

FARM-MARKET ROADS IN
NATIONAL DEVELOPMENT
IN THE CENTRAL ANDES

by

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Farm-market roads in national development in the
Central Andes

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C o n t e n t s

| | |
|--|----|
| Preface | 1 |
| Roads and Andean Development. | 4 |
| National Highway Policies | 8 |
| Breakdown of Regionalism. | 19 |
| Puquio | 20 |
| Huancayo | 21 |
| Specialized Economic Production for the Cash Economy. | 23 |
| Case: Viru. | 25 |
| Case: Quinti. | 27 |
| Case: Vicos | 27 |
| Case: Central Peru. | 28 |
| Case: Julcan. | 28 |
| Case: Hualhuas. | 29 |
| Manufactured Good Purchase. | 31 |
| Case: Vicos | 31 |
| Case: Huaylas | 32 |
| Case: Puquio. | 32 |
| Economizing | 33 |
| Railroad | 38 |
| Individualization | 40 |
| Case: Quinti. | 41 |

P R E F A C E

On 8 May 1963, Cornell University contracted with the Agency for International Development of the United States of America to conduct a survey of the feasibility of the University's contracting with the Agency to carry out a regional Indian integration program in the Andean countries of Ecuador, Peru and Bolivia.

The Andean Research Project of the Department of Anthropology carried out the contractual functions of Cornell University under this contract, No. AID/1a-110 (Regional) PIC/T 598-Z-89-AS-55243. The Department dispatched a senior Research Associate, Henry F. Dobyns, and a Research Associate, Miss Eileen Maynard to carry out the host-country phase of the feasibility survey. They left Ithaca on 8 May and with the Agency's representative, Miss Ann Brownell, reached Lima, Peru, on 10 May. The Andean Research Project provided another Research Associate, Mario C. Vazquez, its Field Director at Vicos in Peru, for the Peruvian and Bolivian phases of the feasibility survey. The Senior Research Associate returned to the United States with the Agency's representative on 10 June 1963. The Research Associate remained in Peru, active on contract analysis until 19 June.

The field survey team rendered two reports within ten days of returning to the United States. Report "A" dealt with the general findings of the field team with regard to the feasibility of Cornell University's carrying out a regional Indian integration program in the three countries aforementioned. Report "B" comprised a proposal by the University to the Agency for carrying out a four-aspect Indian integration program in the three countries indicated. Submitted on 14 June, Report "B" was shortly afterwards superseded by "A Modified Proposal" dated 19 June.

The survey contract calls for Cornell University to submit to the Agency for International Development two additional reports. One of these reports is to discuss social scientific manpower available in the United States to carry out the proposed Indian integration activities. The other is to summarize published materials relevant to the proposed developmental program. The short lead-time between the date of signing of the contract and the end of the spring semester at Cornell University prevented the Cornell Andean Research Project from assigning a graduate student to full-time analysis of published materials as contemplated in the contract. A significant number of books purchased by the Senior Research Associate during the survey trip for purposes of this analysis did not arrive at the University until 10 July.

The Senior Research Associate, on the other hand, had unexpected uncommitted time during July and August. The analysis of published materials has been carried out, therefore, in the main by the Senior Research Associate, assisted by a Peruvian Ph.D. candidate, Sr. Abner Montalvo V., who was able to devote the final two weeks of June to this activity. English quotations of Spanish texts have been translated by the author.

ROADS AND ANDEAN
DEVELOPMENT

Members of the Andean Research Project of the Department of Anthropology at Cornell University have proposed to the Agency for International Development that it support the formation and operation of mobile technical teams which would provide engineering and other technical advice and services to land-owning Andean Indian communities with proved local development capability.

The proposal in part takes cognizance of inability of such communities to obtain such services from their own national governments in the past, or to afford to hire them from private specialists. This is merely another way of saying that the proposal takes cognizance of national economic inability to provide such developmental services in the past, and defines these as a legitimate United States contribution to building up the material and social technology of Ecuador, Peru and Bolivia nearer to a self-sustaining level.

The Cornell Andean Research Project has in its files scores of requests from government-recognized Indigenous Communities in Peru asking for technical assistance. Most of these requests came from communities that have already proved their capacity for cooperative improvement work by

successfully completing one or more communally-built projects. Most requests are for farm-market or town access road layout along Andean mountain slopes, for hydroelectric installation engineering, for irrigation dam and ditch construction layout, and similar medium-scale endeavors beyond the capacity of simple folk-engineering skills possessed by members of largely illiterate, uneducated rural communities, yet not generally requiring a high order of engineering knowledge.

The Cornell Andean Research Project proposed to AID that it support teams to provide such services to Indigenous Communities requesting them. The Cornell Andean Research Project envisioned the teams as being composed of a general engineer, an assistant, a driver-rodman, and a photographer-social scientist. The requests already received from Indigenous Communities would provide a number of immediate starting points in Peru. Similar requests can certainly be found quickly in the files of the Ministry of Peasant Affairs in Bolivia, as the contract feasibility survey team determined. There is little reason to doubt that similar requests can be easily encountered in Ecuadorian ministerial files as well.

The manifest function of the mobile technical services teams proposed by the Cornell Andean Research Project would be to provide specific requested technical skills to local

rural communities that would permit their further or more rapid development. Their local improvement would in turn contribute to their regional and national economies. The present lack of such technical services, at least on any prompt basis, constitutes a definite stumbling block to in-place rural community progress in the Andes. Certainly it slows down the pace of general rural and therefore national development.

In a larger sense, the latent function of the proposed mobile technical services teams would be to encourage and to stimulate rural as opposed to urban development and to foster in-place rural progress while diminishing the many motivations for migration to cities. Under existing Andean conditions, rural residents enjoy relatively few comforts of urban life. To the extent that roads, stable irrigation systems with water storage facilities, electric lighting systems, sewage disposal and potable water systems can be provided rural populations, they can become competitive with Andean cities for population. As long as only urban centers offer such conveniences, plus moving picture theaters, high wages for industrial employment, and administrative centralization, rural-to-urban migration such as already characterizes Peru will continue to accelerate and to swamp existing and under-construction urban facilities.

The feeling of nearly complete abandonment by central government that characterizes much of rural Peru, at least (Cornejo 1959: 153-4), forms a fundamentally important psychological factor encouraging rural-to-urban migration. To the extent that rural communities willing and able to work cooperatively if provided technical direction receive it, change can be expected to occur in existing patterns.

While the Cornell Andean Research Project has proposed that the AID support the formation and operation of mobile technical teams, the members of the Project do not pretend that this is the only institutional means suitable for working toward the goal of providing rural communities in the Andes with technical advice and services they desire and require. It is one means which the members of the Cornell Andean Research Project predict would be effective.

The important point so far as the policy decisions of the Agency for International Development is concerned is that Andean rural communities urgently require engineering and other technical services to enable them to make efficient use of their own local materials and cooperative labor capacities. With their local material and human resources combined with external technical assistance, many rural Andean communities can accomplish a great deal toward placing their own future social and economic

development upon a sound, self-sustaining and democratic basis.

This report concerns, therefore, analysis of the importance of one of the rural improvements for the execution of which Indigenous Communities most often seek outside technical assistance. This report examines the social and economic effects of opening farm-market or rural town access roads in the central Andes.

The United States Department of State (1962: 22) has recognized that "The inadequacy of transportation facilities has been one of the most important factors retarding Latin America's development." The Department considers Latin America to be short of "good roads" and the cost of building new ones to be "very high." The State Department credits all of Latin America with 400,000 miles of "highway," and considers that: "The Andes Mountains are a tremendous barrier to transportation."

National Highway Policies

These truths have long been recognized by residents of the Andean area. The former Peruvian president Nicolas de Pierola in 1912 stated that "roads precede the temple and the school, precede governmental action, and the rule of law and right, and industry, because roads are the condition to all of them" (Castagnola 1936: 17). The Dean of the Faculty of Philosophy, Letters and Sciences

in Ecuador's Central University recently labeled the "communication routes" as the "routes of progress" in calling upon the reformed Indo-American Universities to study, among other things, "the networks of highways appropriate for the economic development of the country and the imperatives of a greater cohesion of national spirit" (Verdesoto S. 1961: 39). The Bolivian National Planning Board (Junta 1963: 26) considers the "lack of communication routes and, consequently, the isolation of important population nuclei" as one of eleven principal obstacles to rural progress in the country. Another of the principal adverse factors appears also related to dearth of complementary economies in the different geographic regions of the country. Others include high percentage of illiteracy and peasant conservatism, especially among women, and minifundium.

Such national thinking agrees closely with the generalizations of economic analysts of the development process. Eugene Staley (1961:252), for example, commented that "such things as isolation from town markets for lack of roads" combined with greedy and not very efficient middlemen, unequal taxation, deficient rural education, poor health, population pressure, and various land tenure systems that divorce the actual cultivator from control over the land he works inhibit socio-economic development and create the need for agrarian reform in the widest sense.

The three central Andean nations have long carried on national trunk road construction programs. The Peruvian government may be said to have formulated "a definite policy regarding the building of roads" as early as 1916 by creating a special corps of highway engineers (Tschopik 1947: 18). "With the government of Leguia (1919-1930), the wheel began to function, but already as the wheel of the automobile and truck, to traverse the audacious highways that have since then been conquering the defiance of our uneven geography" (Valcarcel 1957: 7).

Central Andean trunk highway construction was materially aided by United States subsidization of the paved Pan-American Highway. "Today the Inter-American Highway is the only road linking most countries in Latin America" (U.S. Department of State 1962: 22). It is the major all-weather road link between Ecuador, Peru and Bolivia.

