CHAPTER 4 TAUNGYA METHOD/AGROFORESTRY METHOD/AGRI-SILVICULTURAL METHOD

The agri-silvicultural method in the tropics is usually called the "taungya" method, a Burmese name meaning the cultivation of crops by the slash-and-burn method of farming. As it started in Burma, it was applied to the "field in the hills". It has come to be known as "kaingin" in the Philippines, "tumpangsari" in Indonesia and the "shamba" system in Kenya.

The original model of the taungya system was introduced about a hundred years ago when Brandis, a German botanist/forestry engineer then employed by the Forestry Agency of India came across the vast Imperata grassland having been deserted by a Burmese mountain tribe who had practiced the slash-and-burn method there. He proposed the development of a teak plantation by natives and was accepted. The natives were allowed to cultivate the grassland into arable land and use it for crop production for two years, on the single condition that they should plant teak seedlings furnished by the Forestry Agency before they left the land.
The taungya method has been improved in many ways over the years. Compatible with various combinations of crop/fruit plants and useful tree species, it contributes to the increased profit potential of the land and accelerates the growth of forest trees at the same time.

The modern taungya method is essentially the same as its original model introduced about a century ago. Under a certain restrictive contract, farmers are permitted to develop a clearing for crop production by burning down a forests.

Seedlings of useful trees are planted after crops are harvested by the farmers of in the first or the second year of cultivation. The most important thing is that they are planted before the clearing comes to be covered with useless grasses.

The modern taungya method is becoming none widespread in Africa, India and Sotheast Asian countries. Throughout the tropics taungya is the word which means the combination of farming and forest-raising activities.

A Japanese version of the agri-silvicultural method has been traditionally adopted by farmers in the north-eastern part of the country.

Called "Kibasaku", it aims at reinforcing the fertility of the farmland. When the productivity of their land has run down over a certain period, farmers switch to raising alders and the like which encourage the propagation of root bacteria so that nitrogen is increased in the soil. The trees are cut in 10 to 15 years and crop production resumes.

Japanese farmers are also known to combine the cultivation of such cabinet woods as paulownia or fruit trees with that of crop plants. This can be regarded as a derivative of the taungya method in a broad sense.

The taungya method of combined agricultural and silvicultural activites, as seen above, is also advantageous in that fertilizing and weeding, primarily intended for the increased productivity of crop plants, also promotes the growth of seedlings of useful trees.

According to the taungya method, space for farming is obtained by felling trees, and such crops as soybean, pepper and Mandioca are raised as the cover crop on the land while seeds of useful trees are directly sowed or their seedlings are planted between the rows of crop plants. Farmers usually tend the planted seedlings.

While crop production continues such activities as weeding, removal of creeper, protection from insects and diseases are carried out for the trees. When crop cultivation ceases on the land, the trees continue to be tended for several years more if necessary.

Although planted between the rows of crop plants, the seedlings are exposed to the direct sunshine. This means that "pot" seedlings or "naked root" seedlings are preperable for such an environment.

Although the planting density of seedlings tends to be determined by the type of farming and its customary characteristics prevalent in the locale, it is usually possible to plant 1,000 - 1,250 of them per hectare of land.

Because of its very nature, that is, the combination of agricultural and silvicultural activities, the successful application of the taungya method depends on the introduction of a proper land holding system, a viable

organization of farming activities and the farmers' willingness to make a joint effort and observe related rules and regulations. Sun trees of a favorable shape, easy to trim and which are insect and diseases of resistant are preferred in the taungya method.

That a sufficiently large number of farmers are willing to cooperate and that they stay in the place long enough are is essential to the successful reforestation of a large area using the taungya method.

Except for certain special places the taungya method is scarcely used in the basin of the River Amazon, due perphaps to the abundance of land. Shifting cultivation is most widely practiced, resulting in the increasing destruction of forests. This is likely to exert a harmful influence on a growing scale hereafter.

The difficulty encountered in trying to departure from the conventional methods of farming and forest/land applications appears to be a common problem of developing countries. As a means of introducing a well-regulated and orderly method of slash-and-burn cultivation the feasibility of the taungya method throughout the Amazon basin deserves close examination. For instance, the possibility of grouping farmers into local units, so that each unit is assigned to a recurring round of cultivations in a certain area under the leadership of an agricultural engineer, should be considered.

Reforestation by farmers using the taungya method is also rewarding in that it helps them enlarge their capital resources, if only a proper means is established to recycle the profits of reforestation to them.

The improvement of local communities, especially trying to encourage nomadic tribes to settle down in both economic and geographical terms, is taking on added urgency.

If the upstream regions on the Amazon, for instance, Tingo Maria having been surveyed this time, are to benefit from reforestation permanently or semi-permanently, the taungya system is capable of showing good results.

The taungya system as it is applied in various places for the reproduction of tropical rain forests is described in the following pages.

(1) Turmeric catch cropping in the northern part of Bengal

In his paper entitled the "Switch of the Century" Lahiri (1964) discusses the application of the taungya system in the state of West Bengal for the rejuvenation of forests. The growth of planted trees is suppressed for the first one to two years so that crop plants are raised and harvested under their cover. A crop cultivation test site is established in a man-made forest two years old or above, designed for catch cropping. This is intended to spread the concept of integrated applications of forests for a more efficient use of the soil.

The crop plants selected are turmeric, ginger, pineapple and dioscorea, and are cultivated under the following conditions.

1) Tropical weather. The highest temperature is recorded in April at 27°C and the lowest in January at 19°C.
The precipitation averages 3,000 - 4,000 mm a year, centering on the four-month priod from late May to late September.
Humidity is high throughout the year.

2) Land composed of alluvial deposits topped by a thick layes of sandy soil.

3) The gregarious growth of sal (shorea robusta) can be seen in that part of the forest which drains well due to the presence of the thick layer of sandy top soil.

Mechanization was introduced in this distric since 1966, while catch cropping continues to depend on man power.

International caterpillar (TD-25s) are used to collect trees all over the forest. Only tree trunks are harvested while tree tips and stubs are used to make charcoal. Stubs left over from burning are carried away from the district for disposal.

The clearing is prepared for cultivation by using heavy disc ploughs (AMCO). This is done in March every year. Soil preparation is followed by the staking-off of lots for planting the seedlings of selected trees. Small farming tractors (Esort-37) are used to plough and harrow the land between the lots.

For the first two years soybean (aus paddy) was planted in the summer and mustard in the winter, to provide a protective cover for the seedlings. Turmeric and ginger began to be cultivated in and after the third year.

Turmeric (Curcuma longa Linn) can grow in the shade, provided the certain temperature conditions are met. Wild turmeric is known to grow well in the shade of mango trees. For this reason it has been selected for catch cropping in the man-made forest.

The catch cropping work consists of two sessions of weeding and soil improvement a year in the first and second years. The first soil improvement is done when the crop plant grows 15 - 20 cm tall, and the second session takes place when it becomes 50 - 60 cm tall.

Weeding takes place after the rainy season and toward the end of the winter. It is done three times in places where weeds grow more aggressively. Weeding crop plants eliminates the need of weeding the forest lots.

Influence of Catch Cropping on Teak Growth at the Chamtar Site Cleared in 1966

1968 Catch Cropping

(m)

Survey data	1/68	8/68	1/69	8/69	1/70
Catch cropping practised	5.76	6.30	6.98	7.70	8.00
Catch cropping not practised	4.59	5.20	5.50	6.26	6.50

(2) Taungya system at Negri Sembilan in Malaysia

Malaysia contains a vast forestland where nature is allowed to take its course. Reforestation efforts are required to restore its productivity.

The taungya system with its significant forest rejuvenating potential assumes an indispensable role in the management of the national forest in Negri Sembilan.

The taungya system is instrumental in re-instiling the productivity into a land exhausted due to illegal cultivation during World War II, making arable those lands which are covered with useless lalang (Imperata cylindrica) grasses or reinforcing the forest resources on marginal land by artificial means.

The taungya system used in this district is divided into two types, one using pine tree (Pinus caribaea) cultivation while the other uses conventional broadleaf trees.

The former has been adopted by the forest-building authorities at Gallan and Setul near Mantin. Pinus caribaea is the main species. Pinus markusii, Pinus oecarpa, Araucaria hunsteinii and Araucaria cunningnamii are also used.

The broadleaf tree is used by the Kenaboi forest-building bureau of Jeleba. The main species consists of Shorea leprosula, Shorea ovalis, Shorea parvifolie, Shorea acuminata and Dryobalanops aromatica.

In part of the selected for the taungya system the secondary forest "peluker" has been made, but it was largely covered with useless lalang grasses.

In 1966 the state government established a project to reforest the lalang grasslands with fast-growing trees in the Gallah, Setul and

Lenggeng national forests.

The farmers in the district were permitted to use the land freely in the national forests for three years for the cultivation of banana and other crops. They had to pay for the felling of trees, soil preparation, burning of forestlands including roads, etc. all by themselves. They were also bound to plant and tend seedlings of selected trees furnished by the forest-building bureau as long as they continued the cultivation of crops in the state-owned forests.

The crops were usually planted in March and September, mainly banana, at 2.5 x 2.5 m or 3.5 x 3.5 m intervals. Papaya, pineapple, vegetables and others were also raised side by side with bananas.

In the pine tree version of the taungya system, pine trees and bananas are cultivated simultaneously.

The conventional broadleaf tree taungya system for the Kenapoi national forest depends on the cover of banana leaves for the seedlings. The seedlings are planted six to seven months after the planting of the banana trees.

