0.69 ha.
1 (60 kilo) coffee bag	=	132 pounds
16.6 coffee bags	=	1 metric ton
1 short ton	=	2000 pounds
1 quintal	=	approximately 101 pounds
Approximately 20 quintals	=	1 short ton (sugar)
1 banana box	=	42 pounds
1 banana stem	=	approximately 1.35 banana boxes
1 banana stem	=	approximately 57 pounds
1 (cotton) bale	=	480 lbs. net

VOLUME V - FORESTRY AND WOOD-USING INDUSTRIES

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SUMMARY AND CONCLUSIONS

1. In size, composition, and geographic distribution the forests of the Central American Common Market (CACM) area represent a resource that, if protected from encroachments and placed under proper management, is capable of meeting the greater part of the foreseeable needs of the area in wood products of various kinds, including rapidly growing requirements in paper and paperboard. Moreover, several forest zones within the area provide a suitable raw-material basis for expanded overseas trade in the immediate future in products such as high-grade coniferous sawnwood and certain hardwood veneers for which demand abroad is growing steadily.

2. A major factor limiting forestry development is the inadequacy of human and financial resources of the several forest authorities. Hence, the several Governments should give high priority to creating strong forest departments adequately staffed and financed. Also, much of the existing forest legislation is in need of revision and there would be great advantage in the development of investment if such new legislation were substantially on a regional basis. There is need to expand forest-management work and also the coverage of inventories of forest resources: major conifer areas (particularly in Guatemala) not hitherto systematically surveyed and the best hardwood areas in the most accessible localities throughout the region should be inventoried first.

3. The wood-using industries in the five countries have been supplying mainly national requirements. Nevertheless, earnings from the export of their produce have been substantial in Honduras and Nicaragua, and recently also in Guatemala. Projections for exports of wood products (other than pulp products) for 1970 and 1975 suggest that exports of these will continue to grow at a moderate rate. Of this increase, $1.2 million in 1970 and $2.4 million in 1975 would result from the creation in the near future of two of the possible new export-oriented veneer enterprises and a further $3.5 million in 1970 and $7.0 million in 1975 from sawnwood sales would result if the Olancho project in Honduras, which would combine paper manufacture and sawmilling, were established.

4. The major possibilities of forest-products' development in the Common Market area are in connection with the local manufacture of a substantial proportion of regional requirements in container board and kraft paper mainly for the banana export business. These requirements, already large and established, are likely to rise further to at least 160,000 tons by 1970 and 220,000 tons by 1975. It seems unlikely that any single mill that might be established within the area in the near future would be able to supply in the early seventies all the packaging paper requirements of the Central American countries. Currently, several possible projects for these products are in varying stages of elaboration. From a regional point of view, the Olancho project in Honduras and the Istmo project in Guatemala are the two that appear to merit most immediate interest. However, the studies underway may possibly result in substantial modifications of the projects as presently conceived, including increases in the production goals. As far as can be judged from information at hand, conditions in the proposed areas of operation of the two projects are such that, for

a comparable output, investment needs and economic results might not differ substantially. However, a detailed feasibility study of the Olancho project was being carried out in the latter part of 1966; its results were not known to the mission for the purposes of this report, and there appears to be need for additional inventory work and related studies within the Istmo area. The Olancho project would also create the possibility of producing substantial and profitable sawnwood for exports outside the region.

5. In northeastern Nicaragua, conditions of forest growth and topography offer favorable long-range possibilities for the manufacture, mainly for extra-regional export, of pulp and paper. There would be an ample supply of inexpensive pulpwood for such a project provided that the forest resource is built up over the next decade; such a build up will require moderate investment expenditures spread over a number of years.

6. The acute shortage of suburban and rural low-cost houses, observed throughout the region, suggests the possibility of prefabrication in several countries of popular houses made of wood. Such manufacture could be carried out as an adjunct to sawmilling and would provide welcome outlets for wood grades and species that are usually difficult to market. Provided suitable mortgage-finance facilities are developed, a regional output of 3,000 houses per year from 1970 onwards might constitute a suitahle initial target.

FORESTRY AND WOOD-USING INDUSTRIES IN CENTRAL AMERICA

A. Forestry

1. Approximately one-half of the land of the Central American region is forested, amounting to some 10 million hectares of forest (Table 1). Except in densely populated and poorly wooded El Salvador, the ratio of forests to total land area and the forest area per inhabitant, are comparatively high. Of the total forest area within each country, either the majority, or a large proportion, is owned publicly, mainly by the State (except in El Salvador, where most of the forest is in private holdings); publicly-owned forests constitute almost three fourths of the forest area in Honduras and Costa Rica and over half in Guatemala.

2. The forest resources of the CACM[1/] area include both broadleaved and coniferous forests; the former are by far the more extensive and consist in the main of evergreen rain forests. The broadleaved forests are composed of a large number of different species; stemwood volumes per ha., including trees of all species and sizes, commonly range from 30 to 200 m3. These forests contain valuable tree species and yield well-known woods such as mahogany, cedar, andiroba, rosewood and banak. Of the many useful hardwood species occurring in each country, not more than one-third is utilized by local industry. The number of species exported is even more limited.

3. Much of the broadleaved forest in the more accessible localities has lost its best timber or has become degraded. However, there still remain vast tracts of forest that has been little utilized so far, including very large areas in the Atlantic zones of Honduras, Nicaragua and Costa Rica; in the northern half of Guatemala; in eastern Honduras; and in northern and southeastern Costa Rica. These forests represent one of the largest remaining reserves of tropical hardwoods within relative proximity of North America, where demand for tropical hardwoods has been expanding vigorously (as it has in other major importing areas).

4. Some of the forest areas, including several in Costa Rica and within the Atlantic zones of Honduras and Nicaragua, would seem to permit industrial utilization on a major scale with comparatively little infrastructural investment, while in other areas, such as large sections of the Peten Department of Guatemala and the Olancho Department of Honduras, such utilization would be possible only following substantial and time-consuming investments for improvements in transport facilities.