Built along the Pacific Coast of Peru for approximately 2,750 kilometers, the Panamericana constitutes the only long-distance paved route in that country (Coverdale and Colpitts 1961: 21). It forms the main communication link uniting the Peruvian provinces. No railroad parallels the Inter-American Highway for the whole length of the coast. This highway also constitutes Peru's only longitudinal highway, so that Andean montane penetration roads all depend from this Northwest-Southeast trunk route.

The Inter-American Highway route traverses both Andean mountain valley and coastal lowlands in Ecuador, constituting there also the main longitudinal trunk road from which east-west penetration roads depend.

Bolivia lacks any main highway of the quality of the Inter-American route in Peru and Ecuador, but its section of the Inter-American Highway forms a major artery in the Bolivian road network.

The trunk road system of the three central Andean nations beyond the Inter-American Highway leaves many areas without wheeled transport, despite one author's comment soon after World War II that "the various regions of Highland Peru which were formerly remote and inaccessible are today knit together by an admirable system of highways and roads" (Tschopik 1947: 18). One of the campaign emphases of the recently elected President of Peru, Arq. Fernando Belaunde Terry (1959: 27), was that thirty of the 146 provincial capitals in his country remained without external road connections. This amounted, as the candidate pointed out (Belaunde T. 1959: 33), to twenty per cent of the provincial capitals of Peru.

Nor is this situation likely to be soon improved. The ten-year trunk road construction program of the Republic of Peru worked out on the advice of a U.S. consulting firm needs to concentrate upon maintenance of existing trunk routes in order to protect investments already made in road construction. For "one of the most urgent problems facing

the Highway Department today is achieving promptly the proper maintenance of the existing roads and planning to assure good maintenance of the future road network of Peru." If maintenance is not accorded top priority by the Peruvian highway department, "the Peruvian Highway System will continue to deteriorate and the ambitious program for new construction and highway improvements will have become a waste of time, money and effort" (Coverdale & Colpitts 1961: 93).

In 1961, the Republic of Peru boasted 4,293 kilometers of paved highway, augmented by 9,433 kilometers of graveled surfaced roadways supplemented by 11,707.5 kilometers of dirt roads. Another 16,094 kilometers of trails, primarily truck trails passable in dry weather (Coverdale and Colpitts 1961: 71-72), constitute the bulk of the farm-market and access roads of the country. This is the large road investment deteriorating for lack of proper maintenance. The total road system of all types of 41,528 kilometers gives Peru a highway system of only about 25,810 miles (Coverdale & Colpitts 1961: 23).

Only some 2,042 kilometers of new construction would be added to the existing road network during the ten year period 1962-1972 and 5,620 kilometers of existing routes would be improved under the master plan of the Peruvian highway department recommended by its consulting

engineers (Coverdale & Colpitts 1961: 195). Even that scale of improvement, far below optimistic Peruvian dreams, would require devoting one per cent of the gross national product of the country to highway construction and maintenance (Coverdale & Colpitts 1961: 249).

With central government resources committed of necessity to trunk road maintenance and construction, rural Indigenous Communities are not going to be tied into the highway network for many years, perhaps decades, to come, unless they build their own farm-market and town access roads.

That is precisely what a large number of rural farming communities have already done. A Cornell Andean Research Project survey of Indigenous Communities recognized by the Peruvian government found that 44.7 per cent of them had constructed their own farm-market roads employing their own manpower, tools and local materials. Many such access roads were initiated during the eleven-year regime of President Augusto Leguia, 1919-1930, and completed many years later.

The concern over rural roads Arq. Belaunde Terry expressed during his years of campaigning may materialize as one of the major efforts during his administration as president of Peru. At any rate, a news story published in the United States on the day he was inaugurated emphasized his committment to highway construction. The

article cited officials of the U.S. Agency for International Development as believing that the restoration of civilian government in Peru would make the country eligible for development loans that had been under study. "High on the list is a \$2,200,000 request to purchase equipment, materials and supplies for secondary roads through Indian communities" (Onis 1963: 23).

A few days earlier, the author talked with a campaign associate of Arq. Belaunde T., Sr. Eduardo Orrego, who was in Washington D.C., to sound out the Agency for International Development on a loan proposal for approximately \$11,000,000 with which to purchase equipment to be used mainly for road building in rural Peru. Sr. Orrego mentioned a plan for establishing equipment pools in various zones to rent machines such as bulldozers, trucks and tractors to local districts which would supply their own labor in return for government compensation.

The Belaunde administration also appears likely to push construction of a major high-altitude longitudinal highway in Peru. "Starting, traversing, and ending nowhere so far as contemporary economic significance is concerned, it would consume vast quantities of resources in a country still largely lacking adequate highway facilities in the settled areas," according to William Glade (1961: 29) who regards the idea as among "the

most outlandish notions" that "enjoy a receptive audience" due to "the primitive state of public intelligence." As envisioned by Belaunde T., "This is a highway, running from Colombia, through Ecuador and Peru, to Bolivia along the lower eastern slopes of the Andes overlooking the Amazon basin" (Onis 1963: 23). Belaunde T. reportedly believes that such a road would open up a new habitat that would draw population off the highlands. Pietro Vigna, chief of the USAID/Peru civil aviation assistance group, estimates the cost of building a third category road useable all year round in the Montana zone at not less than \$11,000 per kilometer. A road through mountainous and heavily timbered terrain between Caranavi and the Alto Beni in Bolivia cost \$22,000 per kilometer. Another between Sucre and Cochabamba over rolling ground still cost \$12,017 per kilometer (Hedgepeth 1963: 1). The Vigna cost estimate appears, therefore, to be eminently conservative as to the likely minimal cost of the Amazon Basin marginal highway envisioned by the incumbent president of Peru.

There is nonetheless something to be said in favor of building a longitudinal route in the Peruvian highlands as a long-range development project. The traffic-counting approach to planning highway construction and improvement can never provide the objective data for truly long-range planning of highway routing in an area such as the Andes

where vehicular roads are the first roads traversed by wheels, and only packtrains and human beasts of burden are displaced. Economic and social planning combined with political perceptiveness are required, for traffic can be counted only where some sort of road exists already to carry it. It is quite impossible to count traffic on a non-existent route that may alter the sociological and economic characteristics of an underdeveloped and hitherto roadless region.

A functional high-altitude highway in Peru would have numerous advantages. Constructing such a route would link up many mountain settlements now still isolated and not, therefore, contributing much to the national economy. A high-altitude route could carry much traffic that now must descend to the coastal Panamerican Highway and climb up again at another point at high cost in gasoline, oil, and vehicle depreciation. Continual high-altitude operation over shortened routes would economize on expensive vehicles, fuels and lubricants, as well as time.

The communications system of Ecuador is in much the same situation as that in Peru. Milton S. Eisenhower (1963: 132) points out that an Ecuadorian cabinet member once informed him that "his country had three needs: roads, roads, and more roads." According to Eisenhower, the mountainous Andean terrain frequently

cuts rich agricultural regions off from centers of industry "making internal traffic and trade difficult and sometimes impossible." According to USAID/Ecuador (1963: 14) "An estimated 67% of the cultivable lands in the Pacific Coastal lowlands is unoccupied, principally due to lack of access roads." An estimated 8,000,000 cultivable hectares in the rain forest "east of the Andes has thus far not been touched by either agriculture or colonization because of a lack of penetration roads and transportation."

Dr. Eisenhower (1963: 133) also commented that when Bolivia set out to reduce its food imports which ran up to fifty per cent of food consumption, it "found that it would first be necessary to build a highway to open rich farm lands in order to increase and diversify food production." The Bolivian ten-year plan calls for the public sector to dedicate itself principally to public works such as roads (Jordan Pando 1963: 21). An internal food supply system has not been developed in Bolivia, just as a national corps of engineers capable of carrying out an analysis of the feasibility of establishing tin smelters within Bolivia has not been developed, because of over-reliance upon mining. "This is our deficiency as a country, as Bolivia. We have been deformed because all has been directed toward mining. One could have talked of the "tin army" just as one could have talked of the "tin university" (Jordan Pando 1963: 30).

The Andean Indian Programme lowland resettlement effort in the Bolivian Oriente was undertaken without awaiting all-weather road construction. The colony is traversed by the railway between Santa Cruz and Corumba in Brazil. "The road connecting the base with Cotoca and Santa Cruz is very bad and is impassable in the rainy season. This has constituted one of the most serious obstacles to the development of land settlement." The Bolivian Development Corporation and USAID/Bolivia have reached an agreement leading toward construction of an "adequate" road expected to lead to healthier economic development of the colony (Panel 1962: 23).

The principle of strategic intervention in Indigenous Community affairs in the Andes calls for providing still-isolated communities desiring farm-market road links to the national highway systems with technical services sufficient to permit them to employ their own labor and tools to road construction. There can be no doubt of local community capacity to punch farm-market routes through difficult Andean mountain terrain, in view of the hundreds of such access routes already constructed by hand labor. There can also be little doubt that one of the main bottlenecks in releasing local community road-building initiative is lack of civil engineering skills or services to lay out practicable roadways before construction starts. By the same token, the grade and

curve characteristics of many of the already-built farm-market and town access roads clearly show the desirability of roadway layout by engineers prior to construction, since many have been built by rule of thumb principles by empiricists not overly familiar with the characteristics of vehicles powered by internal combustion engines, for lack of engineering services.