Weeding and the prevention of attacks by insects and diseasea are indispensable for the successful application of any taungya system. The tall Mikania spp grasses pose an especially significant threat after farmers have left the site at the end of the contract.

The Mikania spp grasses grow quickly. The taller they grow, the more expensive weeding out becomes. Several weed killers have been tested but have not been very effective so far.

Young, conventional broadleaf trees have sometimes been known to develop withering problems with their top or side branches. It has already been learned that it is caused by parasitic insects which impairs their growth. Braodleaf trees are susceptible to attack regardless of tree species. The withering problems are more pronounced in low lands than high lands.

Chean (1971) found that a species of cicada tunnels and breeds inside the inner bark layers which are essential to the trees growth, thus accounting for at least part of the withering problem. The application of proper insect killers has mitigated the extent of the problem.

(3) The Taungya system in the Democratic Republic of the Congo

The planting density of Terminalia imperba trees at relatively wide (12 x 4m) intervals is regarded as optimum for the country's Belgian forest, where bananas are the main crop. This is economically feasible in places where forest management of a sufficiently large scale is possible.

In the West Indies the taungya system depends on the combination of mahogany (Swietenia maerophylla) and banana, using fertilizers to promote the growth of mahogany trees.

Another version of the taungya system involves cocoa cultivation. This is considered fairly advanced at the Cross River North Forest in eastern Nigeria, which is on a large-scale experimental basis.

According to this method, natural useful trees are harvested, except for a certain number of protected trees. Cocoa planting is done at 3 x 3m intervals and the protected trees are felled except for those that will provide cover for the cocoa trees. On the other hand, the cassava/cocoa taungya system has a planting interval of 6 x 6m.

The soil consists of fertile loamy soils of volcanic ash, and the rainfall is 2,540 mm a yaer.

The problem with this system is that the protected trees may obstruct the continued growth of cocoa of crop plants, depending on the species selected. The trees may be thinned out or destroyed by using some chemical agents, but cocoa and other crop plants may suffer at the same time.

On Trinidad this system is especially promoted in privately owned forests where all the trees are felled, but burning is omitted. The crop plant selected is banana while cocoa and Erythrina spp. trees are combined for cultivation. Erythrina spp. trees are planted before cocoa.

Such other high-quality cabinet woods as Cedrela odorata, Cordia alliodora and Swietenia maerophylla are also among the preferred tree species.

The timber crops are cultivated, assuming a harvesting cycle of 30 to 40 years. Timber profits at the end of the last cycle are expected to make up for the costs incurred in cocoa cultivation.

If the taungya system fails to be practised as extensively as desired due to a lack of effort, or if reforestation efforts contradict natural conditions in one way or another, high-land forests can be rejuvenated in two ways; reforestation after the complete felling of trees and the linear planting of seedlings. The marketability of forest products determines the best method. The former is the best when the forest needs to grow as quickly as possible for the production of wood pulp, tips, parks and the like, or when a plantation of tree species capable of generating higher returns on investment at both thinning and harvesting, (for instance, teak) must be developed. The linear planting method cannot raise these tree species as effectively as desired.

The tungya system is useful where the productivity of the land must be maximized, to promote soil conservation in the tropics.

(4) Taungya system in the Philippines

In the Philippines the taungya system is practised as part of the PICOP project at Bislig on the island of Mindanao.

The participating farmer is provided with at least 10 hectares of land within 100 km of a paper manufacturing plant. He devotes 20% of his land to the production of foodstuff and livestock, and the

rest to the cultivation of pulp trees which grow quickly and are felled at the time of harvesting. The foodstuff/livestock production side by side with the pulp tress results in not only increased agricultural production as a whole but also in increased income for the farmer.

The paper manufacturing plant has pulp wood consumption capacity of 430 tons a day. A Philippine Development Bank loan of 1,000 pesos per hectare of land is available for the participating farmer.

The main tree species selected is Albizzia falcata, which is harvested every eight years. The paper manufacturing company furnishes seedlings for 0.1 pesos each at the nursery and at 0.15 pesos at the plantation. But the payment is deferrable until the farmer concludes the first sale of his pulp wood to the company.

CHPTER V OUTLINE OF THE PERUVIAN TIMBER PROCESSING INDUSTRY

5.1 OUTLINE OF THE INDUSTRY

Timber production in Peru has been gradually shifting toward the international market for several years, departing from its total dependence on domestic consumption. The main customers are the U.S.A. and South American countries, but the Peruvian product is also finding its way into the European and Asian markets, but only on a limited scale.

Such conventional centers of Peruvian timber production as Pucallpa and Iquitos continue to be the mainstay of the industry. But the survey team got the impression that timber production development efforts are centered on the Chanchamyo district. The development of the Tingo Maria district in association with that of the Tarapoto disctrict, where the road service now extends over the Andes, will assume a major significance hereafter.
The opening of the road between Tingo Maria and Tarapoto is looked forward to.

The Peruvian Government is emphasising enlarged higher education facilities in forestry in order to cope with the shortage of experts in these developing districts. The timber processors, that is, plywood manufacturers and saw mill operators, are relatively well equipped, and free from major technical problems. The quality of their products is impressive, reflecting the abundance of high-grade logs. But there seems to be some room left for improvement in the setting and trimming techniques of saw mill operators and plywood manufacturers' technical efforts to attain a more intensive use for raw materials. Another point worth noting is that both material woods and products are "short" ones. For instance, plywood material is a round slice 8-feet long in the forest and has its length trimmed by one foot imediately before it is carried into the plant.
This reflects the limited transportation capabilities, especially roads, but the situation seems to be improving fairly quickly through the introduction of rechanged transport.

The conventional dependence of floating down river for the delivery

of material woods in the rainy season or carting often caused a pause in plant operations. But this pause has been reduced due to the growing use of tractors which carry chain-sawed logs to the loading station where they are loaded onto trucks for delivery. The work period of a timber processing plant using mechanization is steadily increasing.

From the standpoints of material woods and products, the state of affairs in the industry can be summarized as follows. Material woods have been almost exclusively limited to those which would justify: i) transportation dependent on floating down the river in the rainy season the tress which have been felled in the dry season, or carrying ripsawed logs on the back of donkeys, etc. to the road side; and ii) additional costs incurred in re-processing them in Lima. They are manogany (=caoba; Swietenia sp.) and cedro (Cedrela sp.) which are typical of the useful Peruvian woods, The very existence of the industry has depended on the world-famous quality of the material woods and products. The shortage of such superior wood is becoming increasingly problematic. The use of species other than mahogany and cedro is assuming growing significance. The Peruvian universities and the Forest/Animal Bureau, and Ministry of Agriculture are uniting efforts to make a success of this challenging task. The indication is that they are achieving encouraging results. But the reforestation of areas where such useful trees are felled will continue to take on extra urgency.

From the consumption standpoint, the demand for fuel wood across the country and of building wood in local sectors are also rather pronounced. Building wood is mostly required for flooring and cottage building, mostly consisting of logs of eucalyptus (Eucalyptus sp.) supplied from plantations and others ranging from "small" to "medium" in diameter. The demand for small-diameter logs as stakes is also quite large. Unlike Japan, the Peruvian situation is characterized by the relatively large share of flooring materials, utility poles, stakes, railroad ties and furniture, and the local polarization of the domestic demand.

Peruvian timber standards have not been established, but appropriate foreign standards have been adopted for the export trade.

5.2 TIMBER APPLICATION SITUATION

(1) Resources

Saw mill operations have been maintained on a relatively small scale for the past 40 years, centering on the selective harvesting of the most useful trees as described above.
The reforestation of felled areas is taking on extra urgency these days. The material wood situation in Tarapoto, Tingo Maria, Pucallpa and others covered by the survey conducted this time are discussed below.

(i) Reforestation efforts in the Tarapoto district are understood to involve six tree species for a site less than 1,000 ha in area and 12 tree species for a site larger than 1,000 ha. and cutting is at the rate of 30%.

Thirty to forty tree species are listed as useful. The most important of them, that is, mahogany, cedro and tornillo (Cedrelinga sp.) are reported to include such huge trees that measure 1.5 - 2 meters in diameter and more than 30 meters from the ground to the lowest bough.

(ii) Main tree species and material wood diameters in the Tingo Maria district.

Generally speaking, standing trees measuring more than 62.5 cm (25") in diameter and 25 - 40m in ground clearance (distance between the ground surface and the lowest bough) can be felled. They are usually transported in logs, each measuring 75 cm in diameter and 3 - 5m in length.

(iii) The Pucallpa district is the birth place of the Peruvian timber processing industry, and still forms the hub of its activities along with Iquitos. Many forms of wood processing operations are practised in this district. Typical of "red" woods are mahogany and cedro and "white" woods are catahua (Hura sp) and moena (Necrandra sp.) which are susceptible to attacks by insects.

The felling of trees used to be limited to within 3 km of the banks and branches of the river, and depend largely on man power. However, the increasing introduction of chain saws and tractors to cut trees and haul them to the loading station, has enlarged the range to 15 - 18 km from the branches and 120 km or so from the main stream. Geographically current activities cover the area between Seyana which is located 200 km down the river Ucayali (Amazon) and Atarala situated 300 km up the river. Mechanization accounts for 70% of present operations in the area where 70 tractors are already employed.

Logs up to 22-feet long are now transportable due to the introduction of tractors, compared with the conventional maximum of 12 feet. The mechanized transportation of material woods enables timber processors of Pucallpa to work continuously throughout the year. A certain processing mill is reported to be dependent on the motorized delivery of material woods for 40% of its total needs. Material woods of superior quality are firstly earmarked for plywood manufacturers in this district.

