Perspective on Land Use—American Samoa*

BY BRYAN FARRELL

American Samoa, a dependent possession of the United States, consists of four small, volcanic islands in the tropical Southwest Pacific. The territory is a physical, ethnic and cultural outlier and close neighbor of the very much larger, independent, Western Samoa. American Samoa has a limited, largely subsistence agriculture, a low level of technology and a population which, since 1956, despite a rapid birth rate, has decreased because of emigration. Western Samoa on the other hand has a well-developed commercial agriculture, a rapidly increasing population and a relatively high economic potential.

Tutuila, the main island (Fig. 1), has an area of 34,700 acres. The Manu’a group of three small islands, sixty miles east, covers 14,500 acres. Ta’u with 11,200 acres is the largest.

This tropical territory fourteen degrees south of the equator is seventy-seven miles east of Western Samoa and about 2,300 miles southwest of Hawaii. The group is in an area of the Pacific characterised mainly by haphazardly strewn islands, resulting from the outpouring on the sea floor of immense quantities of volcanic basalt. Continued emission in a number of cases has raised great islands of material above the surface of the sea. Those of American Samoa are truly representative of the high islands of this part of the South Pacific.

NATIONAL AND INTERNATIONAL CONFLICTS AND AMERICAN INVOLVEMENT

Recent archeological work by Golson and Green suggests that the

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Dr. Bryan H. Farrell is professor of geography and head of the department at the University of Victoria, Victoria, British Columbia.
Figure 1. Map of Western Samoa
group was occupied by at least the beginning of the first century A.D. and before eastern Polynesia, Hawaii and New Zealand. ¹ The first recorded sighting of the islands by a European was in 1722, by a Dutch navigator, Roggeveen.² In 1768 Samoa received its name, L’Archipel des Navigateurs, from the French explorer Bouganville who, with two ships, made a Samoan landing again from the east.

The first official American interest was shown in 1839 by a naval surveying expedition under the leadership of Commodore Charles Wilkes whose instructions were principally to promote “the great interests of commerce and navigation.” Wilkes was highly impressed with Tutuila and with the lively trade in copra and coconut oil.³

For the next forty or fifty years increasing interest was being shown in the islands by Americans with both worthy and unworthy objectives. As the result of most optimistic reports on Pago Pago Harbor the Navy sent Commander Richard W. Meade, in the U.S.S. Narragansett, to Samoa with orders “to locate a coal depot at Pago Pago” and to secure a treaty with the chiefs of Tutuila “to frustrate foreign influence. . . .”⁵ Although Meade’s mission was successfully accomplished Washington ultimately took no action in recognizing the treaty.

For the last thirty years of the century Samoa was in the throes of internal turmoil aggravated by international rivalries. The representatives and citizens of the United States, Great Britain and Germany initially acting as individuals in this island outpost jockeyed for positions to forestall and invalidate the actions of each other in gaining commercial and political advantage. Each group in time, for its own gain, wooed contending Samoan chiefs and supported one against another in political intrigue and open civil war. This state of affairs led finally to the reluctant involvement of Great Britain and the United States together with Germany who was anxiously attempting to establish a Pacific empire. The resulting political chaos

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⁴ Foster R. Dulles: America in the Pacific (Boston, 1932), p. 103.
⁵ Ellison, op. cit.
Figure 2. Pago Pago Harbor. A former river valley within the confines of a caldera has been drowned and now provides a magnificent protected harbor. The government administrative area and docks in the immediate foreground are on land reclaimed since original European settlement.
has been well documented.\textsuperscript{6} International intrigue and civil war finally ended in 1899 when some degree of control was established with the eventual partition of the group. A convention signed in Washington resulted in the island Upolu and Savai‘i, now Western Samoa, being administered by Germany, Tutuila passing into American hands and Great Britain yielding claims to Samoa in favor of German territories elsewhere in the Pacific and in Africa. The Senate ratified the Treaty in January 1900 and in February Tutuila was placed under the administration of the Navy Department. The United States had acquired all she as a nation had ever really desired—Pago Pago Harbor for strategic military purposes.