5. The Central American region contains some 4.4 million hectares of coniferous forest, with a volume of 166 million m3 (see Table 2). The coniferous forests are most extensive in Honduras but they also

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1/ Throughout this report CACM is used as an abbreviation for Central American Common Market.

occupy large areas in Guatemala and Nicaragua, and a small area in El Salvador; Costa Rica has practically no conifers. Map I indicates the approximate location of major areas containing conifers. A substantial proportion of the coniferous forest is in mountain country of a difficult topography. The main species are Pinus oocarpa, P. caribaea, P. pseudostrobus, P. montezuma, and P. ayacahuete. All these are important in Guatemala, but only the first three (and particularly P. oocarpa) in Honduras, and only P. oocarpa and P. caribaea in Nicaragua.

6. The coniferous forests, which furnish concentrated and uniform supplies of a widely accepted raw material, are exploited much more intensively than the hardwood forests. The economic importance of the conifers is further enhanced by the fact that they constitute a potential source of supply of long-fiber pulpwood that can be used in manufacturing papers of a high strength.

7. In the more accessible localities the coniferous forest has been depleted of timber no less severely than the broadleaved forest. But in the case of the conifers the remaining areas of forest that has been little utilized so far are much more limited, the largest being probably those found within the Olancho Department of Honduras. Such forests usually contain a large proportion of overmature trees capable of yielding sawlogs of considerable commercial value but also susceptible to damage from insects and disease and thus liable to become a focus of infection. The spread of the Dendroctonus beetle epidemic, which, originating in Olancho, expanded across Honduras during 1963-65 destroying one-fifth of the pine timber of the country, appears to have been favored by overmaturity of stands as well as by inaccessibility, lack of systematic forest protection and other factors. Thus the introduction of rational management in pine forests containing overmature timber is an important and necessary measure to diminish the risks of losses in the coniferous resources in the region as a whole.

8. In recent years the government agencies responsible for forestry in the five countries, beside administering concessions and timber-sale contracts in public forest lands, have endeavored, within limitations imposed by small budgets and scarcity of trained men (1) to ascertain the economic potential of forests, particularly in localities holding promise for industrial development in the near future, and (2) to introduce a measure of protection and management in selected areas. Substantial inventory work, mostly in cooperation with FAO and the UNDP, has been carried out or is being currently initiated in each of the five countries. So far, the largest areas have been inventoried in Honduras, where the forest service continues to devote considerable efforts to this task. Both in Honduras and in Nicaragua selected areas of pine forest have been placed under fire protection aimed at furthering regeneration, generally with good results; in Honduras this work is about to be intensified with the support of AID. While these are encouraging beginnings, both the inventories and the management work should be expanded substantially as a matter of considerable priority.

9. The future of the forestry sector is likely to depend in large measure on the extent to which national forest services can be staffed with properly trained officers (both on the professional and the sub-professional levels); and the extent to which these services can be adequately financed with the continuity needed for formulating and executing long-range development plans. Currently both staffing and departmental finance are clearly inadequate; for instance, in Honduras (whose forest department is probably better staffed and financed than most of the other forest authorities within the CACM area) a small group of professional foresters is endeavouring to cope with a resource that in conifers alone extends over more than 2 million ha.

10. A suitable legal framework is essential also: under the prevailing conditions, forest laws should, at the very least (1) ensure that the institutional situation of the forest authority and the powers vested in it, be compatible with effective action; (2) enable the forest authority to set aside selected areas for management as public forests; and (3) encourage forest-industrial development through a well-planned system of concessions and felling permits and by other means. Forest legislation in the CACM countries, currently in varying stages of codification, does not meet these requirements adequately; much of this legislation is clearly in need of revision. Regional cooperation in revision of forestry legislation would be productive. Conditions within the area are sufficiently similar to permit a far reaching unification of forestry legislation: this would greatly facilitate sharing of experience and other forms of cooperation between countries, on both the governmental and the industrial levels and provide a better basis for allocation of resources for development of forests.

11. Forestry development in the several countries, as also regional cooperation, could be further promoted by the establishment, both on the national and the regional levels, of policy boards composed of representatives of government and private interests that would provide overall guidance in the formulation and execution of forestry programs. These would also provide essential points of contact for discussion between industry and the public agencies, the lack of which now hinders development of forest resources.

B. Wood-using Industries

12. Primary wood-using manufacture in the CACM area includes sawmilling, manufacture of board products (plywood, veneer and particle board) and manufacture of paper and paperboard.1/ Each country possesses

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1/ Production of fuelwood, poles, etc. (not regarded here as a part of wood-using manufacture) is substantial. Estimates for 1964 (adapted from data in the FAO Yearbooks of Forest Products Statistics) are as follows (in million m3): Guatemala, 6.6; Honduras, 2.5; El Salvador, 3.0; Nicaragua, 1.9; Costa Rica, 1.6; total, 15.6. The average value of this class of produce may be conservatively estimated at $1.50 per m3.

a sawmill industry and, with the exception of El Salvador, at least one plywood plant; Costa Rica has a corestock veneer plant and Guatemala a particle board mill; paper and paperboard are manufactured by a factory in Guatemala.

Sawmilling

13. Approximately 500 sawmills operated within the CACM area in 1964; Costa Rica had nearly 200 mills, Honduras and Guatemala more than one hundred each, with Nicaragua accounting for most of the remainder.1/ The great majority of mills in the area are small, but there also exist a few large enterprises, particularly in Honduras. Most of the sawnwood produced in Honduras is coniferous, as is a large part of the production of Guatemala, Nicaragua and El Salvador.

14. Estimates of sawnwood production in 1964 2/ are shown below together with the estimated 1964 consumption:

	Production in 1000 m3	Consumption in 1000 m3
Guatemala	145	135
Honduras	550	320
El Salvador	6	60
Nicaragua	115	80
Costa Rica	364	350
Total	1,180	945

Nearly one-half of the regional output derived from Honduras. Costa Rica, the second largest producer, appeared to have the highest consumption.

15. Manufacture of sawnwood is primarily for domestic usage. The only large exporter is Honduras; in 1964 Honduran exports absorbed approximately 40 percent of production. Honduras also exports significant quantities of logs (32,000 m3 were exported in 1964). Nicaragua, a much smaller sawnwood producer than Honduras, is the only other Central American country that has been exporting a substantial part of its sawnwood. El Salvador, with a very small sawnwood output of its own, imports approximately 90 percent of its requirements, mostly from Honduras.