The farm-market and town access road fairly clearly constitutes one key factor in modernizing rural Andean indigenous communities. When the Indigenous Community is connected to national trunk highways, local residents are able to travel much more readily and rapidly than before to the national capital and to other urban areas, and a great many modernizing influences reach the rural community along the roadway. The "profound changes in the lives of the Highland peoples" produced by expanding highway and road networks supplementing railways were already clearly discernable at the end of the second World War (Tschopik 1947: 18).

Breakdown of Regionalism

The Andean population has historically been characterized by tremendous regional differences in culture. The relative difficulty of travel across the Andean topography has clearly contributed to this extensive regional differentiation through time. The modern internal combustion engine powering wheeled vehicles moving along

man-made roadways is without doubt the single most important factor in breaking down regionalism. "The rapid and recent increase in means of communication has had sweeping effects on the population of all Peru." (Tschopik 1947: 18).

Puquio. The city of Puquio, capital of the Province of Lucanas, in Peru's Department of Ayacucho, is a case in point. Four ayllus recognized as Indigenous Communities for approximately twenty years -- Qollana, Chaupi, Pichqachuri and Qayao -- make up this city (Arguedas 1956: 184). The Province of Lucanas formerly belonged to the cultural and commercial area of Huamanga, dominated by the Departmental capital of Ayacucho. Since the construction of a modern highway, first opened by voluntary Indian labor in 1926, the Province belongs to the growing area of influence of Ica on the Inter-American Highway on the Pacific Coast. The arrival of the highway converted Puquio, moreover, "from a small city of landlords and Indians into an active commercial center. The ancient norms are being broken with progressive rapidity." The old landlord "high society" has disappeared (Arguedas 1956: 186).

Andean highland commercialism can be measured quantitatively. Whereas Puquio had only eight commercial stores in 1935, by 1956 it had no less than 137! (Arguedas 1956: 187). Although this commercial expansion has been

in Mestizo hands, Arguedas comments that their commerce is complementary to Indian agriculture and stock raising, not competitive.

The movement of Peruvians from mountain valleys to the Pacific Coast has constituted a notable migration for at least two generations that have witnessed the major road-building effort in that country. Rural to urban migration within the Andean provinces has also occurred very rapidly where modern means of transportation create favorable social and economic conditions. Just as the Vicos experiment constitutes a key proof of the feasibility of in-place rural community development in the Andean highlands, (Holmberg 1960), so does the modern history of Huancayo constitute key proof of the feasibility of in-place urban community development in the Andean Highlands.

Huancayo. The key event in the urbanization of Huancayo was the construction of the Central Railway to that then-town in 1908. It "was converted almost overnight from a small native market town into a thriving commercial city; the system of barter which formerly prevailed in the surrounding towns has today been almost entirely replaced by a money economy" (Tschopik 1947: 19). The opening of the Central Highway competing with the Central Railway has simply reinforced the strategic location of Huancayo and accelerated its

growth. The process of modernization of the Indigenous Communities in the Mantaro Valley of the Department of Junin has gone hand in hand with the burgeoning of the city of Huancayo. The railway and highway both permitted the Indigenous Communities to place themselves in rapid contact one with another, as well as with the mining and smelting centers, the national capital, etc.

In 1616, Huancayo was simply a settlement of muleteers on the road to Cuzco from the coast (Arguedas 1957: 99). Before the Central Railway was built, "the Mantaro Valley was inhabited by a population whose culture differed not from that of the other interandean valleys in the South such as Ayacucho, Andahuaylas or the Vilcanota" (Arguedas 1957: 120). Huancayo was given the title of city only in 1822 (Tschopik 1947: 34) and had an urban population of only 5,948 according to Peru's 1876 census (Tschopik 1947: 35). In 1940, however, the Peruvian national census returned 26,729 persons in Huancayo (Garayar 1959: 61). The Peruvian national census of 1961 then enumerated 46,014 inhabitants in Huancayo (Garayar 1962: 34b). So Huancayo now constitutes one of the main industrial, commercial and cultural centers in Peru. Lima is "the most powerful center of diffusion of contemporary Western culture" and Huancayo is its frontier with relation to the "very uniform and extensive southern area that begins at the

limits of the Province of Huancayo and is made up of the Departments of Huancavelica, Ayacucho and Apurimac." Huancayo receives the production of this area, and acts as a perturbing influence upon the old colonial structure of this underdeveloped area (Arguedas 1957: 141). In sum, "Increased facilities for travel are tending to break down local institutions and to obliterate local differences in custom" (Tschopik 1947: 19).

Specialized Economic Production for the Cash Economy

One effect of the farm-market road that is of vital importance in the modernization process in the Andes appears to be its stimulation of commercial specialized agriculture. Under conditions of relative geographic isolation such as obtain in the Andes, when all goods must move on men's or animals' backs -- cart or wagon trails being virtually unknown -- rural communities have generally engaged in subsistence agriculture. Very little or no surplus over family subsistence needs has been grown, largely because no feasible market existed for bulky agricultural products because of the very high cost of transporting them. Much of the Andean mountain region has been characterized by a barter market in foodstuffs and a few basic necessities, rather than a cash economy, under near-subsistence agricultural conditions. Some specialization in crop production existed in accord with differences in altitude or valley

microclimates, and special markets such as muleteers' pack animals requiring large quantities of fodder. Thus farmers in one area bartered maize for hot peppers or guinoa grown in distinctive areas, but this barter maintained an adequate and varied diet rather than providing any monetary profit for the producers. True, in some highland villages up to a third of the population might be engaged in petty trading -- moving such produce from one place to another -- in order to sustain itself, but this barter market system operated fairly independently of the world cash economy.

The farm-market road encourages the production of an intentional agricultural surplus over and above family subsistence needs, a surplus raised for sale for cash in the urban market. The cities of the Andean region already participate markedly in the world market economy. Thus the construction of farm-market roads typically links rural Indigenous Communities up with that cash economy for the first time to any significant extent, and also helps to provide the cities with domestic food products to replace those formerly imported to feed growing urban populations.

Another fundamentally important change in rural indigenous agriculture often brought about by the farm-market road and its consequences is specialized farm production. At the same time, the construction of access roads may well alter previously established

agricultural specialties based upon an animal transport system. In the countryside around the city of Ayacucho in Peru, "Formerly before the highway was completed, large quantities of alfalfa were produced to feed the extensive mule trains of the arrieros." (Tschopik 1947: 29). Discussing the Peruvian Indigenous Community, Buitron (1946: 49-50) observed that: "Another factor that aids assimilation is participation in the national commerce, be it by means of specialization of the community in the manufacture of clay vessels, hats, weaving, etc., or be it by means of cultivating commercial products or the sale of crop surpluses." Specialization generally requires increased technological knowledge.

Case: Viru. "A pattern of commercial farming and industrial life based on specialization and a money economy" came to be accepted in the coastal Peruvian town of Viru following construction of the paved Inter-American Highway through the Viru Valley. As Holmberg (1950a: 415) has indicated, "improvement of communications and the introduction of modern technology from the United States and Western Europe" set off rapid change in Viru, where the traditional value system "is simply not consistent with trucks, tractors, and airplanes, with radios, telephones, and movies." In couching this discussion in terms of roads, the fact must not be lost

sight of that it is the truck, bus or other vehicle providing transportation service along the road that really constitutes the key influence toward modernization. For where road traffic simply passes through town, road influence is minimal, as in Quinoa in Peru's Ayacucho Department. (Tschopik 1947: 32) or Choclococha in Huancavelica (Tschopik 1947: 23).

Locally owned buses and trucks providing regular transportation to other settlements appear to be correlated with economic development and modernization of the rural town environment. Thus Sicaya with three buses and a truck giving daily service had piped domestic water, albeit inefficient, telephone, post office, boys' and girls' schools, a priest's residence, municipal mill, and agricultural school (Tschopik 1947: 42-43). On the other hand, Chupaca with four locally owned buses making daily trips had a large spacious principal square planted with trees and decorated with monuments, concrete sidewalks and benches, two story municipality building, restaurants, police station, post office, telegraph office, pharmacy, moving picture theater, resident priest, three elementary schools and a normal school (Tschopik 1947: 37-38).

Case: Quinti. In recent years, the economy of San Lorenzo de Quinti, an Indigenous Community in the Province of Huarochiri in Peru has been based largely upon making a special type of cheese for sale on the Lima metropolitan market. The mountainside dirt farm-market road connecting San Lorenzo de Quinti to Lima was built by residents of communities located along its route. Started in 1919, it reached the provincial capital of Huarochiri in 1944 and Quinti in 1947 (Cotler 1959: 15). Cheese production has meant a shift from row crop to alfalfa cultivation in order to provide pasturage for the milch cows (Cotler 1959: 26).

Case: Vicos. Since 1957, the Andean Community of Vicos (not officially recognized as a Comunidad Indigena) has earned large community income by raising potatoes for sale directly on the Lima wholesale market 450 kilometers away. This community farm enterprise could not pursue its profitable agricultural specialty without the farm-market road six kilometers long that connects the community with the national highway traversing the Callejon de Huaylas and linked to the Pan American Highway. Specialization in potato production characterizes not only the community farm enterprise, but also the individual Indian farmers. During the first quarter of 1963, 103 Vicos farmers shipped individually grown and owned potatoes to the Lima wholesale market, realizing an average cash income of S/. 961 from their sale.

Case: Central Peru. The inter-Andean valleys of Central Peru abound in examples of specialized economic production by rural participants in the cash economy. The Tarma Valley, for example, is extensively planted to truck crops for the urban markets of Cerro de Pasco, La Oroya and Lima. Carrots, artichokes, fresh maize, cabbage are locally favored crops, observed by the author in 1962.