**AGRICULTURAL ADMINISTRATION**

The United States Navy administered American Samoa for half a century during which time many useful achievements can be listed, but its function, obviously, was quite specific and was not concerned with rapid economic development. Within its terms of reference however the Navy did much to provide for the welfare of the people. Naval governors found difficulty in establishing an agricultural program because of such things as their short periods of office, official lack of enthusiasm in Washington, and a similar apathy shown by the Samoans, who, after generations of practising their own agriculture, were reluctant to embrace new methods with wholehearted fervor.

Throughout the period of Navy administration, although there was a very small export of agricultural produce, farming in American Samoa was dominantly of a subsistence nature. Work done by the Department of Agriculture and directed towards the villages included introductions of new crops and attempts to preserve local foods for periods of emergency. Unfortunately over a long period and as the result of numerous difficulties little was accomplished.

During World War II, much farm labor was directed towards defence work in the Marine Corps Reserve or at the docks, or left for essential work in Hawaii. The experimental farm which had been established turned its attention to the growth of vegetables for the American military forces on the islands, and in the villages there...

was no time for harvesting copra. Large numbers of Marines and Seabees were billeted on the island and potential agricultural land and established plantations were cleared for military purposes, for storage, mess halls, or parade grounds.

After the war the Department of Agriculture was reorganized, a trained agriculturist was appointed Director and the organization was recognized officially by the Legislature. But the pattern which had been set many years before remained and the official policy was "one designed primarily to develop a self-subsistence agriculture."7 Samoans, with much justification, still looked to employment on the docks, membership in the Fita Fita Guard, or service in the armed forces on the "mainland," as a means of earning cash income rather than producing cash crops from the land.

In 1951 the administration of the group was handed over to the Department of the Interior. Throughout the 1950's, although the Department allegedly supported commercial development, the official policy within the territory was to encourage only subsistence agriculture. By 1960 even basic Samoan foods were being imported, and agriculture in all its aspects had reached one of its lowest levels.8 The export value of all products of the land, agricultural and otherwise, amounted to less than $215,000 or not three per cent of the total value of exports. Efforts have since been made to upgrade agriculture.

Through its history of 130 or more years of European and American contact the island group has developed in a patchy and uneven manner. Rather than all sectors of the economic and social structure moving forward together development has been uneven and sporadic. Although some economic and social elements have received attention, many within the past four years, few things suggest a century of continuing development; the agriculture indeed, suggests that overall it has changed little. The greatest changes may be observed in Tutuila especially in the core area lying between Pago Pago and Leone—the area early settled by outsiders. Culture contact has been greatest near the "core" and is less farthest away from it, especially in Manu'a, where farming is essentially the same as it was a century ago.

8 In 1959-1960 the value of all imported foods was valued at almost $1,000,000, Koenig, op. cit., p. 57. During the past few years strenuous efforts have been made to up-grade agriculture from its 1960 low point.
A RAPIDLY INCREASING POPULATION

At the time of the arrival of the first missionaries the population of American Samoa was probably about 5,000 with between a quarter and one-third of this total living in the Manu’a group. Wilkes’ 1839 estimate of 10,000 for American Samoa, the earliest known, seems incompatible with later estimates. Erskine, for instance, made an estimate in 1849, of 4,900, and subsequent estimates, together with the first United States Census of 1900 when the total was 5,679, suggest that the 1849 figure was not unreasonable.\(^9\)

The 1960 census recorded 20,051 persons in American Samoa. This was a gain of almost six per cent since the last Federal Decennial Census, a decline of 0.5 per cent since the local census of 1956. In less than three decades the population more than doubled, and had it not been for the marked and increasing rate of migration to Hawaii and mainland United States of America—over 500 per annum, a rate which has now almost tripled—the total population would have been considerably higher than it is today. Only in Manu’a has there been a significant decline in population. The annual rate of increase, similar to that for Western Samoa, has been one of the highest rates of any place in the world. Between 1900 and 1960 it was 2.1 per cent per annum; between 1940 (12,905) and 1956 (20,154) it averaged 2.8 per cent per annum.

The reasons for this growth may be explained in terms of rapidly rising birth rates and decreasing infant mortality. Both are reflected in the fact that half the population is fourteen years old or less. Only one-tenth of the population is over forty-five years old.