16. Honduras' sawnwood production is believed to have increased considerably since 1964. In Nicaragua the output of coniferous sawnwood appears to be declining as a result of shortages of suitable logs, while production of hardwood sawnwood is on the increase.

1/ Estimates based on reports by FAO experts and information from interviews.

2/ Based on reports by FAO exports and information from interview.

Manufacture of board products

17. Available data on production of board products in 1963 are as follows:1/

Plywood (1000 m3)	
Guatemala	3
Honduras	2
Nicaragua2/	6
Costa Rica	5.7
Veneer (1000 m3)	
Costa Rica	4.0
Particle board (1000 tons)	
Guatemala	2.2

Costa Rica's output of core-stock veneer is destined for export, mainly to the USA, and a substantial part of its plywood is also exported (as was one-third of that produced in 1963). In the other countries nearly all of production has been for domestic use. Since 1963 most board-product manufacturers within the CACM are believed to have increased their output substantially in response to a rising demand within the area. Until recently the demand had been abnormally low; in 1963 consumption of board products within the CACM, an estimated 20,000 m3, was less than 2.5 percent of sawnwood consumption.3/ Currently, however, the consumption of board products appears to be increasing at a rapid rate. Rising local demand, particularly for plywood, has an important bearing on exports, since it helps to absorb those grades of veneer that are difficult to market overseas.

Manufacture of paper and paperboard

18. At present there exists only one mill in Guatemala; it manufactures a variety of grades using imported pulp and waste paper. Production is believed to have been 6,500 tons in 1964; since then it has increased considerably and at present (1966) may be in excess of 10,000 tons. Sales are protected by high tariffs.4/

1/ Cf. FAO Yearbooks of Forest Products Statistics. The figure for Nicaraguan plywood production is based on local information.
2/ Year 1964.
3/ The average ratio for Latin America is more than 5 percent.
4/ For example, before the common tariff came into effect, the effective tariffs on imports of wrapping paper into Guatemala (at 1964 import unit values) were 28 percent; since mid-1966 the common tariff is equivalent to 73 percent (at 1964 import unit values).

19. While there is little primary manufacture of paper products within the area, there is a great deal of secondary conversion. Most of the converting plants were set up in recent years. They include at least seven banana box factories, owned largely by the fruit companies, and ten factories making bags, non-banana containers, etc. Paper is supplied in the main by paper companies in the U.S.A., several of which have close links with the converting plants. Paper for banana containers is now granted exemption from import duties.1/

Wood product exports

20. Total exports of wood products (other than pulp products) by Central American countries in 1964 amounted to almost CA pesos 17 million. The major commodity was sawnwood which comprised about 70 percent of the total value of exports; the great bulk of this was coniferous sawnwood (Table 3).

21. Total exports of wood products by the five countries were relatively stagnant from 1960 to 1963, and rose appreciably only in 1964, except from Nicaragua, where the supplies of coniferous timber declined. Honduras has been by far the largest exporter - providing almost 70 percent of the region's exports of wood products - followed by Nicaragua. In 1964 Guatemala's exports rose sharply (mainly as a result of trade in sawnwood of high-priced broadleaved species) and practically equalled the value of the Nicaraguan exports. The rise between 1960 and 1964 in Honduran export earnings from wood products was mainly due to exports of high-grade pine sawnwood to European markets. As shown below these exports more than doubled in volume between 1960 and 1964 (whereas the volume to all destinations rose by only 8 percent) and increased even more rapidly in terms of value.

Honduras: Exports of Pine Sawnwood to Europe

	Quantity 1000 m3	Value $ 1000	Value $ per m3
1960	29.3	1349	46.0
1961	30.8	1592	51.7
1962	34.5	1866	54.1
1963	48.7	2670	54.8
1964	69.1	4036	58.4

1/ Import duties on packaging paper vary between countries but are invariably heavy (much heavier, for instance, than in Panama). Following unification of outer tariffs on paper (being increased by steps and to be fully unified in 1969) duty on paperboard will be 10 percent ad valorem plus $0.10 per gross kilogram, while common kraft paper will be dutiable at 10 percent ad valorem plus $0.05 per gross kilogram. This would nearly double the cost of the imported products.

The rise in wood-product exports from Costa Rica between 1960 and 1964 was mainly due to expanded trade in plywood and veneer.

22. The mission's projections of wood products exports for 1970 and 1975 (shown in Table 4) are necessarily tentative. However they are probably broadly indicative of possible trends for (1) Honduras and (2) the CACM as a whole; in the case of Guatemala, Nicaragua and Costa Rica, whose exports of wood products are small and substantially dependent on the policies and performance of a few firms and individuals, the forecasts are little more than a step in estimating regional totals. In elaborating the projections for 1970 and 1975, the mission believed it reasonable to expect that Guatemala's trade in broadleaved timber and Honduras' trade in pine sawnwood would continue to expand at a fairly vigorous rate. The projections for Honduras include an alternative set of projections based on the higher export levels that would result if the Olancho pulp and paper project were carried out and one-half the sawnwood output which could be generated by it were attained by 1970 and the entire output (120,000 m3) by 1975. (This project is discussed in the following section of this report). For Nicaragua and Costa Rica, the projected increases in export values would result mainly from sales of veneer by Nicaragua and of veneer and plywood by Costa Rica. Existing enterprises in Costa Rica are likely to continue to expand their exports and, in addition, it is assumed that two major veneer plants of the kind discussed in the following section would be established in the near future, one in Costa Rica and one in Nicaragua. 1/ In all projections it was assumed that additional export earnings would result from larger volumes of trade rather than from rising average prices. The increase that occurred between 1960 and 1964 in the average value of wood products exported by each country (due partly to rising market prices and partly to increasing industrial elaboration of the products prior to export), may or may not continue in the future, depending on price trends in the importing countries and other factors, and it was thought preferable not to allow for any such increase. The total of exports as projected for the several countries for 1970 and 1975, excluding those contingent on the realization of the Olancho project, suggest rates of annual growth in wood-products trade that are somewhat lower in terms of value, though higher in tonnage, than the corresponding rates for the period 1960-64.

Market for Pulp Products in Central America.

23. Consumption of pulp products in Central America have increased rapidly since 1960, due mainly to a steep rise in the demand for packaging paper. This rise was brought about by an almost sudden generalization of containerboard usage in the packaging of bananas for export and also, though to a lesser degree, by a rapidly growing consumption of kraft paper and containerboard in the packaging of many locally consumed goods.