The Mantaro River drainage settlements specialize in much the same way, and have for some time. "The Jauja Valley towns, which were once largely self-sufficient communities, now depend upon many manufactured articles from the outside and, in addition, produce cash crops for the Lima market" (Tschopik 1947: 19).

Case: Julcan. In the past century, Julcan was noted for specialization in shoe production. In 1939, "Julcan had 60 shoemakers, Huancayo 51." Because the Mantaro Valley where Julcan is located had been converted into a large market, especially in the city of Huancayo, capitalists installed shoe factories in that city. This enormously affected the artisans in Julcan. "They found themselves confronted by clear alternatives: either they could import machines and install factories, or they could accept the possibility of being ruined in a short time." In the event, "Two of the most expert shoe makers...

purchased machines in Lima and installed factories in the town" (Arguedas 1957: 137), thus capitalizing Julcan's traditional specialization under conditions of rapid industrial transportation in central Peru.

Case: Hualhuas. In contrast to Julcan, Hualhuas at the end of the past century was not specialized to weaving which has since become its specialty. "Nevertheless, now all the members of the community dedicate themselves to the industry, either part-time or professionally." Until World War II, all the local production was destined for the provincial Indian market. Then a merchant from La Oroya suggested to some weavers producing rugs and throw rugs in different sizes, weaving into them "Incaic" designs aimed at appealing to the tourist market. He promised to purchase all the production of certain weavers. They accepted his proposition, and he provided them with historical texts with color illustrations of prehispanic ceramic designs. The experiment was successful, "and all a class of weavers, the Mestizos, dedicated themselves to producing the new type of work." Demand created competition, forcing the weavers to improve their old looms, and learn to spin on spinning wheels. The innovator from La Oroya was unable to absorb the production, and weavers installed selling posts at fairs. Freed from direction, the designs have become

sterile and freely interpreted by the weavers, but "the textile industry of Hualhuas is found in this state of prosperity" (Arguedas 1957: 137-138), based upon initiative and specialization that built upon the new economic base opened up by railroad and highway construction in central Peru.

Modern transportation which has greatly extended the range of the small trader permits a marked degree of local specialization in producing goods for sale in the Andean markets. The great Sunday market at Huancayo provides a good example of commercialization of specialized production. There vendors offer fine glazed ceramic wares from Aco and Andahailas, utility vessels from Mito and Orcotuna, decorated gourds from Pariahuanca or Piura and Lambayeque, wooden articles from Pariahuanca and other towns on the Amazon basin border, shoes from Jauja and Chupaca, felt hats from Cajas, woven goods from Ayacucho and Hualhuas, woven goods and jewelry from San Geronimo, knit goods from Juliaca, cotton goods from Huancayo, Sicaya and Lima, furniture from Jauja, Huancayo or San Geronimo, hides and horse trappings from Chongos and Huancavelica, rope from Sapallanga (Tschopik 1947: 36-37).

Manufactured Good Purchase

The commercial agricultural production encouraged and made economically feasible by farm-market roads in the Andes also typically opens up the mountain village as a market for manufactured goods of many types. The sale of surplus agricultural produce provides indigenous community farmers with cash with which they can purchase goods they could not afford to buy as long as they farmed on a subsistence basis. The farm-market road also permits trucks to haul in objects of a size difficult to accomodate on horse or mule back, even broken down into component parts. From the purely commercial point of view of the importer or manufacturer, the indigenous communities of the Andes still lacking farm-market and town access roads are to be regarded, then, as potential markets.

Case: Vicos. Vicos has purchased out of community farm enterprise profits one heavy-duty Ford truck, about a dozen Dutch-manufactured back-pack spraying machines, and many iron and steel hand tools. Individual families nowadays purchase bottled beer, alcohol, soft drinks, several forms of pasta in addition to small amounts of bread they have always purchased as a treat, kerosene, and cotton cloth among consumer goods, and have invested in a number of Singer sewing machines by way of capital

goods. While the six kilometer farm-market road was not a sufficient condition for these purchases, insofar as sweeping sociological and farm technological changes had to occur after the road was built before the cash income to pay for them was created, the road has been a necessary condition, particularly for the truck purchase.

Case: Huaylas. An administrative district with a 1961 population of approximately 5,500 individuals, Huaylas built a seventeen kilometer access road from its central town to the Callejon de Huaylas trunk highway between 1927 and 1942 (Doughty 1963: 262). Like the shorter farm-market road into Vicos, this Huaylas-built road permits the trading town to be serviced regularly by trucks carrying manufactured goods. A liquor company truck makes regular calls, for example. When the community put up its own power transmission lines to the Santa Corporation generators at Los Cedros, electric iron sales skyrocketed as soon as twenty-four hour electric service became available. Electric grain mills cut the price of milling services to half the price of diesel-powered mills, both types hauled in by truck over the community-constructed access route.

Case: Puquio. The increase in stores from eight in Puquio in 1935 to 137 in 1956, with maintenance of Indian political power during the same period provides

another noteworthy case showing the effects of highway construction and truck transport. Although Mestizos sought and obtained recognition of the four Puquio ayllus as Indigenous Communities, and the president now presides over meetings instead of the traditional varoyoc, "the economic power of the Indians, who are small proprietors in Puquio, and the solid influence of the Indian communal authorities which was very great prior to the official recognition, have frustrated the illusion of the Mestizos" that they would gain political dominance. "The Mestizos live from commerce, and the increase in value of agricultural and livestock products has increased the acquisitive power of the Indians" (Arguedas 1956: 187) since highways reached Puquio.

Economizing

The road for internal combustion engine-powered wheeled vehicles in the Andes introduces a very important element of economic competition into the rural village, as well as other sectors. The roadway permits competition between truckers for cargo and passengers, holding down the cost of moving both people and goods. The trucking industry in Peru, at least, is a major area of private enterprise, predominately on a relatively small and intensively competitive scale. While several bus companies operate on regular schedules over fixed routes, truckers

are not even so well organized. A recent consultant firm analysis of Peruvian trucking found that there are several trucking firms operating twenty or more trucks, but most non-industrial cargo is handled by small contract operators and itinerant or "tramp" service (Coverdale & Colpitts 1961: 19). There is little reason to believe that the Bolivian situation is very different, although the smaller geographic extension of Ecuador permits more regularly organized bus service to at least the highland portions of that republic.

Another type of competition the highway provides is external. The truck operating over farm-market and town access roads invariably puts the pack train out of business. In the Mantaro Valley, "trains and trucks have made the arrieros obsolete in many regions" (Tschopik 1947: 19). Pack train operators compete for loads, among themselves, but their operating costs are so high in relation to load carried that they are not able to compete against truck haulage. This directly affects the economy of villages which specialize in muleteering. "In former times the arrieros of Carmen Alto made frequent trading trips via Huaitara to Ica and Nasca on the Coast to trade Highland products for wines and aguardientes. Today truck transportation has largely taken over this traffic" (Tschopik 1947: 31). Again,

"Formerly arrieros from Chupaca made several trips yearly to the Chanchamayo region of the Montana and to the lowlands of Huanuco Department to purchase oranges, avacados, coca, and other tropical products. Owing, however, to malaria contracted in the jungle and to the competition offered by trucking companies, these journeys are at present made less frequently" (Tschopik 1947: 41).

Farm-market road construction both lowers the unit cost of packing foods on horse or muleback, and increases the tonnage that can feasibly be laid down in the rural town or village. One response of the professional muleteer to truck competition is a shift to two or three month long trading trips through isolated highland settlements, trading manufactured goods for local produce, skins and animals (Tschopik 1947: 30-31).

The railroads built during an earlier period of Andean development also compete effectively with packing. The basic reason is purely economic - a muleteer's pay alone often exceeds the ton-mile cost of moving freight by rail (Stearns 1950: 84). The construction of the Central Railway to Huancayo profoundly altered the pattern of traffic of people and goods into central Peru. In pre-railroad times, the major footpath to Ayacucho from the Peruvian coast was a 302 1/2 kilometer route from Ica. Riders made the journey in six or seven days.

Pack trains took eight or nine days to traverse this distance. The Department of Ica suffered a considerable economic loss when the Central Railway opened because it had previously exchanged many products with Ayacucho and Apurimac via the foot-trail, a commerce largely displaced by the Central Railway (Ruiz Fowler 1924: 142).

"Ayacucho was quite literally squeezed to death between two railway terminals, Huancayo and Cuzco, to neither of which did it have access" (Tschopik 1947: 19). The Central Railway reached Huancayo from La Oroya in 1908, the same year the Southern Railway was finished from Puno to Cuzco. A Central Railway spur was built from Huancayo to Huancavelica between 1919 and 1930 (Arguedas 1953: 118). Huancavelica remains "the center of economic activity for a great portion" of the Department of which it is the capital, "since it is the terminal" of this narrow gage spur (Tschopik 1947: 20).

Another case in point is that of Sicaya. "What accelerated the rhythm of social transformations in Sicaya and in all the Mantaro Valley was the arrival of the Central Railway in 1908. The railroad produced the death of muleteering in Sicaya, emigration, the progressive increase in the cost of living, that made always less possible communal working of church lands and exclusive reliance upon agriculture. It also produced progressive elimination of Quechua, Spanish becoming indispensable for commercial uses" (Arguedas 1957: 122).