The pattern of population distribution is interesting. Fundamentally the general outlines are those of village distribution but this gives no reliable hint of concentrations or major foci. Like Western Samoa the general overall pattern is peripheral, hugging the coast in all except the most rugged areas. Unlike Western Samoa, for its size and population, American Samoa has a significant non-coastal population on the Leone plain in southwest Tutuila.

By far the greatest proportion of the population is found on Tutuila: 17,250 persons or eighty-six per cent of the total population live here. There are two main population foci on Tutuila: the central

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agglomerated “urbanized” area of large villages about Pago Pago Bay from Nu’u’u’li to Laulii and the less marked, but nevertheless significant grouping of moderately-sized villages within the triangle Aoloau, Vaitogi and Leone. (Fig. 1).

THE SHAPE OF THE ISLANDS

Piles of volcanic debris accumulated during the early Tertiary, 14,000 feet (2,000 fathoms to 2,500 fathoms)\(^{10}\) beneath the surface of the ocean, from the outpouring of northeast-southwest trending submarine rents. By the Pliocene or earliest Pleistocene period basaltic domes and cones had emerged from the sea. Under conditions of heavy rainfall these now forested uplands were scoured by turbulent streams while wave action along the shoreline planed submarine platforms upon which corals flourished during warmer interglacial periods.

From mid-Pleistocene to the beginning of the Recent Period the islands had a history of submergence and changing sea levels. As the sea level in relation to the land changed, a submarine barrier reef was formed and at the same time the drowning of a deep river valley within an old caldera created the present Pago Pago Harbor, a deep-water inlet on the south coast of Tutuila.

During recent times geologically less significant changes took place although from an economic and geographical viewpoint the more contemporary transformations are highly important. In the southwest of Tutuila, lava, ash, tuff and cinders were spread and ejected from a fissure marked now by cinder cones and small craters (Fig. 3). From their origin on the inland side large quantities of pahoehoe, olivine basalt lava were extruded, much of it piling upon a submerged coral reef where eight square miles of new land were won from the sea. From the south end of the rift much of the nearby lowlying area to the north and to the west was veneered with several feet of stony breccias, and later with tuff. Similar accumulations of ejecta upon a basaltic basement were developed in Manu’a.

Although there are a variety of volcanic rocks together with alluvial and colluvial deposits, basalt containing varying quantities

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GEOLOGY OF TUTUILA

Scale of Miles

1 2 3 4 5

Basalts, mostly olivine, thinly bedded with cinder cones, dykes and vitric tuff
Basaltic and andesitic flows with cones, dykes and plugs
Trachyte plugs and dykes
GREAT EROSIONAL UNCONFORMITY
Lithic vitric tuff
Stony ash cone
Cinder cone
Olivine Pahoehoe basalt lava flow
Beach sand, talus and alluvium

Figure 3
of olivine is by far the dominant rock mantling the islands of American Samoa. Yet despite the relative homogeneity of the rock, structural differences, the length of time areas have been exposed to denudation, and local climates have led to differential terrain characteristics which in some areas are relatively well-marked. In the uplands, the major portion of American Samoa, stream erosion, under general conditions of exceptionally high rainfall, has been particularly active and has adjusted to a structure dominated by a number of volcanic domes and plugs.

Valleys are deep and steep-sided but nowhere are they wide nor do they resemble the relatively broad lowlands of the Falefa river system in Western Samoa. These narrow trenches tend to fan out into a characteristic amphitheatre-form in the interior where headward erosion is most active.

Although the islands of American Samoa may be described as mountainous the average height above sea level is less than 1,000 feet. The highest elevations on Tutuila are the two peaks on either side of Pago Pago Harbor: Matafao (2,141 feet) in the west and Pioa (1,717 feet) in the east. In Manu’u, two mountains in the center of the island, Olotania and Lata, rise to 2,600 and 3,056 feet respectively.

A line drawn from Fagasa Bay to Nu’u’uli roughly divides Tutuila into two landform regions and also corresponds to the administrative divisions of the Western and Eastern districts. The same landform characteristics found in the Eastern Division are also found in the Manu’u islands, Ofu and Olosega. Ta’u, also in the Manu’u group, is characterized by its dome shape with a significant area of gently sloping land near its summit. The Western District has the only lowland of any significance in American Samoa and this is, by most measures, the most important agricultural area in the territory.