Material woods produced in the dry season and delivered by conventional (non-motorized) means become fit for processing in about two years. The so-called "sunken" wood is not used by the industry. The saw mill covered by the survey had no facility for this type of material wood.

(iv) Diablo fuerte (Podocarpus sp.) is the only needleleaf tree of Peru and makes a quality material wood. The survey team did not visit the place this time, but the production of diablo fuerte is reported increasing in Pasco and Junin Kayamalka and Amazonas Prefectures inthe north are also credited

with sizable shares in the Peruvian production of this needleleaf tree. Presently ulcumano (Podocarpus glemeratus) and roble (Neetandra sp.) are regarded as major production species.

(v) The wood material price at the plywood plant of Pucallpa amounted to S/L 4,000 - S/L 6,000/m^3. While the Peruvian Governments puts a ban on the export of logs, there is no regulation at all as the size of sawn wood. The wood resources application conditions are summarized in Tables 1 to 6 below.

Table 1 Major Production Species Resources Breakdown by District

Tree species	Agricultural zone number								
	I	II	III	VIII	IX	X	XI	XII	XIII
ALFARO	-	-	-	o	o	o	-	-	o
CAOBA	-	-	-	o	o	o	o	-	o
CATAHUA	-	-	-	o	o	-	o	-	-
CEDRO	-	o	-	o	o	o	o	o	o
CONGONA	-	-	-	-	-	o	-	-	o
COPAIBA	-	-	-	o	o	o	-	-	-
CUMALA	-	-	-	o	o	o	-	-	-
DIABLO FUERTE	-	-	-	-	-	o	-	-	-
ISHPINGO	-	o	-	o	o	o	-	-	-
LUPUNA	-	-	-	o	o	o	-	-	-
MARUPA	-	-	-	o	o	-	-	-	-
MOENA	-	o	-	o	o	o	o	-	o
NOGAL	-	-	-	-	-	o	-	o	o
ROBLE AMARILLO	-	-	-	-	-	o	-	o	o
ROBLE CORRIENTE	-	-	-	-	-	o	-	-	o
TORNILLO	-	-	-	o	o	o	o	o	o
ULCUMANO	-	-	-	-	-	o	-	-	-
EUCALIPTO	-	o	o	-	-	o	o	-	o
OTHERS	o	o	o	o	o	o	o	o	o
Total	1	5	2	12	12	17	7	5	11

Table 2 Yearly Swan Wood Production Breakdown by Tree Species (m^3)

Tree species	1968	1969	1970	1971	1972	1973	1974	1975	1976
ALFARO	3,411	4,904	6,525	6,438	3,884	6,330	10,210	7,890	11,739
CAOBA	18,312	17,386	16,752	20,201	21,176	22,207	16,821	26,094	39,129
CATAHUA	178	174	32	1,156	105	8	1,677	7,220	10,956
CEDRO	70,815	70,530	70,668	89,820	83,997	84,408	55,347	88,513	134,602
CONGONA	1,511	1,543	3,390	2,512	-	2,983	4,231	5,135	7,826
COPAIBA	2,470	3,545	3,951	4,862	2,292	5,057	7,567	17,898	27,390
CUMALA	1,222	2,268	5,829	2,820	13,311	504	13,900	10,780	16,435
DIABLO FUERTE	2,025	2,803	4,397	4,501	3,637	2,876	2,787	3,088	4,674
ISHPINGO	1,330	1,284	1,517	1,606	1,538	1,369	1,173	3,783	6,261
LUPUNA	15,787	*	- *	79	8	1,373	4,360	1,665	2,348
MARUPA		228	523	1,121	- *	82	433	1,330	2,348
MOENA	2,642	4,599	5,828	12,585	11,814	14,150	17,150	20,753	31,303
NOGAL	1,600	1,947	2,064	1,487	1,258	1,577	1,986	1,827	3,130
ROBLE AMARILLO	4,466	4,635	8,115	8,400	7,084	6,727	8,480	7,467	11,139
ROBLE CORRIENTE	68,472	64,373	28,088	13,663	13,796	45,812	70,841	108,608	165,122
TORNILLO	5,756	9,052	20,159	30,321	30,083	37,313	50,268	59,263	89,095
ULCUMANO	3,855	3,411	3,263	4,147	3,884	5,551	6,455	4,398	7,043
EUCALIPTO	17,134	22,463	40,427	63,497	67,026	78,651	142,041	85,047	129,906
OTHERS	48,341	51,200	90,323	110,459	114,812	71,453	48,502	52,881	80,604
Total	269,327	266,345	311,653	379,769	379,626	388,431	464,964	513,640	782,572

* Included in "Others".

Table 3 Main Tree Species of Tarapoto

Tree species	Botanical name
Caoba o Aguano	Swietenia macrophylla
Cedro	Cedrela spp.
Cedro colorado	Cedrela odrata
Tornillo o Huairacaspi	Cedelinga catenaeformis
Moena Amerilla	Aniba amazonica
Moena negra	Nectandra sp.
Cumala	Virola sp.
Chucchunbo	Gunyacan Vetess
Bolaina	Guazuma sp.
Quinilla colorada	-----
Mashonnaste o tulpay	Clarisia sp.

Table 4 Main Tree Species, Application and Log Diameter of Aucayacu and Tingo-Maria Products

Tree species	Log diameter (in.)	Application	Botanical name
Tornillo *	30-45	Building	Cedrelinga catenaeformis
Moena *	24	Furniture	Nectandra sp. **
Bolaina *	6	General	Guazuma crinita
Chontaquiro	24-26	Flooring, Railroad ties(good material)	Diplotropis martiusii
Favorite	30		Osteophloeum platyspermum
Vilco *	30-40		Pithecolobium spruceanum
Pashaco *	30-40		Schizolodium amazonicum
Huimba	40-45		Ceiba suhuma (pentandra)
Azufre *	25-28		
Matapalo			Ficus sp.
Zapote	30-45	Furniture, sliced veneer undersea structure	Matisia eoroata
Tulpay *	25-28		Clarisia racemosa
Chamisa	24-30		Terminalia sp.
Huangana rinon	30		Lucuma sp.
Higuerilla	30-40		Ricinus comunis
Manchinga	20-28		Brosium nueanum
Renaco	25-35		Ficus sp.
Azucar huayo *	25-30	(Good material)	Hymenaes courbaril
Palo sangre	30-35		Brosimum paraense
Yacushapana	20-28		Terminalia sp.

* Especially important

** Large accumulation

Table 5 Main Tree Species, Log Diamter and Production Ratios of Pucallupa Products

(For plywood)

Tree species	Log diameter (in.)	Production ratio
Lupuna	40	65%
Catahua	35	25-30%
Ubos		5-10%
Copaniba		
(For sliced veneer)		
Lagarto	25-40	35%
Catahua		60%
Ishipingo		5%
Caopa		
Azucar huayo		

Table 6 Log Production by Species and Volume per Log in Pucallupa District (1978)

Tree species	Log production	Log volume
Lupuna	:38,000 M^3	(3.8 M^3)
Cedro	:30,000 M^3	(1.2 M^3)
Tornillo	:16,000 M^3	(3.1 M^3)
Caoba	:15,000 M^3	(3 M^3)
Copaiba	:11,000 M^3	(3.1 M^3)
Cumala	:11,000 M^3	(1 M^3)
Moena	: 8,000 M^3	(1 M^3)
Catahua	: 8,000 M^3	(4 M^3)

The availability of road services for wood transportation will be discussed next.
From Tarapoto through Moyobanba and over the Andes a connection was recently established with the Pan American Expressway which runs along the Pacific coast of the South American continent. It is open to traffic throughout the year, but drivers must negotiate two mountain passes which rise 2,100 and 1,900 meters above the sea respectively. It is understood to be available for trucks of the 5 - 6 ton class at the outside. If so, it is impossible to carry longer wood, be it a material wood or a product, using this road.

The road connecting Pucallpa, Tingo-Maria and Lima is open to heavier trucks of the 12 - 20 ton class. But it usually takes 15 days to drive between Pucallpa and Lima and costs about S/L 120,000 per vehicle. The temperature rises to 40°C in Pucallpa but it is below zero at the 4,000-meter pass in the Andes on the way. Judging from these weather conditions, it is very difficult to use the road, especially in the rainy season.

(3) Lumber Industry

The current operations of various parts of the lumber industry in Peru are described in the following pages.

(1) Saw Milling: There are 376 saw mill operators in the country, with a capacity of approximately 50%. In the Tarapoto district several saw mills are in operation, three of which were completed within the past three years (although one of them is a small one).
The one at the village of Buenos Aires can saw logs up to 2 meters in diameter.

The products are rectangular timber foomlisin. to 2.5 in., measuring 6-, 8-, 10- and 12-feet in length. The 8-, 10- and 12-feet versions are most popular. In addition, boards of 2-in. thickness and 6-, 8-, 10-, 12- ∿ 24-in. wide, measuring 4 to 8-feet in length are also produced.

In the Tingo-Maria district saw mill plants are located in 30 places, and several of them situated at Ukayaku were studied by the survey this time.

The products measure 1, 2, 3 or 4 inches in thickness, 20 - 30 inches in width and 3 - 5 meters in length. The 20-in. wide pieces with a thickness of 2, 3 or 4 inches are mostly produced.

Each mill inspected was equipped with one log band saw, circular saw and horizontal saw. One of the mills have very modam while another uses a circular saw place of the log band saw. These mills produce 20 - 25 types of products. Their respective operations range from 5,000 P/day/ (400,000 - 6,000 P/day) to 8,000 P/day on average (1P = 1 in. x 1 ft. x 1 ft.).