1/ There is a definite scope for establishing soon two such plants within the CACM. The assumption that one would be set up in Nicaragua and the other in Costa Rica is to a certain extent arbitrary and the final locations could well be in other countries. Only the overseas sales from the new veneer enterprises were included in the projections, disregarding possible minor exports to neighboring countries (which actually might be in the form of plywood rather than veneer).

including food products, beverages, cement, fertilizers, and animal feed. The 1965 consumption of packaging paper in Central America is estimated to have exceeded 125,000 tons of which at least 100,000 tons was used for banana containers and the remainder in non-banana containers and bags, wrapping paper and other products.

24. Table 5 shows, for the CACM area as a whole, the historical consumption of pulp products according to three broad classes of product, and the estimated requirements in 1970 and 1975. Consumption by countries, in 1964, is given in Table 6. The largest class of product, "other paper and paperboard," represents in the main different kinds of packaging paper though it includes also a variety of miscellaneous papers.

25. The projections of consumption of "other paper and paperboard" in 1970 and 1975 presuppose that consumption of containerboard by the banana industry is a permanent feature; there appears to be no reason for expecting sudden changes in banana packaging technology that would result in a decline of containerboard usage. With the expected expansion of banana cultivation within the Common Market area (See Volume III, Agriculture) consumption of packaging paper (banana containerboard and other) is likely to rise to at least 160,000 tons by 1970 and 220,000 tons by 1975. Total consumption of "other paper and paperboard" (packaging paper plus miscellaneous papers) in those years may be conservatively estimated to reach the order of 185,000 tons and 260,000 tons respectively.

26. From the above it seems clear that the size of the market for packaging paper in Central America is sufficient for the establishment of an integrated pulp and paper mill of an economic size. Some of the produce of such a mill may be expected to prove competitive in Panama also, where consumption of packaging paper, mainly banana containerboard, appears to have exceeded 30,000 tons in 1965 and is likely to be at least 40,000 tons in 1970; thus within the Isthmus as a whole, consumption of packaging paper in 1970 would be at least 200,000 tons (160,000 tons in the CACM area and 40,000 tons in Panama).

27. Under prevailing conditions it seems unlikely that any single mill that might be established within the area in the near future would be able to supply in the early seventies all of the packaging paper requirements of the Isthmus, or even those of the CACM countries only. It seems more probable that eventually the packaging paper requirements of the Isthmus will be met, in whole or in the main, by at least two mills within the area, (whereby the market might be divided either geographically or on a product basis) or that, alternatively, a large proportion of requirements will continue to be imported from outside the Isthmus.

28. Packaging paper aside the CACM area does not seem to be a promising field for integrated manufacturing of pulp products. One possible exception is the production of papers of high groundwood content, possibly including newsprint, in conjunction with mechanical pulp (whereby the requirements in chemical pulp would be met by purchases from outside the area). Such manufacture might be practicable on a relatively small

scale, provided both power and suitable pulpwood could be made available at a reasonable cost. Newsprint consumption in the area, though limited, is growing at a substantial rate, having increased by almost 50 percent from 1960 to 1964 (Table 5).

29. Consumption of packaging paper within the Common Market is highest in Honduras and Costa Rica, the two countries with the largest production of banana containers. Honduras' consumption of packaging paper rose from some 20,000 tons in 1964 to more than 50,000 tons in 1965, while Costa Rican consumption exceeded 30,000 tons both in 1964 and 1965. Newsprint consumption was highest in El Salvador (Table 6). The great majority of the packaging paper consumed within the area passes through converting plants manufacturing banana boxes or other type of container. Estimated geographic distribution within the Common Market of current (1965/66) consumption of packaging paper passing through these plants is as follows: 1/

Atlantic coast:	55% (including 50% in Honduras and 5% in Costa Rica)
Pacific coast:	30% (including 25% in Costa Rica and 5% in Nicaragua)
Guatemala City area:	10%
San Salvador area:	5%

Thus the major markets for packaging paper in that area at present are in Honduras and Costa Rica.

C. Investment Opportunities in Forestry and the Wood-Using Industries

30. This section reviews in a general manner some of the opportunities for investment that appear to exist at present within the forestry and wood-using industries sectors of the CACM area. These opportunities relate, directly or indirectly, to the manufacture of pulp products, as well as other wood products; the case of pulp products will be considered first. The mission could not, of course, appraise these projects. Information concerning the several projects was in various stages of development and further studies in process or to be made might well result in substantial changes.

Investment opportunities related to pulp and paper manufacture

31. Currently interest is centered on prospects for supplying the growing requirements of the Isthmus (CACM area and Panama) in containerboard (linerboard and corrugating medium) paper and kraft paper. In the case of one important area (in Nicaragua) exports, particularly of pulp,

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1/ Estimates based on data in FAO reports, reports of consulting firms that investigated the market, and data from interviews. Percentages are rounded to the nearest 5 percent.

to non-Isthmus countries have been considered. Presently available data and estimates for four major projects which are in various stages of consideration, and which would be located in Honduras, Guatemala, Nicaragua and Costa Rica, are summarized in Table 7. It is not unlikely that the major projects, as described here, may yet undergo substantial modifications, including their production goals. Even in the largest of these projects, estimated output of paper would be well within the capacity of the Isthmus market: as noted in the preceding section, by 1970 consumption of containerboard and other packaging paper within the Isthmus may be expected to attain at least 200,000 tons, including 160,000 tons in the CACM area and 40,000 tons in Panama. It should be noted, however, that all four projects, though "large" by local investment standards, are within the lower part of the economic size range for the production of liner and corrugating medium and of pulp.

32. Olancho Project, Honduras. This project is based on a large, publicly owned pine resource, and the Honduran government has been active in its promotion. It would be located in the northeast and would involve a large investment, estimated in mid-1966 at about CA$50 million. In addition, depending on the location, substantial infrastructure investment would be needed in roads and in port improvement works. The preliminary studies in mid-1966 contemplated a plant to produce annually some 115,000 tons of paper (83,000 tons linerboard and 32,000 tons of corrugating medium). It would also produce for many years sawnwood estimated at 120,000 m3 annually. A preliminary feasibility study was prepared in 1966, and a detailed feasibility study was commissioned by the Honduran public authorities to be completed in early 1967. Based on data available in mid-1966, the cost of pulpwood would be likely to be moderate (about CA$6.50 per m3 delivered to the mill, excluding stumpage; about $8 including the stumpage). Mill location in relation to Isthmus markets is reasonably favorable. With proper protection and treatment, the forests of the project area should be able to furnish, in due course, wood for pulping on a very large scale.