Almost half the Western District is plain-basaltic lava flow in the southeast and lithic-vitric tuff in the southwest. This entire area, including the alluvial Mormon Valley to the north, occupies approximately 7,800 acres and can conveniently be called the Leone plain. This is a flat to rolling surface. Half the area has a slope of less than 3°; the degree of slope steepens markedly as the uplands of the northwest are approached.

The northern half of the district is a dissected flat-topped table-

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Figure 4. Coastal Scene. A Coastal village; cropland, scrub and forest together with steep slopes which run from upland ridge directly to the quiet sea within the protected waters of a fringing coral reef.
land, the Aoloau Plateau. The northern coastal slopes are generally steeper, 15°-25°, than other parts of the southwest and the steep-sided ridges and narrow valleys are physiognomically more closely related to the Eastern District-Manu’a than to the Western District.

No one single terrain type can be considered truly typical of American Samoa. The Eastern District-Manu’a region, however, has all the essential characteristics usually associated with American Samoa: steep ridges, the almost complete absence of flat land, ragged skylines, areas of precipitous slopes and highly indented coastlines. More than half of the area has slopes greater than 25°, and in the Pago Pago Bay area and on Ofu and Olosega slopes of 35° to 50° are common. Intensity of dissection, slope and relief militate against the intensive use of the Western District and rule out the steeper parts for farming or direct economic use. Where there are pockets of more gently sloping land in the mountainous areas, for example, between Pioa and Faga’itua Bay, cropping is particularly important. The important farming areas in American Samoa are those where slopes are usually less than 25° and relative relief is less than 800 feet.

CLIMATE AND SOIL

The climate is hot and wet; this is particularly true for the Pago Pago area which, although it has the only well-documented records over a period of many years, is not necessarily representative because of the sheltered position of the station and the fact that precipitation records are taken within the mountainous Matafao catchment. Local areal variations are associated both with windward and leeward sides of mountain ranges and with increasing elevation. Prevailing climatic conditions have led to the growth of an abundance of luxuriant vegetation, the speedy decomposition of parent material in the soil process of laterization, and rapid geological erosion.

Although a certain degree of homogeneity might be associated with both pressure and temperature, the climate is by no means characterised by monotony. Rainfall varies considerably as does wind speed and direction. For example, for much of the year, April to November, the tropical easterlies blow fairly steadily. During the remainder of the year winds from an easterly quarter still dominate although winds from the west or northwest are not uncommon. Winds are not characteristically strong; hurricanes are relatively
infrequent, although not infrequently very strong winds associated with steeper gradients on the periphery of a well-developed tropical cyclone are experienced. These winds which bring heavy rain very easily damage the fragile banana palm, the food plant most susceptible to wind damage.

Precipitation comes in association with local convection, orographically induced instability, fronts connected with eastward moving waves and the passage of tropical cyclones. Summer is the wettest season yet variability is so great that occasionally the heaviest rainfall may be expected in the so-called dry season. However, December, January and February can usually be relied upon to have the greatest monthly totals. The January average for the main Pago Pago station is 21.92 inches. By March rainfall is usually showing a considerable decline everywhere and by August an average of 7.66 inches is reached following the other “dry” months of June and July.

Monthly and daily rainfall totals are highly variable and have considerable bearing on the use of the land. Superficially, the presence of luxuriant tropical vegetation would suggest ample rainfall for agriculture yet numerous instances of consecutive days without rain have been recorded and Coulter cites a case, presumably Pago Pago, where 0.2 inches of rainfall were experienced between August 25 and October 3, 1936. Although the mean annual rainfall quoted for Pago Pago is about 200 inches, a more realistic figure for much of the coastal village area of American Samoa would be from 110-150 inches a year.

At all times temperatures are warm to hot and their sensible impact is made all the more forceful by the continually high relative humidity. The mean February temperature for Pago Pago is 82°F, for July 80°F. The other months grade gradually between these two.