One interesting thing that the survey team found was that manritia logs were being processed apparently for flooring materia materials. It also saw a log band saw shaft break while working on a heavy log. Such accidents are inconceivable in Japan and other countries outside the tropics. In the circumstances, sawing machines for such applications must be twice as powerful as their Japanese counterparts.

There are 53 saw mills in the Pucallpa district, the main products being thick boards of 1.5, 2, 3 and 4 inches thick. Twelve to fifteen of these saw mills are each credited with the yearly production of 10,000 m^3. Production tree species include mahogany, cedro and an other 16 miscellaneous trees, and shipping accounts for the majority of them.
The products are shipped to Lima where they are processed again for furniture manufacturing. Railroad ties and wooden plugs are also produced in this district. Lastly the industry in this district is strongly interested in international trade.

(ii) Plywood Industry: There are eight plywood plants in the country, four each in Iquitos and Pucallpa. Their operations are of almost identical size, showing a capacity utilization rate of 75% or so.

The plywood industry began 15 years ago, exclusively engaged in the production of lupuna plywood (Chorisia sp) plywood. But it also uses many other species.

The plant inspected by the survey team is an impressive one, mainly equipped with Cremona machines including one 8-feed rotary latne (provided with the reeling/unreeling device) and two veneer dryers. It also has one continuous press and two 10-stage hot presses both made by Fitz. The material wood is of superior quality and the products quality is very advanced. The plywood boards produced include 3 x 8 ft. 3-ply 4-mm and 7-ply 19-mm designs meant for interior and furniture applications respectively. The product yield on the material wood stands at 40%.

This plant has an affiliate engaged in the production of decorated plywood as a substitute for conventional sliced veneer, This is a new plant built only four years ago, impressively equipped with one horizontal band saw, four largecapacity boiling vats, and Cremona lateral slicers and mesh dryers. It exports 30% of its products. Lagarto (Calophyllum sp.) forms the main portion of material woods but many other tree species are being increasingly used.

(iii) Others:

The survey team inspected a utility pole producer who uses a chemicals injector to work on medium-diameter material woods such as cumala (Virola sp.) and capirona (Capirona sp.) at the monthly rate of about 1,000 poles, part of which are earmarked for export. In the tropical weather utility poles made of harder wood are said to decay in five years.
But their service life is increased to 15 years by injecting special chemicals into them. This utility pole producer has wood supplied throughout the year, and is equipped with four drying chambers. He used to produce prefabricated homes as well but has reportedly stopped becaused the price of S/L15,000/

m^2 was not justifiable from the business standpoint. The production of wooden prefab homes has been adopted as part of the Andes League concept and a concrete program has been mapped out. But it is not making any appreciable progress due to excessively high price factors.

The current Peruvian woodpulp/paper manufacturing industry consists of only one 200,000-ton mechanical pulp plant in Pacullpa, but another 230,000-ton chemical pulp plant is to be constructed in Iquitos.

5.3 PROBLEMATICAL ASPECTS OF THE TIMBER PROCESSING INDUSTRY HEREAFTER

Of the total Peruvian forest area of 74,000,000 ha. the harvestable area runs to 44,600,000 ha. as far as statistics are concerned the actual volume of tree cutting in Peru is still less than 1% of the total.

As is the case with tropical forests in other countries, the Peruvian forestland is covered with many tree species, about 80 - 90 of them per hectare of land. A national effort to discover a larger number of useful species continues, having confirmed the qualitative characteristics of 160 species growing in the country out of the total 2,500.

But it is likely that, if Peru is after an increased export in its forest products, it will take time before the value of its "unconventional" species is recognized in the world market. Another problematic aspect of the issue is a technical one: How should newly discovered useful species be made available in desired quantities, if they are scattered over a wide area?

A typical pattern of the production of exportable timber starts with the cutting of felled trees into logs in a forest before they are carried to the road side. In extreme cases mahogany is ripsawed into rectangular timber using a chain saw in the very place it is felled and a donkey carries it to the road side. In any case the logs are cut into thick boards at saw mills in forest districts and then are shipped to Lima where they are processed again for furniture

Production. They are sometimes carried by air to Lima, if the demand is unusually pressing. These processes and even the export sale of products resulting from them seem justifiable only because mahogany is accepted as a high-grade wood light in weight, crack resistant and outstanding in drying characteristics, and because of the popularity of manogany, altnough its finished surface looks rather reddish, is great enough to overcome the shift in taste in foreign market. But in tne future it will be impossible to report any species wnich mignt be as valuable as manogay. In the future export of nign-grade wood it will be necessary for Peru to supply longer snapes or in tne form of flitcnes naving larger cross-sectional areas in order to better meet the demand abroad. If so, the improvement of roads, especially those in and around forests, as well as general roads connecting to trunk highways, will be essential.

In tne Japanese market tne price of soutn sea lumber nas almost doubled in just over a year. Various reasons suggest themselves but such a situation is essentially attributable to higner log prices against the background of tne essentially limited availability of lumber. These days Siberian lumber tends to be scarce for, which results in corresponding increases in tne price of Nortn American lumber in tne Japanese market. In snort, Japan is likely to have to pay more for its lumber imports. Primary products tend to become more expensive throughout tne world. But the Japanese market does not seem to nave reflected until quite recently the snarp hikes in lumber prices abroad, naving managed to absorb them by taking advantage of the then rising value of the yen on the foreign exchange markets.

If lumber prices stay at nigh level, Peru will find itself in a more favorable position in the export market. Even so, it must be expecially pointed out that current lumber price increases are caused in no small way by the world-wide shortage of petroleum supplies. In addition, the impact of the escalation of log production costs due to rises in freight rates and prices of log transporting machines cannot be ignored. In the circumstances it would be advisable to curb any excessive investment in forest development activities and

the timber processing industry as things stand today. Any investment decision on a significant scale should be left pending until the demand/supply situation sorts itself out in the lumber markets at home and abroad, depending on how to Peruvian domestic demand would develop in the meantime and how the world petroleum shortage would be managed to attain a tolerable level of stability.

5.4 FORESTRY STUDIES AND RESEARCH

Three Peruvian universities and colleges offer forestry courses, La Molina University established in 1963 using an FAO fund. The other two are in Iquitos and Wankaya. The La Molina University was hit badly by the Peru Earthquake, but its present temporary buildings are scheduled to be replaced by new ones which will be built sponsored by the World Bank and total 2,500 m^2 in floor space. It is raw soliciting facilities and equipment from abroad. The research staff is impressive, equipped with facilities which are useful. The pulp and paper manufacturing labratories equipped by the FAO fund are especially useful

Iquitos University is unique in that it is situated in the middle of a forest district. The Wankaya University is said to be mainly devoted to reforestation studies as it is located in the mountain district.

In addition, there is Selva Agricultural College in Tingo Maria. It does not offer a forestry course but studies the application of the science of agro-forestry to the cultivation of coca in the botany course. San Marcos University of Lima has a long tradition, and the Nature Study Museum attached to it is famous for its collection of as many as 300,000 types of dried plants and is credited with impressive expertise in botanical studies and research.

Each of these universities and colleges publishes many articles. They are not necessarily tasy to obtain,but appropriate information is vailable from libraries without difficulty. They also publish magazines which correspond to the journals of the forestry society. It would thus be rewarding to maintain contacts with these universities and colleges hereafter.

CHAPTER VI TINGO MARIA ON-SITE SURVEY

1. General Condition

Tingo Maria situated about 160 km away from the city of Huanuko has a population of 20,000. While there are many saw mills and plywood plants in the town which forms the nub of the local lumbering industry, it also serves as a base for farming and stock breeding activities in the country. There is also en agricultural college in this town. As for transportation, there is a daily scheduled air service between Tingo Maria and Lima, and a national road connects the town with Lima and Pucallpa.

This time the survey team inspected part of the forests on the banks of the River Turumayo. It also conducted an aerial survey of the upstream region of the river (Map - 1). The on-site survey reveals that the forest estate encircled by the Turumayo and the River Topa which is a branch of the Turumayo (Map - 2) is rich in productive stands, the hilly land rising 800 - 2,000 meters above the sea being covered with mountain forest.

For the ground survey the team drove to a settlers' cabin located 60 km away from Tingo Maria into the forest region. The cabin is an outpost of the settlers who have cultivated the slopes for farming, especially the cultivation of coca. Yet the hillsides have already begun to suffer from progressive erosion in some places. This suggests the need for more extensive preliminary research in mapping out future land reclamation programs.

Peruvian interests have carried out surveys of the forests in this district twice, one in 1960 and the other in 1966.

(1) Survey Conducted by Fernando Galvān, Forestry Engineer, in 1960

Fernando Galvan inspected the forestland on the right bank of the River Anda about 35 km away in the north-northwest part of Tingo Maria. The results of his investigation are summarized below.

Area covered: 2,900 ha.

Survey method: Belt method, which divided the land into belts, each measuring 20 m in width and 9.5 km in length, for inspection. (Belt area: 1.9 ha.)

Measured trees: Tres having a commercial diameter of more than 22' (56 cm) at chest level

Standing trees per hectares: 10 of commercial value, measuring more than 22" (56 cm) in diameter at chest level

Forest type: Mixed forest of tornillo and moena

Main tree species: Tornillo (Cedrelinga-catenaaformis)
Moena (Aniba sp.-Nectandra sp.)
Balsamo (Myroxilon sp.)
Estoraque (Myroxilon sp.)
Tulpay (Clarisia sp.)
Yacushapana (Terminalia sp.)
Quinalla (Manilkara sp.)