Two examples of the high cost of packing in the contemporary Andes will indicate why road construction greatly lowers transportation costs. In Ancash Department of Peru, pack trains regularly carry manufactured goods from Marcará up a trans-Andean trail through the Cordillera Blanca to the mine town of Chacas, a two-day trip. Returning pack trains carry ore concentrates to load on trucks at Marcará. The muleteers receive S/. 25 to S/. 30 per animal per trip. A donkey-load is defined as seventy-two kilograms of concentrates. The road covers sixty kilometers or approximately thirty-seven miles. The mines pay from thirty-two to thirty-eight cents per short ton mile to move their concentrates to a truck terminal. On the dangerous fifty-mile long (eighty kilometers- Martinez 1961: 109) trail between Sandia and San Juan del Oro in the Tambopata Valley of Peru, human burden bearers charge thirty to forty soles per arroba (approximately twenty-five pounds) of coffee carried out, and twenty-five to thirty soles for the same weight packed in (Martinez 1961: 177). Packers earn from \$1.50 to \$2.39 per ton-mile, in other words, compared to about one dollar per ton-mile in Central America (Stearns 1950: 84). Muleteers using mules and donkeys charge 120 to 180 soles per quintal (100 kilograms) to pack coffee out, and 100 to 120 soles for the same weight moved into the valley (Martinez 1961: 178). Their charges range from sixty-eight cents to \$1.22 per ton-mile.

Railroad. The other form of external competition the trucking industry provides is that with other forms of modern industrial transportation such as railroads and costal or riverine and lake shipping. Wherever effective competition has been absent in the Andes, businessmen enjoying monopolies have tended to charge high rates for poor service. Andean railroads were no exception to this generalization.

In Peru, the Central Railway was acquired by British interests in 1890 for debts owed British creditors (Tschopik 1947: 18). When the Peruvian Central Highway was built into the central Andes parallel to the railway tracks, competitive haulage on trucks quickly forced several major changes in the conduct of the railroad. Most important in terms of economizing, both passenger and freight rates fell. Passengers and shippers saved an estimated S/: 3,000,000 during the first year after the Central Highway opened -- a sum greater than the cost of building the highway (Castagnola 1936: 73).

Probably as a result of fare reductions, plus better treatment by railroad employees, the number of passengers between Lima and mountain stations increased (although the railroad's overall passenger movement dropped when it discontinued its Lima-Callao run) according to Castagnola (1936: 73). The earlier discourtesy of the railroad's passenger-control employees, especially in

tossing out the windows packages and baskets of goods of passengers who did not pay exorbitant sums, is well remembered by those who traveled on it prior to the competitive situation (Arguedas 1953: 19-20).

Freight tonnage hauled by the railroad also increased during the first year after the Central Highway opened by approximately fifty-nine per cent (Castagnola 1936: 73). The railroad's gross income also increased during the first year of highway competition.

Another facet of true economizing was illustrated in yet another change in Peruvian Central Railway practice brought about by highway competition. Before the highway was built, the railroad collected its freight and passenger tariffs in pounds sterling. Even an act of the Peruvian Congress prohibiting such practice was ignored by the operating corporation. After trucking competition began, the railroad began accepting Peruvian money (Castagnola 1936: 45).

Even today, trucks continue to compete very effectively with the Peruvian Central Railway, and to move people and cargo in volume because they do so cheaper than does the railroad. Metric ton rail tariff for general merchandise moving between Lima and La Oroya, for example, ran S/. 239.85 in 1961 compared to truck rates varying from S/. 140 to S/. 200 (Coverdale & Colpitts 1961: 18). The rail tariff amounts to about 7.85 cents per metric ton-mile compared to a range between 5.23 cents and 7.48 cents per metric ton mile truck tariffs.

Another instance of truck competition with older railway routes is the commercial competition between the departmental capital of Huancavelica and Castrovirreina for the trade of the Huancavelica Departmental hinterland. Huancavelica lies at the end of the narrow-gage spur of the Central Railway. Castrovirreina is connected to Pisco on Peru's south coast, so "tends to act as market center for the southern part of the Department" (Tschopik 1947: 21). Although Castrovirreina was founded in 1591 (Tschopik 1947: 24), "the present-day town has only begun to prosper as a consequence of the recently opened highway to Pisco on the Coast." Donkey and llama pack trains required three or four days of difficult travel. "Today trucks go back and forth regularly, and the life of the town is dominated by the highway" (Tschopik 1947: 25), which permits Castrovirreina to function as a "center for the exchange of Coastal and Highland products."

Individualization

One of the characteristics of modern industrial life appears to be the individuation of economic decision-making, save in Soviet nations. (It could be argued that the nature of decision-making in Soviet nations means that they remain by definition unmodernized, even though industrialized. This argument views "modernization"

as a sociological rather than a technological phenomenon). The nuclear family emerges as the typical family unit under industrial social conditions. Modern means of communication appear to foster change toward familial nucleation and individual property ownership under Andean conditions, or to be constructed in response to the same sociological forces causing other social changes.

"Individualization of property in land has...undermined ...the typical indigenous community since this divides the family and destroys many forms of communal labor" (Buitron 1946: 50). After the Central Railway reached the Mantaro Valley in Peru, "The economy became ever more individualistic and the ties of the extended family became inappropriate" in Sicaya (Arguedas 1957: 122).

Case: Quinti: San Lorenzo de Quinti in Peru's Huarochiri Province formerly was an endogamous community (married within its membership--Cotler 1959: 71) and the residential and economic unit was the extended family (Cotler 1959: 74-5). Nowadays endogamy is still common, but no longer the ideal, and over three-fourths of Quinti's families are nuclear residence units (Cotler 1959: 76). Until the present century, the Indigenous Communities in this area retained common agricultural lands assigned to individuals. Beginning in 1904 (Cotler 1959: 41) but especially between 1918 and 1930

these were sold to community members (Cotler 1959: 42-43). Contact with the mercantile structure of Lima led the people of Quinti to identify with that capitalistic structure and "convert the communal properties into private or semi-private" ones (Cotler 1959: 45).

Social Equalization

Perhaps the most important and fundamental aspect of modernization promulgated by the farm-market road and town access road in the Andes is equalization of social status toward modern norms and away from traditional differences. Just as the highway breaks down regional subcultures that came into being under conditions of geographic isolation, so it breaks down the social barriers between individuals that flourished in traditional agrarian society.

One aspect of equalization is the weakening of age-grading. Traditional Andean society, particularly its Indian sectors, defined aged men as automatically worthy of great respect (Holmberg 1961) thus reducing the respect accorded younger individuals. The geographic mobility and broader experience permitted by the highway and engine powered motor transport changes this situation. In Puquio, Ayacucho, the Indian elders of the four constituent Indigenous Communities complain about the Indian youths, especially those who return from living

on the coast (Arguedas 1956: 188). The youths tell the oldsters that they speak a language the younger men do not understand. They strike at the heart of economic power in the Andes, the distribution of irrigation water (Arguedas 1956: 189). After the Pan American Highway disturbed the traditional ways of the people of Viru, the very avenues to social prestige altered. Now "young men, instead of looking forward to becoming stewards of religious fiestas, are thinking in terms of becoming truck drivers and mechanics" (Holmberg 1950a:415).

Another aspect of equalization is the diversification of a former two-caste society, so that the castes become economically complementary instead of directly competitive for land and land produce. This brings social collaboration in local government and equalization of respect patterns, at least under Andean conditions. Where a man's father walked with a coat and gold headed cane, and lesser beings yielded him the sidewalk, in Puquio his son goes in shirt sleeves and is slapped on the back (Arguedas 1956: 187).

Where road contact with modern industrial plants or immediate proximity to such installations opens employment opportunity to residents of a given settlement, traditional social hierarchies tend to disappear. In Huayllay, a small town near the French Compagnie des Mines de Huaron with forty to fifty per cent of its adult male population working in the mining industry, "Opportunities

for economic advancement are available to all, and Indians and Mestizos alike are in demand as laborers and employees; the fine distinctions of class are largely ignored in the labor markets of modern industry" (Tschopik 1947: 51-52).

Migration

The Revolution of 1952 and the resulting rural land reform in Bolivia seem to have stemmed the tide of rural to urban migration in that country. In any event, La Paz and the other major cities are not surrounded with the belts of squatters' settlements that characterize contemporary Rio de Janeiro, Santiago de Chile, Caracas, and so on. In fact, the Bolivian capital and metropolis, La Paz, appears to be losing population, at least in its central districts, according to the first results of census sampling in 1963 (El Diario, La Paz, 19 May 1963: 7). The city of Santa Cruz in the Oriente may well have increased by fifty percent from 80,000 to about 120,000 inhabitants, between 1960 and the present.

Quito, the Ecuadorian capital city, does not present the squalid appearance of the immigrant-inundated metropolitan centers. Any description of internal migration in Ecuador is rendered difficult because: "The data on migration, especially internal migration ...although collected in 1950, do not appear in the census

reports" (Saunders 1959: 15). There is rural to urban migration in Ecuador. "Guayaquil and to a lesser extent Quito and other cities have experienced the effects of rapid rural to urban migration." The most pronounced effects appear as in neighboring Peru in the coastal cities. "Guayaquil officials in particular find themselves unable to cope with the influx of rural migrants, principally to the city's barrios suburbanos, a section of cane shacks without potable water, sewer system or paved streets" (USAID/Ecuador 1963: 1).

The major coastal cities of Peru have been literally inundated by waves of rural migrants during recent years, and several hundred thousands of Peruvians inhabit squatters' settlements in and around the capital of Lima, Arequipa, Ica, Chimbote, Trujillo, Chiclayo, Nazca, Mollendo, and so on. "The highway has had another characteristic that can be labeled negative. It has violently extracted men from the fields and has carried off all their production, leaving behind misery. The peasant exodus toward the cities and preferably to Lima constitutes today one of the gravest national problems" (Valcarcel 1957: 7).