Generally, soils in American Samoa (Fig. 5) are similar because


13 The availability of agricultural water supply can be from time to time of considerable local concern especially in those areas which have a particularly low water table because of a highly permeable rock mantle and few reliable permanent streams. For an account of water supplies in American Samoa see Dan A. Davis: Ground Water Reconnaissance of American Samoa, Geol. Survey, Supply Paper 1608-C, Washington, 1963.


15 Between 1941 and 1959 Pago Pago rainfall ranged from 116 inches to 336 inches, the average was 209 inches.
SOILS OF TUTUILA

LATOSOLIC SOILS FROM BASIC TUFF & BASALTIC ASH
- Clay & stony clay
- Silty clay loam
- Silty clay loams & sandy clay loams

LATOSOLIC SOILS FROM BASALT
- Loams, shallow & bouldery
- Loams & clay loams, very stony & bouldery

LATOSOLIC SOILS FROM BASIC ANDESITE & BASALT
- Steepland soils
- Silty clay

RECENT SOILS: ALLUVIUM & COLLUVIUM, CALCAREOUS SANDS & MARSH SOILS
- Loamy sands to gravelly clays
- Clays, stony to bouldery
- Calcareous sands
- Marine marsh soils

After Wright
most of them have been derived from either basalts, tuff or ash.\textsuperscript{16} Basically the reddish and reddish-brown soils contain satisfactory amounts of plant nutrients but areally this may vary considerably. The poorer agricultural soils are often deficient in either phosphate or potash or both. Most of them are well-leached and latosolic but because many originate from recent lava, beach blow sand or alluvium, or are newly formed steep-land soil, there can be no overall classification as pure latosols. The most leached areas are flat to gently rolling. Gently sloping areas with deeper soils, such as the tuff areas of the western Leone Plain, suffer the most. A mature, well-leached soil which is not being continuously replenished with new material is likely to have the lowest nutrient status.

On steeper slopes slips and soil erosion are constantly taking place but scars are at least quickly if superficially healed and protected by the rapid growth of the vine, mile-a-minute or \textit{fuesina} (\textit{Mikania micrantha}). Rapid geological erosion contributes to soil formation in these tropical conditions and material removed at higher levels adds to the zone of colluvial soil so important in Samoan agriculture. Steeper surface soils, although usually thin, are constantly having nutrients replenished in the continuous process of soil formation and removal. Consequently, in some ways, the prevalent steepness of the slopes of American Samoa should be looked upon as an advantage rather than a disadvantage. Obviously the very steep slopes of say 30\textdegree-35\textdegree should be left in protective forest. Some lesser slopes, however, may very well support continuous cropping without the land suffering unduly. Samoan agriculturalists have seldom burned vegetation and their type of shifting agriculture with few cash crops has in general not been too demanding of the soil; nevertheless areas ultimately become depleted of fertility and must be spelled. Bush fallow areas then become occupied by low-demanding species which are slow to rehabilitate the soil. The higher the inherent fertility of the soil, the shorter the period of rehabilitation is likely to be. Bush-fallowing periods are shorter than they are in Western Samoa and this may indicate a generally higher soil fertility associated with the cultivation of steeper slopes. It may, however, also stem from the fact that the pressure of population on the land is greater in American Samoa and, without clearing more land, or if extra land is not

\textsuperscript{16} This is discussed in greater detail in A.C.S. Wright: Soils of American Samoa, unpublished report to the Government of American Samoa (Apia?), 1954.
available, farmers cannot afford to spell plots for longer periods than they do.

Without a change in agricultural techniques involving the better use of colluvial soils and the rehabilitation of some wornout lowland areas, and if the net gain in population were to increase markedly further depletion of soils near the coast could be expected. Easily accessible coastal areas near the villages have already suffered considerably and generally steep terrain and limited “hinterland” prohibits all but the most essential clearing on the inland margins.

THE SAMOAN VILLAGE

Samoan land can not be separated from a discussion of the Samoan village. The typical village serves not only a residential function but also an agricultural one, for even within the village precincts some useful food and fibers are grown. The village too, is the major “market” for the disposal of the main crops from adjacent land and it is from the village that Samoan farm-workers make their way to their plantations each day at dawn. The Samoan village is intimately related to its nearby land; and land-use practices cannot be understood without knowledge of Samoan social structure and customs, land tenure, the status of agriculture and the competition of alternative employment. Such influences as administration policy and overseas markets are important but as the agriculture practiced is overwhelmingly subsistence local indigenous influences are most important and these are best observed at the village level.