(2) Survey Conducted by Forestry General Bureau in 1966

This survey revealed a useful wood volume of 121 m^3 per hectare (for trees measuring 25 cm and above in diameter at chest level) and the number of harvestable trees of 55 per hectare. The major tree species are as follows:

Moena	5.3 trees/ha.
Caprirona	7.1 "
Machinga	9.8 "
Yacushapana	8.9 "
Zopote	14.1 "
Huimba	9.7 "
Total	54.9 trees/ha.

Compared with the average accumulation of 90 m^3 estimated for the entire province of Huanuko, this district has a larger accumulation of 121 m^3 and also excels in quality.

The virgin forestland around Tingo Maria is notable for the fertile soil rich in humus. Once deforested by the slash-and-burn method, however, the top soil was washed away by rain. The effect is all the more devastating because of the heavy precipiation per year (3,000mm) and the very pronounced rainy season. The outcome is that the so-called base rocks are exposed in clearings. It is also known that heavy avalanches of earth and rocks caused by torrential rains often wash away roads, blocking traffic between local communities.

The survey team this time visited a place that had been deserted by slash-and-burn farmers. In order to restore the productivity of the land, Kumazasa bamboo of Japan (Sasa albo-marginata) seems to be of use.
A private enterprise already has a plan to plant this bamboo in deserted clearnings. The thin subterranean shoots of the bamboo will hold the soil firmly as they grow in every direction under the ground, and thus prevent it from being washed away even by torrential rains. This will certainly help to re-develop useless cleanings into secondary forests. In addition, leaves of this bamboo are said to contain pectin, vitamin K and other useful ingredients which are good for peoples health.

2. General Topographical and Weather Conditions

Tingo Maria is 625 m above Sea-level, situated in a valley through which the River Hualloga flows. Its streets are wide and are gently inclined.

As the town in at the eastern end of the East Andes mountains, the forest rescurces around it are so huge that they seem to be inexhaustible. The vast forestland remains uncultivated as a whole, although the slash-and-burn method of cultivation is proctised sporadically in flat spots.
Its chief products are coca, tapioca and Indian corn.
(See the section on crop plants.) Moderate temperatures,

humidity and sufficient sunshine lend themselves to agricultural operations, especially diversified ones involving livestock breeding.

The local weather conditions measured by Selva Agricultural College in Tingo Maria are listed below.

As can be seen in the table above the highest temperature is 51.5°C (November), the lowest 18.7°C, and the average 25°C approximately. The rainfall is heaviest in December (the rainy season) at 545.4 mm, and lightest in June (the dry season) at 40.6 mm. It averages a plentiful 2,874 mm for the year. It is interesting to note that rains, mostly torrential rains, usually fall during the night in the rainy season while the weather is fine during the day. Torrential rains wash away the top soil as noted earlier, causing avallanches of earth and rocks that may destroy road beds, claim human lives and/or block roads completely. Heavy rains also swell rivers, and muddy floods may deal a heavy blow to the fishing industry, also.

3. Soil Conditions

As viewed from the road, both agricultural lands and virgin forestland are marked by the abundance of grasses, including typical indicator grasses, which are a convenient yard stick for PH characteristics of the soil, as listed below.

1) Taro in wet places, very notable in every valley.

2) Androprogon, a true grass, typical of barren soil.

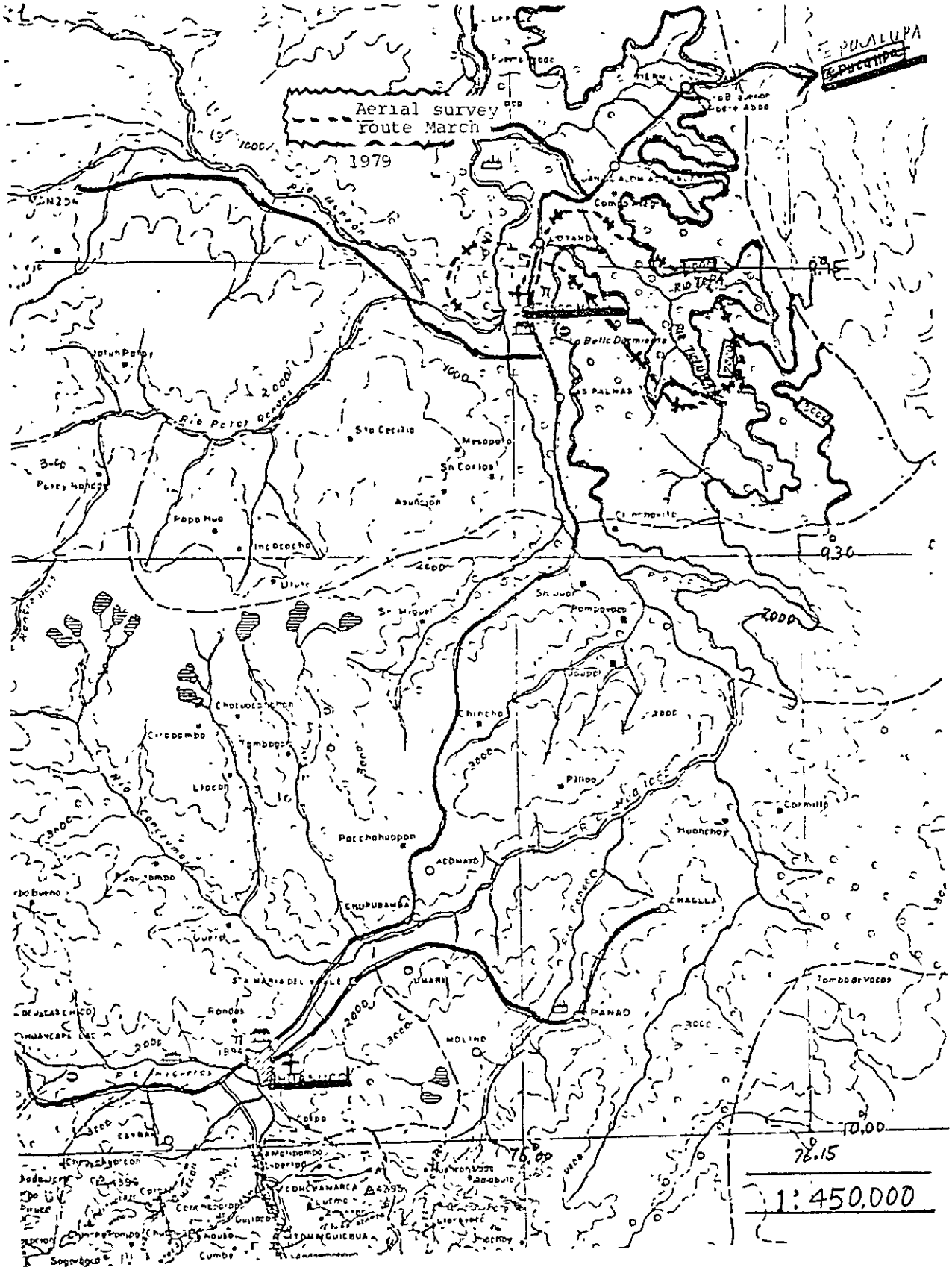
3) Ferns such as mizusugi (almost as tall as 2 meters), koshida (growing well) and fernbrake (thick on the top soil 10 cm deep, and compareble with its Japanese counterpart).

Judging from the above, the soil's PH rating appears to stand at 4 - 5.