It is truism that rural-to-urban migration in Peru has followed and continues to follow established lines of modern industrial communication. The farm-market and town access roads tie to the truck highway system and

channel rural-to-urban migration. The scale of such migration has long since overloaded urban utility installation capacity in all fields -- housing, sewage disposal, potable water installation, electric service, telephone service, garbage disposal services, police protection, fire protection, and so on.

The construction of more farm-market roads tied to the existing national highway network in Peru radiating out from Lima, and based on the paved coastal Pan-American Highway will continue to channel migrants into the coastal cities, other conditions remaining equal. "The mestizo proletariat will grow, especially on the coast, where there is greater industrialization and the plantations are more modern" (Buitron 1946: 50).

Despite the many political and social problems created for the government of Peru by rapid migration into the Lima-Callao metropolitan area and other industrial centers on the coast -- Chimbote (Solis 1963; Matos M. 1963), Paramonga (Soler 1963), Trujillo (Aranguri L. 1963), Chiclayo, Sullana, Talara (Beverly 1959), Ilo, Mollendo -- and despite the relatively poor economic situation of large numbers of migrants, residence in the coastal cities does perform a very useful function in modernization. The present analysis points to the feasibility and the desirability of modernizing indigenous populations in place in the Andean mountains. There can

be little doubt, on the other hand, that to date, the most effective environment for rapidly and effectively modernizing the Andean Indian has been the city. In the city the discriminated against members of the subordinated Indian caste are able to achieve more than in the relatively more static society of the highlands.

The Lima-Callao metropolitan area has led all other urban areas in the Central Andes in numbers of migrants absorbed -- more or less -- into modern life ways and the world cash economy. In 1876, the Province of Lima had 120,994 residents, 109,276 of them urban (Jimenez Correa 1932: 46: Cuadro 13). In 1908, the Province of Lima contained 172,927 inhabitants, of whom 157,949 were urban. By 1920 the same Province held 223,807 persons, of whom 204,449 were urban. By 1931 Lima Province had grown to 373,875 individuals. The mean annual increase of 2.36 per cent between 1908 and 1920 shot up to 6.09 between 1920 and 1931 (Jimenez Correa 1932: 45: Cuadro 11). In 1931, Lima was a city of 342,243 urban dwellers (Jimenez Correa 1932: 44: Cuadro 10). In 1940, Lima had grown to 562,885 (Kubler 1952: 65: Table 9) inhabitants. By 1961, Lima had exploded to 1,769,323 urban inhabitants in its Province, plus 209,187 urbanites in Callao Province, a total of 1,978,510 (Garayar 1962: 4). The capital had expanded physically along the avenues leading out to the port of Callao and

the coastal towns south of it such as Magdalena del Mar, San Miguel and Miraflores. All formed one metropolitan area, even though open fields are still under cultivation behind the blocks of new homes erected along the main thoroughfares, and local sentiment still waxes strong, especially in Callao.

In 1931, migrants formed thirty-five per cent of the population of the provinces of Lima and Callao (Jimenez C. 1932: 183-187). By 1960, according to a random sample of 2,000 women interviewed in the metropolitan area, sixty-two per cent of the adults had migrated to the city (Stycos and Richards 1963: 38). The 1961 Peruvian national census results on migration are not yet available.

One measure from the 1940 national census provides further illumination upon the importance of the Lima-Callao metropolitan area in modernizing migrants. According to that census, "more than half of the persons enumerated outside their native departments were residing either in the department of Lima or in the constitutional province of Callao" (Ford 1955: 16).

There is evidence that transculturating migrants to urban, hopefully modern, lifeways requires considerable time, even in the Lima-Callao metropolitan area where extensive urban facilities have long existed, so that migrants have never really overwhelmed the resident

population at any given time. The author knows of families that have lived in Lima for three generations without changing their diet from that dictated by originally rural norms. The Cornell Andean Research Project study of Peruvian family life found that women who migrated to the metropolitan area from the cities of Trujillo and Arequipa spent an average of S/. 2, 250.77 and S/. 2,160.58 monthly, compared to women migrants from rural areas in the Department of Ancash who averaged S/. 1,466.91 per month.

Another measure uncovered during this survey of a sample of 2,000 women was the occupation of their husbands. Among women born in Arequipa, thirty-seven per cent had husbands classified in the top analytical category of occupations -- businessmen, administrators, officers in the armed forces, etc. Among women from Trujillo, twenty-seven and seven-tenths per cent had husbands in this category. Among women from rural Ancash, on the other hand, only 11.8 per cent enjoyed such well-off spouses (Stycos & Richards 1963: 41).

What such figures mean is that migrants to the Lima-Callao metropolis from other urban areas enjoy a good chance for economic and social success there, while migrants direct from rural areas suffer severe cultural handicaps which keep their prospects for success relatively low. This conclusion holds regardless of whether migrants

come from the Peruvian coastal valleys or the Andean mountains. Modernization in Peru has, to date, been restricted to urban contexts.

One good reason for the historical correlation between modernization and urbanism in Peru has been the geographic and social distribution of formal educational facilities. The Peruvian school system has been an urban school system built originally to educate the offspring of the agrarian elite, and only gradually opened to lower class children. By 1940, only 40 per cent of the population over six years of age enumerated during the census taken that year had received any schooling (Ford 1955: 18). One of the migratory movements noted as a consequence of road construction in Peru has been the movement of people "from the punas and other backward areas into the valleys" (Tschopik 1947: 19) where mestizo settlements typically are concentrated, and schools oftener are available.

In 1940, most of that lucky portion of the national citizenry which had been somewhat educated was located in the cities where schools functioned. This institutional gateway into the modern world, plus the sheer size of urban population, particularly in Lima, and the availability of some industrial and considerable commercial employment, have made Peru's cities much more socially permeable than its rural districts. While the

rural Indian may not find himself accorded in Lima the romantic status he sometimes finds in U.S. cities far distant from Indian reservations, he does find a permeable society with many achievable statuses. "He can achieve a very desirable status through education. Attending secondary school and university, he can win a degree and be an urban professional as a lawyer, architect, physician, or businessman, and marry in accord with his greater or lesser economic success."

Yet the same migrant usually finds himself still counted an Indian in his area of origin if he returns there. He cannot escape the ascribed status of Indianism. Thus urban "migration permits him to by-pass local prejudice and discrimination. It permits the ambitious individual to escape the frustrations of the restricted environment in a way constructive for him and for the society, instead of becoming a destructive criminal or revolutionary" (Dobyns 1963: 20).

Colonization. The most spectacular migratory movement in Bolivia is that opening up the Amazon Basin rain forest to modern civilization, rather than an urban movement of rural people. The Bolivian government is in fact committed to encouraging the colonization of the country's lowlands under the constitution of 1961. Article 170 of that

document reads: "The State shall foment migration in order to secure a rational distribution of the human factor and obtain a better exploitation of the natural resources of the country" (Trigo 1961: 83).

The "penetration" road has played a key role in rain forest colonization, along with the strategically located air strip and lowland riverine transportation. The colonization programs in Bolivia appear to have captured the imagination of Bolivians from all walks of life, from top government policy makers to lowly altiplano peasants who make up the ranks of the colonists.

As the Bolivian government with U.S. assistance punches penetration roads into the rain forest areas, farm-market and town access roads are often constructed with the trunk route, but sometimes not. In the latter cases, additional technological guidance to the colonists to assist them in cutting their own access roads will be required in order to obtain full benefit from the colonization movement. Farm-market roads are peculiarly vital to the rain forest colonist who must engage not merely in subsistence agriculture, but by the nature of his situation must produce a surplus for the commercial market. For the rain forest colonist must pay for his land, his tools, his housing, transportation from the highlands, medical services in a hostile disease environment and many other expenses. In order to sell bulky tropical

agricultural produce even relatively valuable coffee or tea, and particularly soft tropical fresh fruits, he must have farm-market roads over which to move his produce to market on trucks.

Neither in Peru nor in Ecuador is Amazon rain forest colonization so far advanced as in Bolivia. It has been the dream of the future for many planners in those nations, and continues to be such. Part of the campaign platform of Arq. Fernando Belaunde Terry consisted of a rain forest Marginal Highway that would be constructed along the eastern slopes of the Andes from the Orinoco River in Venezuela to the Parana in Paraguay and on to Buenos Aires (Belaunde T. 1959: 112-113).

As Thomas R. Ford (1955: 9) remarked rather wryly of the high rain forest or ceja de la selva where Belaunde would build the Peruvian section of this dream-road, "For more than a century this section has been periodically proclaimed the logical center of future colonization and, as such, the locale of a 'new' Peru. To date, however, geographic isolation combined with primitive transportation facilities has prevented the realization of the dream except in a few limited locations."

Although Ecuador and Peru fought a war in 1941 over their mutual boundary with prime reference to its Amazon basin section, it does not appear that eastward migration has occurred in Ecuador with any greater rapidity than in

Peru, unless within the last few years. A calculated percentage increase in regional population in Ecuador based upon the census of 1950 and estimated population in 1955 showed the coast leading with 19 per cent, the Andes with 12.9 per cent, and the Oriente trailing with 9.3 per cent increase (Saunders 1959: 26: Table 4). Two of the Amazonian provinces, Morena Santiago and Zamora Chinchipe, "were those which increased least in comparison with the other provinces of the country" (Saunders 1959: 27).