33. The pine forests in the area contain a high proportion of large trees. The project thus far has contemplated integration of paper manufacture with the production of high-grade sawnwood. Such wood has been enjoying a profitable and expanding market in Western Europe. Such integration would permit a sawnwood production based on the best logs, while the lower grades of wood, as also a large proportion of the sawmilling waste, would be absorbed in paper making. The information available in mid-1966 suggests that the ratio of returns to inputs may be expected to be much more favorable for the sawnwood than for the paper, provided that the volume of high-grade sawnwood resulting from the project could be readily absorbed by European markets at satisfactory prices; it seems probable that this would be so, yet further detailed market study would be desirable.

34. Preliminary estimates of cost in mid-1966 appeared moderate and low enough to permit sales of paper in the Central American Common Market either with little tariff protection or none at all (particularly in the case of sales to markets in Honduras, Guatemala and El Salvador, which may be expected to represent the greater part of sales within the CACM). While at this stage this seems to be a reasonable project, which may well add considerably to the GDP of the country while improving its balance of payments, the conclusions of the detailed feasibility study are still awaited. Infrastructural expenditure (estimated at nearly CA$11 million, including CA$8 million for the construction of a 150 km road linking the mill with the port), is relatively heavy, but will also have to be assessed in light of advantages it could bring in opening up a major zone in Honduras for development. It is conceivable that the Olancho project could be rendered more profitable by adding a moderate tonnage of kraft paper to the output as planned in the pre-feasibility study. In addition, production of hardwood veneer, plywood or both within the same enterprise might add to overall profitability.

35. Istmo Project, Guatemala. Private interests in Guatemala have been considering a large project near Puerto Barrios, in eastern Guatemala, and commissioned a preliminary feasibility study which was made in 1965-1966. Estimated costs would be about CA$41 million, and production would be about 90,000 tons of paper annually (including linerboard, corrugating medium and kraft paper).

36. The pinewood resource on which the project is based is owned to a large extent by different private proprietors, including the promoters of the project. Wood supplies for production as currently planned appear to be adequate but possibilities for expanding the project in case altered circumstances or further study indicates the need or desirability of mounting a plant of a substantially greater output, remain to be ascertained; as also the delivered cost of wood in the event of such an expansion. For the annual pulpwood volume as foreseen at present (Table 7) the delivered cost per m3, including stumpage, may be expected to be approximately the same as in the Olancho project. The Istmo project evidently would require little or no infra-structural investment and would be located within an accessible and comparatively developed area. Mill location in relation to consuming centers is reasonably good. Capital requirements and manufacturing costs for comparable mill outputs might not be higher than in the Olancho area. However, the Istmo area does not seem to offer the special and very advantageous possibilities that exist in the extensive virgin forest stands of Olancho for combining paper manufacture with production of high-grade sawnwood (that, as indicated earlier would probably add to the profitability of the plant). The available information potential wood supplies in the Istmo area does not permit adequate evaluation of possibilities for expanded production. This is a gap in information that, if possible, ought to be remedied before long by means of surveys and related studies in selected forest

areas; such surveys might provide valuable elements for overall planning of paper manufacture within the CACM area. 1/

37. North-eastern Nicaragua. Preliminary studies by an FAO expert in 1965, sponsored by INFONAC (the government's public development institute), have been made of a possible project near Santa Maria which would require an estimated investment of some CA$23 million; in addition it would probably require improvements or development of Puerto Cabezas. Possible production is estimated at about 100,000 tons of unbleached kraft pulp. The establishment of a mill in this area might render desirable the pooling of its pine resource with that of the adjoining area of Honduras, further to the north; on the two sides of the border, the pine stands, composed of Pinus caribaea, are similar in most respects. While a plant in this area would probably be less well situated in relation to CACM consuming centers than one served by Puerto Castilla in Honduras or Puerto Matias Galvez in Guatemala, the area appears to offer favorable long-range possibilities for manufacture for export, largely to markets outside the CACM, of pulp, paper, or both, providing that the forest resource is built up. One of the major advantages of the areas is the relative ease, due in the main to favorable conditions of topography and soil, of harvesting and transporting pulpwood. Another very important advantage is the comparative facility of protecting the area from fire and ensuring ample regrowth of forest. Fire protection has been carried out since 1959 on about 100,000 ha. by INFONAC, which handles forestry matters in the pine regions of this area. Provided fire protection is extended in the course of the coming decade to some 300,000 ha., new growth within the area should be able to support, from the middle of the seventies onwards, a pulp production of at least 100,000 tons and probably considerably more, based on the Nicaraguan forest alone. For the forest as constituted at present, the delivered cost of pulpwood has been estimated at about CA$5.50 per m3, excluding stumpage; with denser forest growth resulting from fire protection, this cost could well be less, possibly CA$4.50 (at 1966 prices). The cost of a ten-year program of fire protection and forest management may be estimated at CA$2.5 million (including $1 million in foreign equipment and supplies). Even in the event of the wood being exported as pulpwood or pulpwood chips, instead of being pulped locally significant benefits might accrue which should be considered; there are almost certain to arise ample possibilities of such exports to mills, in Latin America and elsewhere, that are short of long-fiber wood.

38. Beside the forestry program, matters requiring action in relation to the Nicaraguan project include (1) full testing of the pulping properties of local Pinus caribaea 2/ and (2) detailed investigation of

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1/ It may be mentioned in passing that the Istmo project area might warrant investigation of possibilities for the manufacture, on a limited scale, of mechanical pulp (using power generated with fuel oil, if this would be available at a relatively low cost) and of grades of paper of a high groundwood content.

2/ Pinus caribaea pulpwood from the Bahamas has been used since 1957 for Kraft liner manufacture at the Jacksonville, Florida mill of the Alton Box Board Company of Alton, Illinois.

marketing prospects for such pulp and pulp products as could be manufactured in the area.