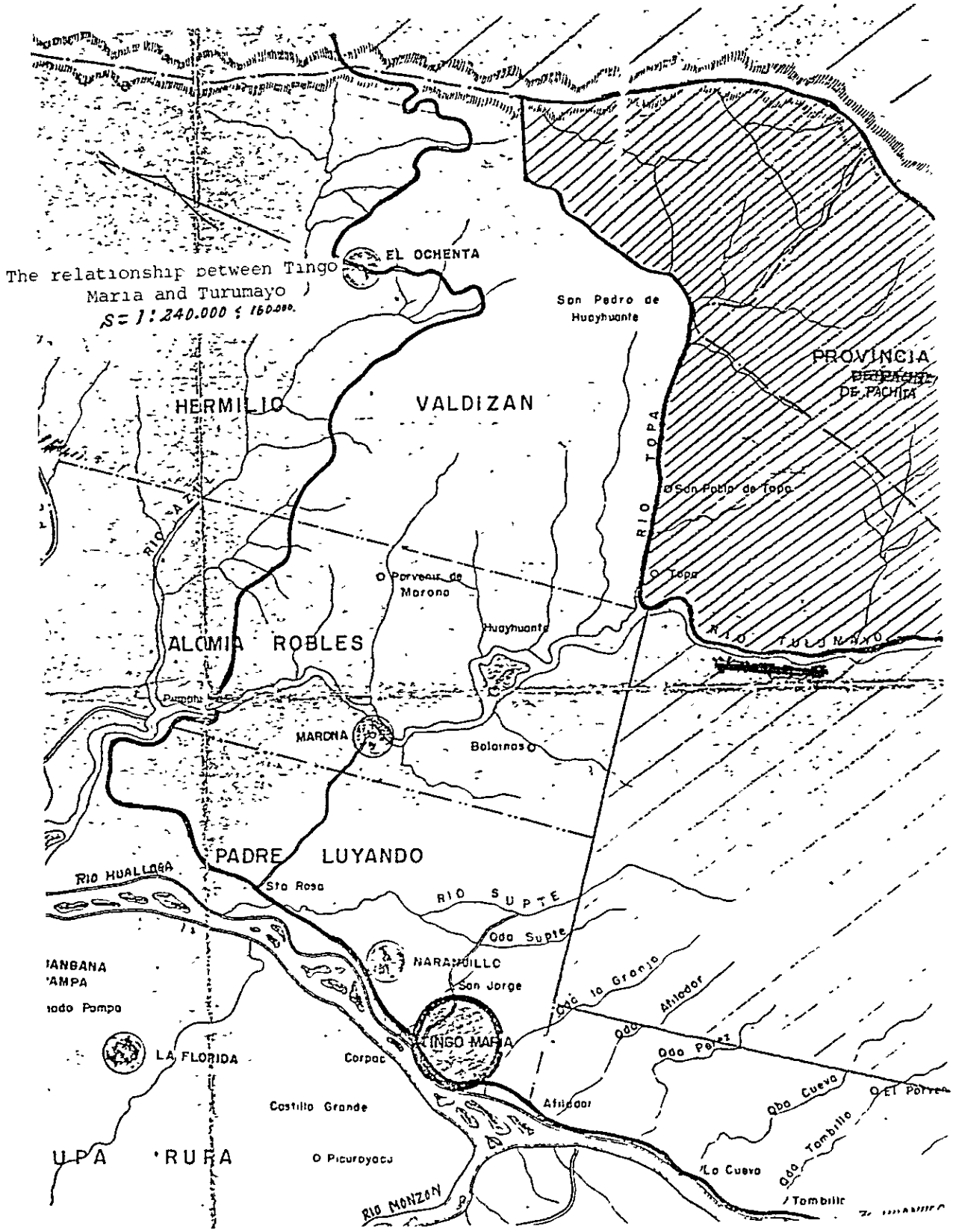
MESES	TEMPERTURAS (° C)					PRECIFITACION mm
	Maxima	Minime	07 HS	13 HS	19 HS	Tot/mes
ENERO	29°5	19°5	20°7	27°7	22°8	291.2
FEBERO	29°2	18°7	19°5	27°6	22°0	276.4
MARZO	29°5	20°0	20°6	28°0	23°2	255.1
ABRIL	29°3	20°2	20°9	27°5	23°5	274.2
MAYO	29°1	19°5	21°2	28°3	22°8	169.3
JUNIO	28°9	18°8	20°1	28°0	22°3	40.6
JULIO	28°8	19°2	19°5	27°1	21°8	313.2
AGOSTO	29°2	19°2	18°5	27°5	23°2	47.4
SETIEMBRE	30°6	18°9	20°1	29°9	22°5	44.7
OCTUBRE	31°1	18°9	- " -	- " -	- " -	297.2
NOVIEMBRE	31°5	18°9	- " -	- " -	- " -	319.3
DICIEMBRE	30°8	19°1	21°7	27°3	22°8	545.4
PROMEDIO	29°7	19°1	20°3	27°8	22°6	2.874.0

* Boletin Del Observatorid Meteorologico "Jose Abelardo Quinones" Publicado en el Boletin Meteororologico de Ia UNA-LA MOLINA- Por Walter A.Sanchez. (Feb.1979).

Map - 1



Map - 2


The relationship between Tingo
Maria and Turumayo
S= 1:240.000 ; 160.000.
EL OCHENTA
San Pedro de
Huayhuante
PROVINCIA
DE PACHITA
HERMILIO
VALDIZAN
RIO TOPA
San Pablo de Topa
Topa
Parcoar de
Marona
Huayhuante
RIO TULUMAYO
ALOMIA ROBLES
Pampa
MARONA
Bolainas
PADRE LUYANDO
RIO HUALLAGA
Sta Rosa
RIO SUPTE
Qda Supte
NARANJILLO
San Jorge
Qda la Granja
Afiador
Qda Perez
TINGO MARIA
LA FLORIDA
Corpac
Castillo Grande
Afiador
Qda Cueva
El Porvenir
Qda Tombillo
Lo Cueva
Tombillo
O Picuroyacu
RIO MONZON

It is interesting to note that Solidago sp., which is so widely found in Japan, has been rarely seen. When it was found in a rare and isolated instance, it stood alone. The lone Solidago sp. almost never seems to "branch out" in this district.

4. Crop Plants in Tingo Maria

Current main crop plants include coca, banana, rice and yucca.

The demand for coca, for medical and other applications, tends to increase from year to year. Its export helps Peru earn foreign currency and the market seems to be little affected by inflation. The legally permitted coca cultivation reportedly accounts for about a third of the total.

Coca exhausts the land so completely in 10 - 20 years that even wild grasses does not grow so well when it is deserted. Another point of note is that the fertile top soil is washed away graudally during the rainy seasons while cocoa cultivation continues. In the circumstances it is safe to assume that the coca field remains productive for 12 - 13 years on average.

Coca tops the list of cash-earning farm products, bringing in S/L 2 million reportedly per hectare of cultivation. This makes it practically impossible to regulate the scale of coca cultivation. So far coca cultivation has reportedly taken approximately 20,000 ha. of land, about a third of which (6,000 ha.) has been exhausted and deserted. The deserted area tends to increase every year.

Yucca

Rich in starch this is the staple food of farmers and is cultivated widely. It grows two to three meters tall, and every farmer has a yucca field for himself and his family. It exhausts the land fairly fast as it grows so

quickly.

Banana

Banana cultivation dates back to the pre-historic days. As bananas are one of the staple foods of the natives, its cultivation spreads from one new clearing to another. In deserted banana fields the buds are always out but they never come to flower and bear fruit. Viewed from a plane banana is very pronounced with its broad leaves and tall stems. The common types of banana are of the violet, yellow and small species. Natives eat bananas raw or cooked.

Rice

Cultivation is almost entirely limited to rice plants grown in a dry field. The rice is long in shape and has little fat content, and is not so glutinous when boiled. It belongs to the rice plants of Indica origin.

Other crops

Lemons and other fruits and vegetables are cultivated. But they are for home consumption, enough only for self-sufficiency, and total production is fairly small.

5. Land Application in Tingo Maria

Plunder farming which entirely depends on the fertility of the land for the growth of crops, prevails in this district. No single does of fertilizer is applied after seeding or planting seedlings.

In coca cultivation all the leaves grown are entirely harvested; no single leaf is left behind to decay on the ground. In this way the productive elements of the soil are completely exhasuted. In 10 years or 12 - 13 years, the land becomes so barren that it fails to sustain the smooth growth of wild grasses, let alone coca trees.

As the land consists of laterite, the top soil is washed away all the more during the rainy season. Everything is

lost in this process, including nutritious organic contents, fine soil particles and small pebbles. The top soil immediately after deforestation may be 20 - 30 cm thick, but it is reduced to 10 cm or less toward the end of the process described above, and a subsequent torrential rain or two wears channels in the exposed surface.

When the top soil is reduced to 5 cm, grasses manage to cover 20% of the land. But they cease to grow when the top soil is washed away completely.

It should be especially pointed out here that there is a large, government-managed coca farm in this district, that also depends entirely on plunder farming and that the land there is exhausted just as expected. There is another coca farm in a flat area near a small river which flows into the River Huallaya. This one also uses plunger farming.

Another point of note is that the number of farmers who raise hogs, ducks or domestic fowls is small.

With Tingo Maria as the hub a vast region fans out toward the north, measuring 4,000 km north and south and 30 - 50 km in width. The mountains along the eastern side of the region are called the "Blue Mountains" and are entirely covered with virgin forests.
There are small clearings here and there in the forests, which are mostly devoted to the cultivation of crops for home consumption.

It is understood that there is an ambitious plan to channel the water reserves in the east into the desert area of low productivity over the Great Andes. However judging from the current level of transportation and favorable environmental conditions in and out Tingo Maria, it will be of primary importance to take measures to secure the livelihood of farmers and stabilize their farming income, paying the gr atest possible attention to the conservation

of favorable ecological conditions.

6 Application of "Kumazasa" bamboo

The low "Kumazasa" bomboo here refers to Sasa paniculata. In Japan this bamboo is distributed widely from the coast of the Sea of Japan in the middle of the mainland through the north-eastern part of the mainland to Hokkaido, the northernmost island. It grows 1 - 2.5 meters tall. The leaf is large and oval and withers white along the edge in the winter. No hair is observed on the stalk and the sheath but soft hairs grow closely on the back of the leaf. Highly resistant to environmental changes, it is easily transplanted.

Botanically speaking, Sasa Veitchii include "Chugoku sasa", a garden plant, whose leaves grow thinner as winter approaches and wither beautifully white along the edge as it is exposed to the cold. It is thus typical of the kumazasa bamboos. It is known to grow wild in only isolated instances.

(a) Characteristics of Kumazasa bamboo

1) Erosion prevention

As mentioned earlier, coca farms are deserted in 10 - 13 years as the land becomes so exhausted that it cannot sustain the growth of grasses.

When kumazasa is planted between rows of coca trees when the farm has passed the prime days of its productivity (7 - 8 years old), it easily takes root and grows. The subterranean shoots grow more than one meter under the ground even in the barren soil of the deserted coca farm (they stretch themselves 4 - 5 meters in fertile soil) and put forth new shoots above the ground at 10 - 20 cm intervals. These shoots grow to put forth several leaves each. In this way the cover of bamboo leaves develops,

preventing other grasses and trees from germinating. If such cover continues to grow for several years, as young shoots and leaves are put forth every year, any other grass will be kept from growing on the land.