An historical analysis of the apparent motivations of spontaneous migrants into Peru's Tambopata Valley suggests that virgin jungle lands attract migrants much less than the later are impelled to hazard their fortunes there because of reverses or limitations elsewhere. Between 1898 and 1913, the Tambopata Valley population increased from nine to twenty families, a total of sixty persons. Between 1914 and 1918, a wild rubber boom occasioned by the first World War brought an increase to forty-four families with 132 members, in this case truly seeking economic advancement in the jungle, yet in a jungle-exploitative economic activity, not in agriculture. Between 1924 and 1928, the Tambopata Valley population increased from fifty-two to ninety families, from 156 to 270 persons, as a consequence of an Indian uprising in 1923 that was suppressed by the central government, forcing many rebels to flee into the jungle. Then from 1929 to 1938, the Tambopata Valley

population again rose rapidly from ninety to 223 families with 669 members, owing to the arrival of Peruvians leaving Bolivia to escape the mobilization for the Gran Chaco War. Although migration into the Tambopata Valley continued during World War II, the rate declined until about 1949. By 1953, the families had increased from 443 to 781 and the population from 1,329 to 2,343. With the social revolution in Bolivia beginning in 1952, land reform for Bolivian citizens expelled many Peruvians born in Puno who had worked in the Yungas on manors, and resultant migration of these displaced Punoños pioneering in the Tambopata Valley raised its population to 3,810 by 1958 (Martinez 1961: 120-121). In other words, save for the World War I rubber collecting boom, and the unexplained rapid increment after 1949, each of the major migratory waves into Peru's Tambopata Valley appears to have been a response to external events closing off previously existing opportunities for Puno natives to seek out a living elsewhere.

Sixty years of spontaneous migration had brought a total of 4,857 persons into twenty-three sectors of the Tambopata Valley by 1958 (Martinez 1961: 122). This figure bears comparison with the figures given previously for the growth of the Lima metropolitan area.

The spontaneous migratory movement that has been underway from the altiplano around Lake Titicaca (Martinez 1961: 72) into the Tambopata Valley closely resembles the

Bolivian movement into the Upper Beni, and indeed forms a continuation of the Bolivian highland situation. Bolivian land reform which began in 1953, by terminating the manorial system and giving preference to Bolivian citizens in land redistribution, aggravated the economic situation on the Puno highlands. Many Peruvians who formerly worked on manors in the Yungas returned to overpopulated highlands and then migrated into the Peruvian jungle frontier (Martinez 1961: 90). Agricultural production in the Tambopata Valley is more narrowly specialized to coffee production than is Upper Beni agriculture, which produces tropical fruits, particularly citrus, and rice in quantity, and has a very significant impact on the La Paz market. A trunk road is currently under construction into the Tambopata River Valley in order to permit truck transport of coffee out of the valley, and foods and manufactured goods into it. These all move on animal or human backs at present. As a matter of fact, many peasants who continue to live around Lake Titicaca earn cash income carrying coffee out of the valley to the road head at Sandia following the harvest season (Bolton 1963: 7). As a Peruvian anthropologist observed, "travelers make real sacrifices beyond Sandia" because "the route is full of dangers, since it skirts deep precipices, where a fall means sure death." There are very inadequate stopping places where "the fleas generally do not permit the solace of sleep" (Martinez 1961: 108).

In northern Peru, the national army has thrown a construction battalion equipped with heavy machinery from the United States into the construction of another west-east rain forest penetration trunk route through Chachapoyas to the Marañon River. There, as in the Tambopata area, farm-market access routes will be necessary once the trunk routes are completed.

Economic planners concerned with the central Andean populations repeatedly have advocated large-scale resettlement as a major solution for observed socio-economic ills. One reason is the tempting prospect of satisfying the land hunger of landless or land-short peasants without disturbing existing land owners. This prospect is especially tempting "where the landowners are powerful and where virgin state-owned lands are plentiful," according to Hirschman (1963: 138). A long-established land-holding elite wields tremendous political power in both Ecuador and Peru. The Hirschman generalization appears to apply to Bolivia as well. Even though the present landowners are not the traditional landed oligarchy, these revolutionary peasants are politically powerful because they constitute a major para-military force in the still precarious political situation.

A United Nations Bolivian study concluded in 1951, in the oft-repeated litany, that "agricultural development on a significant scale will involve a considerable redistribution of population" in Bolivia. The team making this

analysis asserted that there is "no permanent characteristic of highland dwellers that makes it impossible to adapt successfully to lowland conditions." Although this mission held that Bolivian government activity "should not exclude" private enterprise, it stated flatly that "a carefully planned central Government policy is required" (Keenleyside et al 1961: 57).

Amazon rain forest colonization of presently uncultivated lands is not, in my opinion, a realistic alternative to urban migration for the rural Indian agriculturalist as long as his highland social and natural environment remains unchanged by genuine agrarian reform. For rain forest colonization presents a number of hazards which must be realistically recognized and faced if settlement of the Amazon basin is to succeed. "In order to offer or give land to the Indian or any worker in the Oriente, it is necessary first to conquer the jungle. The Oriente is not fat land nor easy; it is virgin jungle" (Reinaga 1952: 50) as a Bolivian revolutionary pointed out.

The first hazard of colonization is that it is a long-term and an expensive process requiring heavy capital investment, whether the capital be paid in the form of human labor and lives of colonists, or in research, machinery and services from the national governments or foreign credits to finance them. High capital cost may be exemplified by some

familiar examples. San Juan del Oro, trading center of Peru's Tambopata Valley, boasted seventy-nine stores in 1958 (Martinez 1961: 172). They sold a bottle of beer for ten soles (Martinez 1961: 174) that cost four in Lima and five in the highlands. Other prices were proportional, and the colonist population was not feeding itself, nor the swarm of human cargo bearers which moved the harvests out of the valley.

Colonization can take place successfully ultimately only from an already developed social and economic base, for "there are certain things that a farmer must do for himself, and certain things that must be done for him if he is to succeed. These things that a farmer or a nation cannot do for themselves must be subsidized" (Hudgens 1961: 7). The banker-minded Agrarian Fund (Caja Agraria) of Colombia managed to colonize no more than 1,000 families from 1959 to 1962 "on a fully reimbursable basis, by apportioning its basic investments in roads and services among the individual settlers" (Hirschman 1963: 140).

An underdeveloped agricultural base such as now exists in the Andean highlands certainly seems far from the best conceivable platform from which to launch a successful rain forest colonization movement, since it cannot afford to pay the subsidies necessary to assure rapid success. The United Nations study of Bolivia that urged colonization at the same

time warned that "efficient colonization requires considerable capital, or else great sacrifice by the early colonists." Historical experience in North America involved "generations of self-deprivation among the colonists" until large capital investments alleviated their situation. The U.N. team noted that "most successful colonization of empty land has taken place from contiguous settled areas" and, moreover, "from similar rather than from dissimilar environments" (Keenleyside et al 1951: 57). Hirschman (1963: 141) has suggested that planned colonization is in fact "failure-prone." He sees the planned project as likely to attract crackpots, utopian thinkers, etc. Certainly the highly publicized La Morada jungle settlement project in Peru fit this model in recruiting Lima city dwellers to colonize the banks of a rain forest river with an agricultural settlement. So also the Quiroz irrigation project in northern Peru was a failure-prone effort during the period of central government direction that made goat herders virtually the only persons eligible for resettlement on newly irrigated bottom lands while experienced irrigation farmers were ineligible.

The cost of successful colonization in the Amazon Basin will always remain high simply because the Amazon rain forest is just that -- a rain forest. It is wet. A student who kept a weather record at Santa Clara Mission in Ecuador's Pastaza Province for four weeks during the dry season recorded rain on every day and an average of three hours'

precipitation per day. A monk at the mission told him that "during the other months it rains all the time" (Sherman 1963: 55).

This means that movement in the rain forest is difficult, particularly during the rainy season. Then clouds inhibit air communication with rain forest settlements (Mautner 1960: 205). Then the earth's surface turns into mud that is very inimicable to wheeled ground transport movement. Such vehicles bog down in the mud, particularly if loaded (Sherman 1963: 1, 56). Human beings find even foot travel through the land uncomfortable and unpleasant (Mautner 1960: 157-158, 168-169). "Only one who has traveled in the region can appreciate the myriad forms of insect life that harass the inhabitants." These include mosquitos, able to breed unhampered in the swamps, gnats and moths at night, with "innumerable varieties of deer flies and wasps" plus stinging ants, scorpions and spiders, sweat bees and ticks during the day (Holmberg 1950b: 7). Accidents are frequent. Wounds and contusions of various sorts constituted the most commonly treated complaint among 2,526 patients during the first two years of operation of the Andean Indian Programme medical post at San Juan de Oro in Peru's Tambopata Valley. No less than 509 patients were treated for wounds and contusions (Martinez 1961:200), or twenty per cent of the total.

Carrying modern civilization and economy into the rain forest requires, then, hard-surfaced roads, as the Andean Indian Programme colonization project at Cotoca in Bolivia has found to its cost (Panel 1962: 23; Marus & Monje 1962: 90). This is exactly the most expensive and difficult type of road to construct in the rain forest because of its lack of stone, high water table and large streams to be bridged, the growth power of tropical plants, and soft surface which inhibits use of wheeled equipment heavier than the wheelbarrow (Sherman 1963: 5, 52, 56). An Ecuadorian penetration road in Pastaza Province has been built at the rate of 45 kilometers in eleven years (Sherman 1963: 2).

The humid tropical climate poses problems of preservation of paper, clothing, shoes, and other material accoutrements of civilization. "Laundry which is hung up to dry remains wet for a week" (Sherman 1963: 58). The rain forest house, if it is to be successful from the inhabitant's point of view, must be adapted specifically to the humidity and precipitation conditions of the environment. Since the highland natural environment is very different, a very different type of housing has been developed there which is quite unsuited for the rain forest environment. So settlers have to change their housing habits, not always an easy thing to do.