39. Atlantic Zone (Costa Rica) project. Studies are reported to have been made by consultants for private interests of a possible project in the Atlantic Zone of Costa Rica; estimated cost of the project is reported to be about CA$23 million. The production might be about 50,000 tons of paper annually (40,000 tons of linerboard and corrugating medium and 10,000 tons of Kraft paper). In contrast to the projects discussed above, this project lacks a local supply of long-fiber pulp. It therefore would involve importing either pulpwood of long-fiber pulp until such time as conifer or other long-fiber yielding plantations, which would need to be established locally, would attain maturity.

40. For certain papers (e.g. corrugating medium) a mill depending on mixed hardwoods might have to face competition from small to medium-size manufacturing units based on bagasse; currently projects are being elaborated for setting up such units in Nicaragua (in the Chinandega area) and Costa Rica (near Turrialba).

Investment opportunities related to wood products other than pulp products

41. There would appear to be a strong prima facie case for investment in (1) veneer manufacture for export and (2) the manufacture of prefabricated popular houses made of wood. Current market prospects for veneer (including core stock and face veneer), seem to favor the creation, within the CACM area, of export-oriented veneer industries based on selected timbers of the mixed tropical hardwood forest. Conditions appear to be appropriate for production in several localities, including the Rama region of Nicaragua (now linked by road to Managua, as well as being linked by a navigable river to the Atlantic port at Bluefields) and several regions in Costa Rica (e.g. the Sabalito area and the Osa Peninsula). The greater part of the veneer exports would probably be absorbed by plywood manufacturers in the U.S.A. For the CACM area as a whole, the following production targets based on new veneer plants ought to be attainable:

	Volume in 1000 m3	Value in million dollars 1/
1970	25	1.5
1975	50	3.0

1/ Average values implied are somewhat below current price levels.

Such production might derive from two major enterprises, which would need to be established, each attaining approximately one half of its capacity by 1970 and full capacity before 1975. Each plant, to produce some 25,000 m3, could involve an investment in the order of CA$2.0 million, including some $1.4 million in foreign currency. Much of the capital needed for such enterprise is likely to be available from private sources given a satisfactory investment climate. 1/ Based on typical cost data, the gross and net values added of one veneer manufacturing enterprise working at full capacity might be in the order of CA$1.2 million and CA$0.9 million respectively. Overseas exports would probably absorb some 80 percent of the value of production; the remainder of the output would be utilized domestically or else sold to plywood manufacturers in neighboring countries. With rapidly rising demand for board products within the CACM area this should not present any special problems.

38. An essential preliminary to the establishment of such new industries is a fairly detailed, though not necessarily very expensive, survey of the forests to be utilized. UNDP-supported surveys currently in progress within the CACM area may be expected to provide, for several localities, part of the necessary information; however, substantial additional work is certain to be needed.

39. The setting up, in selected locations within the CACM area, of industries for the manufacture of prefabricated popular houses made of wood (using properly seasoned and treated timber), would seem to offer considerable advantages. Houses of this type would be destined for suburban and for rural use. In many cases, cost per unit, including construction but excluding land, may prove to be as low as CA$1,000 or less. Prefabrication of the houses, if carried out in conjunction with established sawmilling enterprises, need involve comparatively little additional investment in equipment and installations. However, ensuring an appropriate market for the houses would involve the provision of long-term mortgage finance, similar to that already available in the several countries (largely through IDB-supported loans) for other, more expensive types of housing. Furthermore, it would involve considerable promotional effort, no least in order to overcome certain traditional but unfounded prejudices against the use of wood in tropical areas, and also, possibly, additional technical studies of the kind that were sponsored by FAO in Honduras in 1964-65. 2/

40. Beside helping to satisfy an acute demand, production of wooden houses on a major scale would create substantial outlets for the lower pine grades and for certain hardwood species that are difficult

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1/ One project is reported to have been delayed as a result of squatters settling on private forest land that is to provide the timber, and also due to difficulties in ensuring a long-term lease for a suitable plant site.

2/ Cf. Tuolumne Corporation: Low-cost Industrialized Wooden Housing in Honduras, 1965.

to market at present. The problem of manufacture from wood of popular houses may well warrant a fairly comprehensive investigation covering the CACM area as a whole. Potential demand is undoubtedly very large, and many years will elapse before production can catch up with requirements. For the CACM area as a whole, an annual output, from 1970 onwards, of some 3,000 wooden houses might constitute a suitably modest initial target without requiring substantial additional investment for production.1/

1/ Gross value added in manufacture per house could be about CA$400 assuming that production is an adjunct of sawmilling (as it probably should be under the prevailing conditions) and that each finished unit would be sold for about CA$1,000.

STATISTICAL APPENDIX

Table 1: CENTRAL AMERICA, FOREST AREAS BY COUNTRIES 1/

	Area 1000 ha.	Forests as percent of total land area	Publicly-owned forests as percent of total forest area	Per caput forest area ha.
Guatemala	5400	50	54	1.3
Honduras	6275	56	76	3.1
El Salvador	226	11	n.a. 2/	0.1
Nicaragua	6450	47	n.a.	4.2
Costa Rica	2981	61	72	2.2
Total Region	21332	50	n.a.	1.8

1/ Including certain areas of unstocked forest land.

2/ Not available.

Source: FAO World Forest Inventory 1963; the statistics refer to different dates between 1960 and 1965.

Table 2: CENTRAL AMERICA: AREAS AND GROWING STOCK OF CONIFEROUS FORESTS

Country	Area million ha.	Volume million m3
Guatemala	1.0	30
El Salvador	0.03	1.4
Honduras	2.7	120
Nicaragua	0.7	15
Total	4.4	166

Source: Estimates for Guatemala and Nicaragua were based on inventory results for certain areas (including Pinus caribaea forests in northeastern Nicaragua, with a total growing stock of approximately 6 million m3) and on data from mission interviews and other sources. The estimates provide no more than an indication of possible orders of magnitude. For Honduras, fairly accurate information is available on the areal extent of coniferous forest, and the growing stock within approximately 80 percent of the conifer area (106 million m3, excluding dead trees, within a forest area of nearly 2.2 million ha.); the overall figure of 120 million m3 was estimated. Statistics for El Salvador (based on survey results) are from FAO Report 1742 and refer to the position in 1963.