By the time the surface cover has developed to this stage the subterranean shoots from a powerful net under the ground which serves to hold the soil firmly enough so as not to be washed away by torrential rains. In addition, large quantities of fallen bamboo leaves decay on the ground to restore the fertility of the land from year. This also encourages the growth of soil bacteria, insects, earth worms, etc., which all increase the fertility of the land. The top soil whose fertility is recovered this way will never be washed away under the bamboo cover in the heaviest of rains.

2) Soil conservation for securing surface traffic

Consisting of laterite the land of Tingo Maria is poor in its capacity to hold water in heavy rains. Large quantities of cultivated soils and earth and sand in river basins are washed away into rivers every time it rains. This deprives the land of its fertility. In addition, laterite banks put up only a poor resistance against the pressure of swelling rivers. The resultant folids destroy roads, making it impossible to transport agricultural products to the market and impairing the farmer's will to work.

If the kumazasa bamboo cover is provided for river banks and road beds with its powerful net of subterranean shoots to hold the soil, these problems will be appreciably reduced.

3) Feedstuff

Kumazasa bamboo is one of the preferred feedstuffs for horses and cattle in Japan. For instance, an ailing horse takes to it even when it will not eat any other feedstuff. The advanced agriculture hereafter must satisfy diversified requirements including livestock breeding (which is essential) and improved ecological conditions for fish farming. Graxing in the fields covered with kumazasa bamboo will serve to further enrich the soil with animal droppings, which in turn will reinforce the under-

ground net of subterranean shoots of the bamboo, and hence the more effective prevention of soil loss. If so, water oozing out of such soil contains rich doses of organic matters and minerals and will be useful for fish farming.

4) Medicinal plant

Kumazasa leaves are known to contain large quantities of pectin and vitamin K and thus are usuful for medical purposes which in Japan include cancer prevention. After pectin, vitamin K and others of medical value are extracted from the leaves, the leftovers contain large quantities of N, P, K and organic matters essential to the cultivation of useful plants. They will thus be an effective fertilizer.

(b) Land fit for planting kumazasa bamboo

1) Little competion with otner plants

Kumazasa in Japan takes several years to grow one meter tall. In the first year its growth stops at about 20 cm. In the second year it grows to 30 cm or so, and 40 - 50 cm in the third year, and is also exposed to competition with other plants. Sufficient account must be taken of this competition when considering the feasibility of planting kumazasa bamboo in the area covered by the survey this time, because true grasses and brackens are found growing very strongly in many places surveyed due to favorable temperature and precipitation conditions. From this standpoint it will be necessary to avoid planting kumazasa bamboo in river beds. In other words, it will be advisable to center kumazasa planting efforts on deserted coca farms or clearings which are un-eroded, having been devoted to plunder farming.

2) Forest felled areas

Kumazasa bamboo planted in clearings developed by the slash-and-burn method will probably not compete with other snoots which arrived there naturally because it

usually grow one meter or more a year. If the bamboo is to be planted in such places, large quantities of seedlings will be required. The seedlings must be raised well in advance at deserted coca farms and the development of clearings by the slash-and-burn method should begin when the seedlings are two to three years old. The seedlings will them be planted in small lost so that the area covered by them may increase gradually. It will also be necessary to repeat weeding competitive grasses for several years after the seedlings are planted.

It will thus be more convenient to cultivate crops for several years on clearings developed by the slash-and-burn method so that kumazasa seedlings are planted among crops here and there at a density of two to three seedlings per 1 m^2 of land. These seedlings will grow on both sides of the ground while crop plant cultivation continues. The purpose of planting them will be achieved with time, free from the competition with useless but hard-to eradicate plants.

3) Timing and method of transplanting kumazasa

Judging from the natural conditions of Tingo Maria, it is advisable to transplant kumazasa from late December to early January, because: i) it will take root all the more easily in the rainy season; and ii) it will put forth shoots as soon as it is brought into a warm place like Tingo Maria, if it is shipped from Japan.

For planting it is advisable to deliver only the subterranean stalks of shoots. They must be wrapped in bog moss for transportation as soon as they are dug out of the ground are unnecessary parts removed. If exposed to the sunshine even for a short while and left to dry white, they wither and are useless.

Anotner point of note is that they must be covered with soil as soon as they are planted. They should be removed of moss and planted only one by one. The essential point is to "work

quickly not to let them get dried". Leaving them in boxes or wrapped in vinyl for a long time should be avoided completely.

4) Reforestation of land covered with kumazasa

If land covered with kumazasa is to be reforested, the following steps will meet the requirements. Grazing consumes especially new, young leaves, without which the bamboo will die in less than a year. For reforestation purposes grazing is thus most useful in the season when the bamboo puts forth new shoots. Tree seedlings to be planted in the place where kumazasa is dead or dying, should at least be more than one meter tall so that they may not be outgrown by new bamboo shoots, should they be put forth. Seedlings smaller than kumazasa will have an almost impossible time taying to survive.

It is also possible to use bamboo-killing chemicals. The withered bamboo is cut in the immediate vicinity of the planting hole and stamped into the ground. In this case the tree seedling as tall as the one mentioned earlier is preferred.

What few kumazasa left on the reforested land will wither naturally in a few years as the seedlings grow into trees. The bamboo leaves, stalks, shoots all decay to ultimately promote the growth of forest trees. Any misgivings about the possible adverse effect of kumazasa leftovers on the growth of tree seedlings are not justifiable.

7. Agriculture Hereafter.

Farmers will be increasingly required hereafter to diversify their interests, if not actual operations, from the conventional line of farming into forestry, livestock farming and further in to fish farming. The significance of this trend will increase in the future.

As they are deserted coca farms are nothing but waste lands. Plunder farming has exhausted the fertility of their soil so completely that they are not fit for grazing or conversion into grasslands or secondary forests, let alone farming.

Left unattended, they cannot sustain the growth of the seed.

In the circumstances the following countermeasures should be seriously considered (and implemented as soon as possible) before the situation gets out of control.

1) Reclamation of barren land into fertile land.

2) Promoted conversion into grazing fields.

3) Improvement of roads, road beds and transportation services so that natives may be assured of a dependable means of transport regardless of the weather, and thus be encouraged to settle down.

Waste lands other than those which must be reclaimed for forming should be positively redeveloped into secondary forests. This may pave the way for the inauguration of new forms of processing industries as well as enlarged farming forest development operations, very probably leading to an increased income for the natives involved. These possibilities should be explored before anything else.

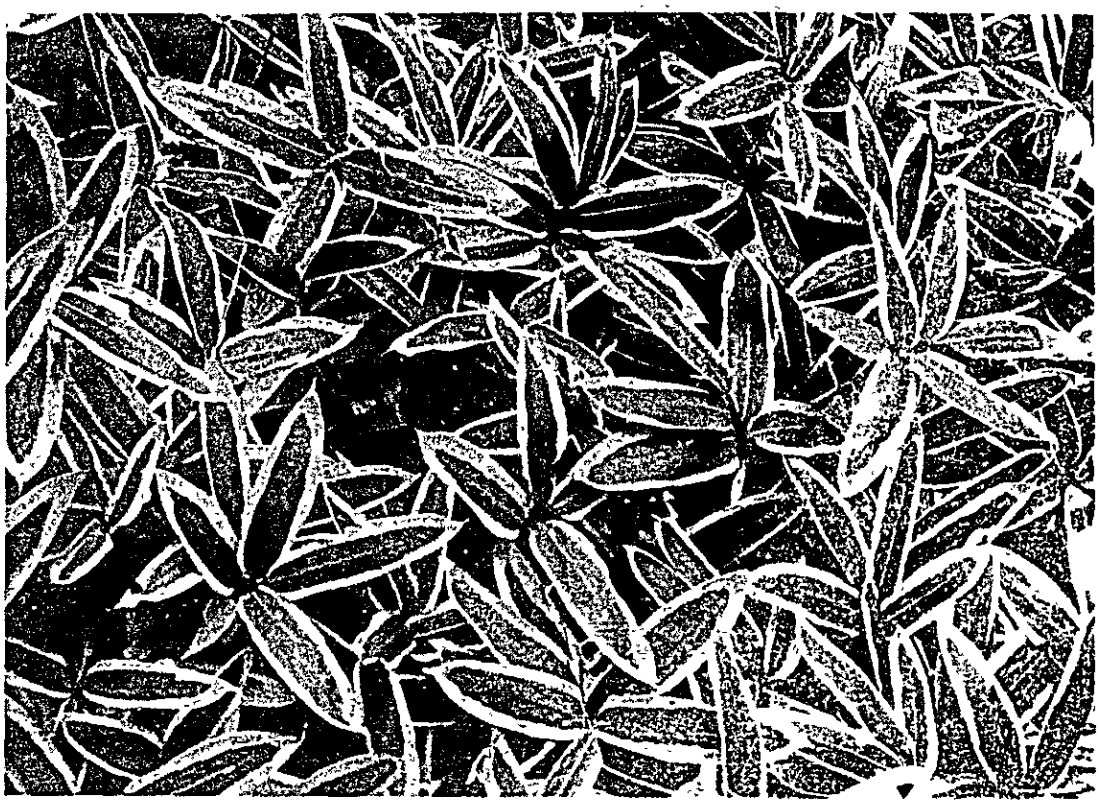
8. South American "Sasa"

It is sometimes said that "sasa" grows in Brazil, Peru, Argentine, Venezuela, etc. on the South American continent. The botanical fact is, however, that the geographical distribution of genuine sasa is limited to Japan, the southern part of Saghalien and part South Korea, and the spontaneous generation of kumazasa (temakizasa) is ristricted to Japan.