Settlement in the rain forest also requires a change in diet. On the one hand, settlement in the tropical rain forest permits agriculturalists to produce fruits and other products for sale outside the rain forest where they are exotic and in demand. Tropical rain forest settlement requires the settler, on the other hand, to adjust his diet to the limitations of tropical production if he is not to spend his earnings importing temperate foods. Just as the Andean highlands limit the range of agricultural crops that can be grown in any given locality, so also does the Amazon rain forest. Settlement of the lower region from the higher requires the colonists to learn to prepare and consume quite different products than they have been accustomed to eating.

These factors all enter into the matter of the physical well being and even biological survival of the settlers in the rain forest. Diet affects health, and tropical diets are notoriously low in nutritional value if not carefully controlled. The spontaneous highland Indian migration into Peru's Tambopata Valley exposes the migrants, and especially their children, to goiter. The area is badly eroded -- a condition aggravated by clearing rain forest cover in order to plant crops -- and deficient in iodine. Migrants consume a diet lacking in animal and vegetable proteins. This, plus poor hygiene, results in 32 per cent of the school children examined between 1958 and 1960 having dental caries. (Martinez 1961: 306). Peruvian table salt, produced and sold by a

government monopoly, is not iodized. A medical survey of school children in the Tambopata Valley between 1958 and 1960 found 54 per cent of the students suffering from goiters (Martinez 1961: 305).

One reason for poor nutritional quality of tropical agricultural produce is the frequency of nutrient-leached soils in high rainfall areas of the tropics. The transportation network that will permit exchanging tropical produce for temperate zone produce enters into the dietary question, as well as the question of settler capability of attracting and paying physicians, nurses, dentists and other health guardians.

There is one basic physiological factor involved in migration of Andean Indian populations from the higher altitudes in these mountains into either the Amazon rain forest or to the Pacific coastal valleys in Peru and Ecuador. That is genetic adjustment to life at high altitudes. Andean man has made a number of physiological adjustments to life in an oxygen-shy environment (Monge 1963: 24; Valcarcel 1957: 7), and those genetic adjustments ill equip Andean man for life at low altitudes. "The problem of Peru is a population problem. The Indian is the mountain dweller; the climates of the other zones kill him" (Mayer 1938: II: 42). The humidity of the Amazon basin is thought to foster bronchial infection (Sherman 1963: 58).

This is not to say that Andean Indians cannot successfully migrate from the heights to sea level. Richard W. Patch (1962: i) recently reported results of surveys of successful rain forest migrants in Bolivia, beginning: "The principal object of this report is to modify the many times repeated belief in the inadaptability of the peasant of the altiplano and valleys to sub-tropical climate." The data cited are self-images of the colonists themselves, not including those who failed. Colonists in three zones claimed they had not encountered difficulties in adapting themselves to new types of agriculture by 79 per cent, 48 per cent and 64 per cent majorities (in Santa Cruz, Caranavi-Alto Beni and Chapare respectively -- Patch 1962: v-vi). The successful colonists claimed to like the rain forest climate better by 73 per cent, 82 per cent and 74 per cent majorities (Patch 1962: vi). As for diet, the respondents claimed they and their families had no difficulty by 59 per cent, 35 per cent and 53 per cent in the same zones (Patch 1962: vii). The colonists who succeeded also thought health conditions were good by 64 per cent, 67 per cent and 65 per cent majorities (Patch 1962: iv). Yet 61 per cent, 71 per cent and 71 per cent in the three zones reported sickness in the families (Patch 1962: iv-v). In two of the three areas, moreover, the successful colonists quite clearly considered the rain forest a more dangerous place than the

highlands. The rain forest settlements were more dangerous to 35 per cent of the successful colonists in the Santa Cruz area (where medical protection exists), to 69 per cent of those in the Caranavi-Alto Beni area, and to 70 per cent of those in the Chapare area. (Patch 1962: iii).

It must be said that a relatively higher proportion of highlanders per thousand migrants into the low-altitude rain forest will fall ill because of constitutional inadaptability to life in a high-pressure, oxygen-rich environment, than would occur among an equal number of persons born at or near sea level. Susceptibility is greater in the population genetically specialized for one environment moving into a different one.

The Amazone rain forest environment harbors, in addition, several disease agents with which modern medical science is not sufficiently familiar to be able to control them. Scientific medicine has not yet been called upon to counter these disease agents because not enough participants in modern civilization have penetrated the rain forest to create the demand for therapy that would finance research on disease agent control.

This concatenation of factors leads those conscious of them to doubt that rain forest colonization can provide any quick or economic solution to Andean highland population problems.

Awareness of these factors has led at least some upper class Peruvians to advocate Andean Indian colonization of the Amazon rain forest quite cynically. Such individuals express the view that the United States has developed because it solved its "Indian problem" by killing off the bulk of its aboriginal inhabitants. They advocate a similar course for Peru as the best one for national development based on non-Indian population. They seek to encourage Indian migration into the rain forest, then, with the expectation that great numbers of Andean Indians will perish there if they can only be persuaded to attempt the move.

Awareness of these factors, along with other considerations, has led members of Cornell University's Andean Research Project to advocate in-place Indian community development in the Andean highlands themselves as more economical of material and human capital than large scale colonization in the rain forest. The prospects for economic growth per unit of capital invested in highways and roads, in transport vehicles, in crop loans and farm mortgages, etc., are considerably higher in the highlands than in the rain forest.

The expectation that large scale migration of highland natives into the Amazon rain forest would create health problems appears to be borne out by the current health crisis in lowland Bolivia.

A disease agent causing hemorrhaging and falling hair appeared at San Joaquin near Bolivia's border with Brazil in 1954. It was labeled "Black Typhus," but the virus responsible was not identified until 1963. Thirty per cent of 485 cases recorded proved fatal (El Comercio Lima, 5 June 1963: 9). The Middle American Research Unit of the United States National Institute of Allergy and Infectious Diseases sent a field team into the epidemic area in 1962. The virus was isolated locally from the liver and spleen of a victim in May of 1963, and maintained in mice and hamsters. By early July samples of the virus reached the Canal Zone laboratory of the Middle American Research Unit. A mite that affects forest animals came under suspicion as the vector that transmits the disease agent (New York Times 7 July 1963: 29).

At the same time, bubonic plague reached epidemic proportions in Cochabamba, a highland city from which it might easily spread along migration routes (El Diario, La Paz, 23 May, 1963: 4). Diphtheria was also epidemic in Cochabamba, Sacaba and Quillacollo, where it had caused the deaths of twenty-one children from January to mid-May (El Diario, La Paz, 19 May 1963: 4). This epidemic spread into lowland Santa Cruz. Yellow Fever was epidemic in the tropical portions of Santa Cruz and La Paz (Ultima Hora, La Paz, 23 May 1963: 5).

A final aspect of colonization as a potential solution for rural overcrowding and urban utility overloading by rural-to-urban migrants, is the rate of colonization. All the factors previously mentioned affect the real rate of successful movement of people into new jungle lands. It is this real rate of successful colonization that determines whether colonization can provide a useful alternative to in-place community development in the Andean mountains and/or planned urbanization there. For while colonization may succeed on a limited scale, the very high rate of natural population increase means that colonization must succeed at an even faster pace in order to solve the problems of existing aspirations and their tendency to rise even higher by siphoning off population.

It is, therefore, significant that sixty years of spontaneous colonization of the Tambopata Valley have moved only some 5,000 successful colonists into the area. It is significant that the colonization centers at Aroma, Huaytu, Cuatro Ojitos, Cotoca, San Juan, etc., in Santa Cruz Department of Bolivia have attracted a total of approximately 2,500 families. The Chapare area linked to the valleys of Cochabamba Department has attracted about 2,000 families. The number of families successfully established in the newer colonization target area in the Upper Beni drainage of Bolivia is not known (Junta 1963: 18-19).

The conclusion to be drawn from such figures, compared to those demonstrating the rate of rural-to-urban migration to coastal Peruvian and Ecuadorian cities, appears to be that Amazon rain forest colonization cannot possibly in the near future attain a rate of success equal to the rate of natural increase of the central Andean highland population, much less keep pace with rising social and economic aspirations.

Conclusions

The argument derived from the sources of information summarized and discussed in this analysis may be stated briefly.

Given the present state of sea, air, and ground transport, a key variable in modernization of the central Andean peoples is the farm-market and town access roadway that connects rural populations to national communications networks.

The access road is also a key to rural-to-urban migration which fosters social equality in the central Andean republics with their two-caste history, despite numerous problems created in urban environments by the fast rate of migration.

The penetration and access road is also a key to rain forest colonization on an agricultural basis, although it is highly dubious whether any foreseeable amount of capital investment can initiate colonization rapid enough to drain off natural population increase in the highlands.

Numerous rural communities in the Peruvian Andes have already constructed their own farm-market and town access roads with local labor and materials, proving that in-place social and economic development can be accomplished with greater capital economy than rain forest colonization or rapid urban construction, by stimulating and releasing the constructive energies of rural communities concerned over their own future.

Requests for technical assistance in laying out such in-place community development facilities -- specifically access and farm-market roads -- constitute one of the types most frequently made.

Agency for International Development-financed mobile technical teams operated to provide this technical assistance could trigger local regional and national development in a limited number of cases, and provide an experimental example for national governments to follow, and perhaps for private enterprise to copy. At least, the Agency could experimentally determine the impact such teams could hope to achieve in the total sea of need for technical assistance at a medium level.

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