Table 3: CENTRAL AMERICA - WOOD EXPORTS BY PRODUCT CATEGORIES, 1964
(in thousand US dollars)

Product	Guatemala	Honduras	El Salvador	Nicaragua	Costa Rica	Total
Coniferous sawnwood	200	8,715	-	497	-	9,412
Broadleaved sawnwood	997	146	2	770	172	2,087
Coniferous logs	-	1,498	4	438	-	1,940
Broadleaved logs	323	216	-	392	36	966
Plywood	250	178	-	192	548	1,168
Veneer	-	27	-	22	482	532
Other wood-products	329	176	107	5	143	760
TOTAL	2,099	10,956	113	2,316	1,381	16,865

1/ Excluding exports of pulp products.

Source: SIECA

Table 4: CENTRAL AMERICA: EXPORTS OF WOOD-PRODUCTS, ACTUAL 1960-1964, AND PROJECTED, 1970 AND 1975 1/

Exporting Country	1960 Q	1960 V	1961 Q	1961 V	1962 Q	1962 V	1963 Q	1963 V	1964 Q	1964 V	1970 Q	1970 V	1975 Q	1975 V
	Quantities in thousand tons (Q) values in million CA Pesos or U.S. dollars (V)													
Guatemala	11	1.1	11	1.1	13	1.2	13	1.1	16	2.1	27	3.5	38	5.0
Honduras	203	8.2	182	7.6	162	7.2	177	8.6	209	11.0	(230 2/ 275 3/	(12.0 2/ 15.5 3/	(250 2/ 340 3/	(13.0 2/ 20.0 3/
El Salvador	-	-	-	-	-	-	3 4/	0.1	3	0.1	3	0.1	3	0.1
Nicaragua	66 4/	3.7	47 4/	3.0	30	2.8	22	2.3	23	2.3	26	2.6	32	3.2
Costa Rica	4	0.2	6	0.5	13	1.0	9	1.0	10	1.4	20	2.6	30	3.8
Total	284	13.2	246	12.2	218	12.2	224	13.1	261	16.9	(306 2/ 351 3/	(20.8 2/ 24.3 3/	(353 2/ 443 3/	(25.1 2/ 32.1 3/

1/ SITC 24 and 63(wood, lumber and wood manufactures). By far the major portion of projected exports in 1970 and 1975 will be to markets outside the CACM. The most important intra-regional exports are from Honduras to other CACM countries(CA$ 2.5 million in 1965, CA$ 3.5 million projected in 1970 and CA$ 4.5 million projected in 1975)

2/ Excluding possible exports of sawn wood from the Clancho project.

3/ Including possible exports of sawn wood from the Clancho project.

4/ Mission estimate.

Source: SIECA and official national statistics of foreign trade for 1960-1964; mission estimates for 1970 and 1975.

Table 5: CENTRAL AMERICA: CONSUMPTION OF PULP PRODUCTS IN THE AREA, 1960-1965 AND MISSION PROJECTIONS FOR 1970 AND 1975
(1000 tons)

	Newsprint	Printing and writing paper	Other paper and paperboard	Total
1960	14.9	5.8	23.0	43.7
1961	15.7	5.6	44.8	66.1
1962	19.2	6.6	55.0	80.8
1963	18.7	7.1	80.4	106.2
1964	21.8	9.6	113.4	144.8
1965	n.a.	n.a.	140	n.a.
1970	31	12	185 1/	228
1975	47	16	260 2/	326

1/ Consisting of 160,000 tons of packaging papers and 25,000 tons of miscellaneous papers.

2/ Consisting of 220,000 tons of packaging papers and 40,000 tons of miscellaneous papers.

Source: Except as noted below, the table is based on CEPAL/FAO/DOAT: El papel y la celulosa en America Latina: situacion actual y tendencias futuras de su demanda, produccion e intercambio (Santiago de Chile, 1966). For "other paper and paperboard", consumption in 1965 was estimated from U.S. export statistics and other data, while projections for 1970 and 1975 were derived by the mission by adjusting CEPAL/FAO/DOAT projections on the basis of estimated banana exports in 1970 and 1975 and of recent consumption trends for packaging paper other than that used in banana containers.

Table 6: CENTRAL AMERICA - CONSUMPTION OF PULP PRODUCTS BY COUNTRIES, 1964
(1000 tons)

	Newsprint	Printing and writing paper	Other paper and paperboard	Total
Guatemala	4.6	2.7	19.5	26.8
Honduras	1.2	0.9	21.4 1/	23.5
El Salvador	7.8	2.2	18.7	28.7
Nicaragua	2.7	1.3	8.0	12.0
Costa Rica	5.5	2.5	45.8	53.8
TOTAL	21.8	9.6	113.4	144.8

1/ The corresponding 1965 consumption is estimated at 58,000 tons (based on U.S. export statistics and other data).

Source: CEPAL/FAO/DOAT, op.cit. (cf. Table 5)

Table 7: CENTRAL AMERICA: SUMMARY OF DATA AND ESTIMATES ON FOUR MAJOR PULP PROJECTS[1/]

Project & Location	Promoters	Estimated Investment	Estimated Annual Output	Estimated Annual Wood Requirements	Available Wood Resources in Area	Current Status of Project
Olancho, Honduras	Honduras Government through ADELA	CA$ 50 million, plus CA$ 11 million in infra-structure, (roads and port facilities)	Paper: 115,000 tons (83,000 tons liner board and 32,000 tons corrugating medium) Sawnwood 120,000 m3	550,000 m3 of pine and 30,000 m3 of broad-leaved species.	Pine: At least 8.7 million m3 in near-by areas. (28.9 million m3 altogether, within a wider area.) (Based on survey results.) Broadleaved species: Ample for likely requirements.	Preliminary investigation by ADELATEC, Panama (1966). A detailed feasibility study by ADELATEC in preparation in latter part of 1966.
Istmo, Guatemala	Papelera del Istmo (private)	CA$ 41 million	Paper: 90,000 tons (54,000 tons liner board, 27,000 tons corrugating medium, and 9,000 tons Kraft paper)	380,000 m3 if pine only is used.	Pine: At least 6 million m3, and probably much more (estimated from limited survey data).	Feasibility study completed completed by Brown and Root Inc. of Houston, Texas (1965-66).
North-eastern Nicaragua	INPOMAC	CA$ 23 million (plus port improvement or development)	Pulp: 100,000 tons unbleached Kraft pulp	420,000 m3 if pine only is used.	Pine: Inside Nicaragua the net volume available for pulping is about 4.5 million m3; the corresponding volume in adjoining areas of Honduras is probably 2.5 million m3 (based on survey results.) Broadleaved species: Ample for likely requirements.	Preliminary study completed by J. Brax, FAO (1965).
Atlantic Zone, Costa Rica	Papel Centro-Americano SA (private)	Possibly CA$ 23 million	Paper: Possibly 50,000 tons (40,000 tons liner board and corrugating medium and 10,000 tons Kraft paper)	These will depend on the volume of pulp imports.	Broadleaved species: Probably ample for likely requirements.	Feasibility studies by Parkinson, Crosby and Warricks, and by the Austin Co., Cleveland, Ohio are believed to have been completed (1965).