Genuine sasa is ligneous and its seed is covered with a seedcase. As it is a sun plant, it will not grow in a shady place. For this reason it propagates itself only in sunny places.

The South American "sasa", on the other hand, it herbaccous and its seed is covered with a thin skin. It is a weak plant growing in shady places under jungle trees. Although is certainly resemble the genuine one in appearance, it is all the

Sasa Veitehii



Sasa Paniculata

more difficult to cultivate as it is a shade plant. It will not grow unless it is planted in wet and shady places under trees. It is impossible to cultivate such a plant on any appreciable scale.

The difference from the genuine sasa also lies in the fact that the leaf is soft and contains almost none of the medicinal components such as pectin.

More concretely this herbaceous plant is divided between Platonia sp. which puts forth large leaves and grows 50 - 70 cm tall, and Chusques sp. which is shorter (20 - 25 cm) and known to be gregarious. Both of them come into flower and bear fruit at the tip of their branches every year.

The genuine sasa is characterized by a long subterranean stalk which puts forth shoots on the ground. These shoots are of course ligneous and have sheaths around the stalk as the grow. These sheaths do not fall for a long time or until they decay.

CHAPTER VII FUTURE PROMOTION OF COOPERATION

(1) Main Points of Peruvian Requests

As stated in I-1 the purpose of this survey is to "grasp the basic factors that will be required when considering the possibilities of technical and financial cooperation Japan may provide for forest development in Peru".
This is reflected in the fact that the survey activities have covered a considerably large part of the country. As for the possibility of one or two Japanese enterprises' cooperation with Peruvian development efforts (which possibility is the root cause of this survey), the survey team made an on-site inspection tour of the country after having heard the opinions of the Peruvian Government as to the requests having been made by the Peruvian interests concerned, and sought to understand the basic factors that will be instrumental in promoting timely and effective cooperation between Peru and Japan on these issues.

The main points of the Peruvian requests, including the contents of the survey team's discussion with the officials of the Forest/Animal Bureau of the Peruvian Government, are described in the following pages.

1) Cooperation and Requests Concerning Peruvian Forest

Development (Lumber Production, Promoted Reforestation) Japan is expected to actively develop the un-developed forests in the country in accordance with the legal system of Peru. This indicates an aporeciable difference from Brazil and others in the State of domestic affairs concerned. Much is expected of Japan as to the following items, regardless of the form of cooperation.

i) Improvement of the infrastructure for the transportation of lumber to the west coast area. Especially cooperation in effecting a switch to forest paths and national roads from conventional rivers as a means to transport lumber.

ii) Cooperation in market surveys for promoting the more rational sale abroad of forest products, which is the major product

of Peru.

iii) Cooperation in the reclamation of felled areas in the forestland, especially in Selva Alta.

v) Cooperation in Integrated Regional Development Taking Advantage Chiefly of the Taungya System of Management

With the natural, political and economic environments of the country as they are the Peruvian Government is especially aware of the backwardness of the country's agricultural, forestry and livestock industries and the necessity of stabilizing the livelihood of the rural inhabitants. It is placing greater emphasis on "Community Development" which is assuming growing significance in developing countries throughout the world, and expects to incorporate it in its integrated development plan, together with the participation of the communities concerned, in order to promote well-balanced development of the country's land resources.

It is against this background that Peru requested that the survey activities this time should be centered on the Tingo Maria district, a hub of political and economic activities of the surrounding country and is within about an hour's flight from Lima, and which is exposed to land erosion problems of growing proportions. They also expressed their wish for Japanese cooperation in developing a pilot estate there is step with the national policy of "Community Development". The Peruvian request is also based on the facts that the Tingo Maria district has a long history of Japanese immigrants, and that the agricultural and forestry operations there can be expanded technically in terms of crop plant types and tree species, and that the district has a good possibility of introducing a livestock industry.

(2) Japanese Cooperation on Industry or Government-to-Government Basis

a) Industry Basis

As described in IV-(2) the natural forests account for the majority of the Peruvian forestland of 84,500,000 ha. The supply capacity is thus very impressive. As it becomes increa-

singly clear that the world lumber demand/supply situation will be tightened further in the 2000's, advanced countries including Japan are placing their growing hopes on the vast natural forests of the Amazon in Peru as a major base for lumber supply, as well as the forest resources of Brazil and Colombia.

Judging from the country's weather conditions, people's customs and way of life and the state of development of the netional economy, the domestic lumber demand is not likely to increase so rapidly in the future.
The transportation of lumber by motor venicle to ports for shipment abroad has long been urged but has not yet materialized. The lumber of limited tree species is carried using the Amazon through the lengthy route of Pucalpa - Iquitos - Belem.
The Peruvian forest development efforts have so far entirely assumed this dependence on the river. They have not been very productive and the saw mills involved are mostly obsolete. Some of them are too outdated to continue operation.

The growing world lumber demand and the apparent limit in tropical lumber supply as described previously will inevitably raise lumber prices in the world market. But Peru will not be able to benefit from such a favorable trade climate as much as it should, if it continues to depend on the long-route river transport of its export forest products. This and the likely shifts in the distribution of population and urban development efforts of the country hereafter suggest it inevitable for the Peruvian lumber industry to move its material wood, processing and marketing bases to the west coast of the country.

Taking into account the future Japanese demand of lumber under these objective circumstances, Japanese cooperation in the orderly and rational development of the forestland up- and down -stream from Tarapoto, which is attracting the interest of some Japanese enterprises and has been inspected by the survey team this time, will assume major significance for Peru as well.

As has been pointed out by one or two Japanese enterprises these several years, purchasing activitias have been suppressed to

almost a minimal level due to the very limited availability of adequate road services.

The foregoing are based on the current state of affairs of a district which has been inspected by the survey team this time, and is regarded as a possible place of cooperation between Japanese and Peruvian interests for development.
But they serve to indicate clearly that the problems in the way of forest development in Peru are common to developing countries which are eager to open up their respective forest resources.
These problems are not in the transportation field alone.
They can be summarized as follows.

i) The forestland may have been surveyed in outline, but details of the area that may deserve development are not sufficiently known. This makes it highly difficult to draft development plans at the industry level.

ii) The exploration of a development system that will ensure the adequate reclamation of felled areas, an essential element of any forest development programs hereafter, still depends on studies and surveys to be conducted in the future, due to the very complicated nature of tropical forests.

iii) The small domestic demand tends to concentrate lumbering interest only on those tree species which are commercially preferred at present. This results in the continued decline in the value of the forest as a whole, and is also all the more likely to stand in the way of rational lumber production in the future.

iv) The very slowdevelopment of forest paths and general roads including national roads that should facilitate the delivery of forest products to the market is of course responsible for this discouraging situation in no small way.

v) Forest labor is short in both quality and quantity.
This also impairs the stability of lumber production.

vi) The export of logs is prohibited, but wood processing

industries of superior capabilities are too scarce.

Therefore, if Japanese enterprises are to work with Peruvian interests for the proper development of the Peruvian forests, it will be firstly necessary to ensure a good road service, which is the key element of successful forest development and reforestation. The investigation should follow in both financial and technial terms: i) the quantity and quality of forest resources to be developed; ii) the availability or feasibility of an optimum system for the reclamation of felled areas; iii) the possible extension of wood processing industries to places where labor is obtainable relatively easily; and iv) other requirements that must be satisfied in order to ensure orderly and integrated operations from the felling to the processing of trees.

Furthermore, reforestation prospects by both natural and artificial means should be examined in accordance with the reforestation obligations by the current forest law of Peru.

b) Government-to-Government Basis

Altnough findings in on-site surveys and researches having so far been conducted by U.N. organizations and interested advanced countries are certainly helpful, many problems remain to be settled before a decision can be made on Japan - Peru cooperation at the industry level. It should again be noted that these unsettled problems range far and wide, including forest surveys, lumber production, reforestation, wood processing, marketing, etc.

The Peruvians' belated start in utilizing their huge forest resources is attributable at least in part to their excessive dependence on their mineral and fishing resources, in addition to the barrier imposed by the country's natural conditions.

If the one-sided dependence on the limited types of resources continues hereafter, it might impair the sound, well-balanced development of the country. The natives of tropical forestlands failing to settle down due to too severe weather conditions and

overwhelming threats of epidemic and other diseases are known to move to high lands where environmental conditions are more temperate, not only in Peru but also in other developing countries. The lack of proper care for these natives inevitably leads them to practise the slash-and-burn method of cultivation. They subsist on primitive crops they manage to raise on clearings, whose productivity runs down quickly in a short time. Once deserted, these clearings become wastelands incapable of producing fuel woods or crops for some use. They only serve to accelerate erosion problems in the district.

Poor farmers having been denied any stable livelihood cannot help moving to some other part of the forest to practise plunder farming again, or to cities in order to find employment. This trend which is characteristic of many other developing countries has been observed by the survey team this time.

This illustrates the fact that international cooperation simply aiming at lumber production and reforestation in developing countries is quickly losing its significance.
Successful cooperation in forestry operations in a district containing many poor farmers depends on the complete recognition of the relationship between forest development and the improvement of local communities.

In this connection it is highly significant that the Peruvian Government's El Plan Tupac Amaru recently established encourages the participation of local inhabitants in forest development/conservation activities. The survey team has been informed of the strong Peruvian wish for Japanese cooperation in the development of an agro-forestry model estate in the Tingo Maria district. This request deserves full examination in respect to the contents of projected estate and other related factors.