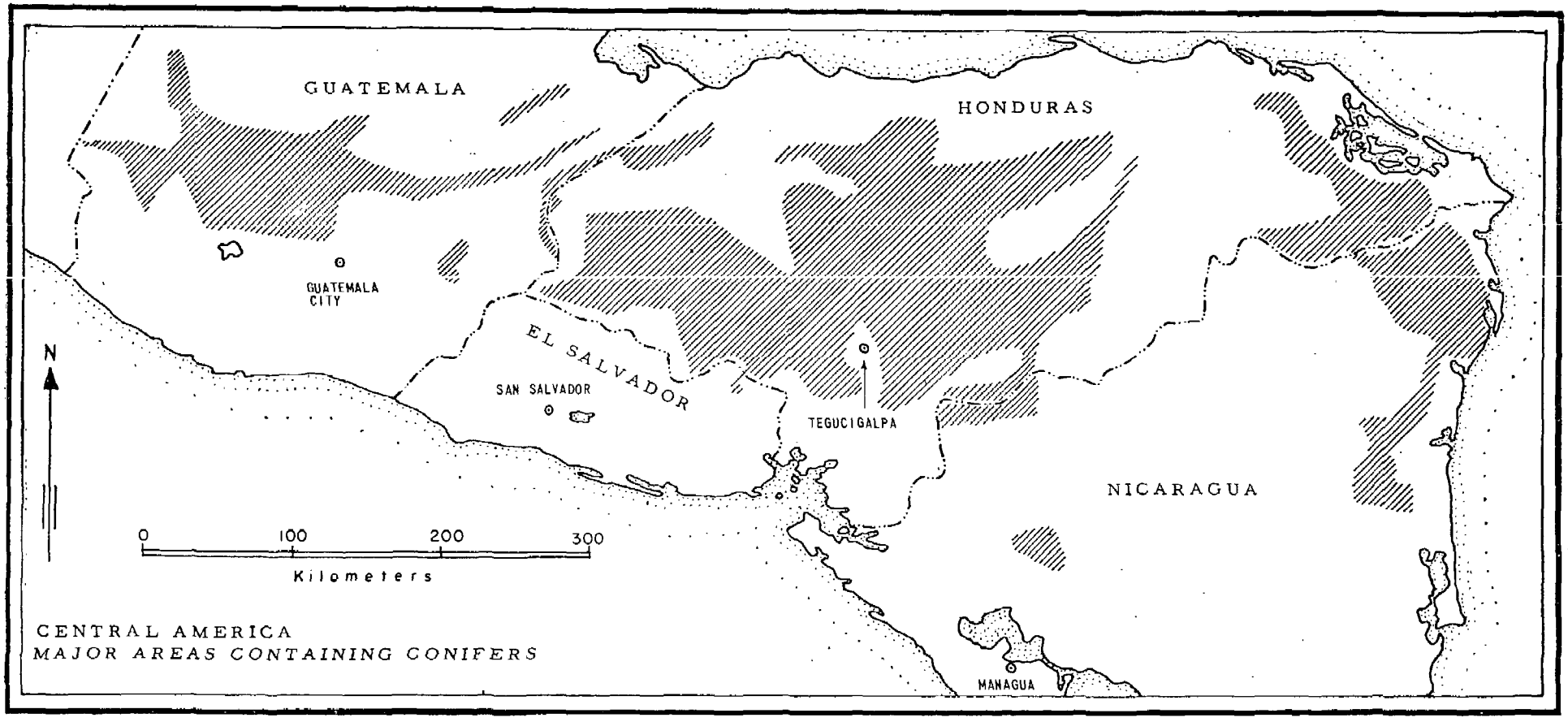
1/ Based on Studies Listed and information available to mission as of mid-1966.

Table 8: CENTRAL AMERICA - SELECTED FEATURES OF POSSIBLE FOREST-INDUSTRIAL PROJECTS
(Values shown are in million CA Pesos)

	Capital requirements				
	Total	Foreign currency in percent of total	Annual sales	Value added gross	Value added net
(a) Olancho project - paper manufacture (Honduras)	41.8	75	15.7	11.2	7.9
(b) Olancho project - sawnwood manufacture (Honduras) 1/	8.2	54	7.0	5.5	4.7
(c) Istmo Project (Guatemala)	(probably similar to (a), given comparable output)				
(d) North-eastern Nicaragua project (Forest protection)	2.5	40	Returns delayed		
(e) Manufacture of veneer (for use in plywood) (Two major enterprises in CACM area)	4.0	70	3.0	2.4	1.8
(f) Prefabricated popular houses made of wood (several manufacturing units in CACM area as adjuncts to already established major sawmilling enterprises)	1.0 2/	60	3.0	1.2	1.0

1/ Linked to (a)
2/ Additional investment in established sawmill enterprises.

Source: Studies listed in Table 7 and mission estimates.



CENTRAL AMERICA
MAJOR AREAS CONTAINING CONIFERS

Source: Forest map of Honduras; reports on Nicaragua by FAO experts; data from private survey of certain forest areas of Guatemala; and information obtained in interviews and through aerial reconnaissance. Except for Honduras, the available data are incomplete and generally represent rough approximations only.

MAY 1967

IBRD-2037R

MAP 1