The land use map (Fig. 7) shows the area occupied by Samoan villages, three per cent of the total area or about 1,390 acres. The greatest ratios of village land to other uses occurs in the Pago Pago Bay area where, because of steep land and limiting terrain together with greater employment opportunities, more land than elsewhere is given over to residential use. Outside the “urban” Pago Pago Bay area Samoan settlements occupy a much greater area than appears necessary for a residential function. Reference has already been made to an incidental agricultural function and to this may be added a not unimportant ceremonial function.

Villages in American Samoa average about twenty-four acres,

Figure 6. Food production within the village site. Although most food is grown on adjacent village farmland frequently around village houses a number of more specialized crops are produced. In this photograph the trees in the foreground are, from left to right, coconut, breadfruit, and cacao. Yam vines are attached to a stake against the breadfruit tree and the ground cover is pineapples.
larger in Manu‘a, where the average area is thirty-three acres, smaller in Tutuila where available land is more limited and the average site is twenty-one acres. Sizes are wide-ranging from, for example, 13 acres at Alega to over 1,300 acres at Pago Pago. The distribution of villages is typical of that found in Western Samoa: small villages (384 persons average) close to the sea and seldom more than a few miles apart (Fig. 1). In Tutuila the average distance between villages on the south coast is less than a mile, while in the Pago Pago Bay area it is close enough for settlement to be continuous for several miles. Two concentrations are worth noting—one focuses on Pago Pago Harbor, the other on the Leone Plain.

The villages about Pago Pago Harbor accommodated 7,209 persons in 1960, some forty-one per cent of the population of Tutuila, yet they are adjacent to some of the steepest and most unproductive country on the island. Villages on the out-skirts of the group have close relations with their adjacent lands which help to sustain their population; but towards the head of the bay, villages become progressively bigger and their dependence on the land considerably less. The largest village and seat of government is Fagatogo (1,338 inhabitants) where many of the adults, as in neighboring villages, find employment in commerce, in government offices, the Public Works Department or the canneries. Understandably per capita land under cultivation is lower here than anywhere else in American Samoa and the number of “temporary” residents from other villages in both Tutuila and Manu‘a is considerably higher than elsewhere.

Other than to take up employment for wages, outsiders come into these “urban” villages for hospitalization, for vocational training, teacher training and high school education, to look for a job, or just to look around. Its position of centrality on Tutuila, linked with its role as the in-port from Manu‘a and Apia, makes the general station area a clearing-house, a movements center and a group community center where old friendships may be renewed and new friendships won. There are always a large number of visitors in the area relying on the traditional hospitality of their relatives.

The Leone Plain’s concentration is based on the occupation of a significantly wide, non-coastal area of low relief. Mountains and rough terrain are not present to impose restrictions and a group of more than twelve, moderately-sized villages has developed inland: a
decidedly non-Samoan characteristic. Part of this population is associated with the Mormon College in the Mesepa-Maupusaga area.

All land in American Samoa belongs to the village and not to individuals and even if in some places forests have not been cleared or villages have not formally staked their claims it is usually tacitly understood that village land extends from the coast to the summit of the central ridge where such a natural division exists.

From its broad base along the coast, on either side of the village

![Fagasa Village Land Use Map](image)
the "farmland" cleared from forest extends inland not infrequently in a triangular pattern or in tongues narrowing towards the interior. Village land is made up of a disorderly jumble of crops, weedy clearings, scrubby second growth and patches of remnant forest (Fig. 8). Towards the interior the useful tree crops occupy less land, the open clearings often planted to root crops become visibly more numerous, and patches of scrub become more numerous. Ultimately scrub merges with forest and the highest areas, the most inaccessible and the farthest interiors, are clothed entirely in forest. This is, in most general terms, the usual sequence from beach to upland ridge. Superficially there is little order: more where the interior is commonly dominated by forest, least in parts where the land is lower and narrows and the patchwork mosaic of cropland, unhampered by physical barriers or undifferentiated by orderly selective use, extends from sea to sea.

**FOREST AND SCRUB**

Humid tropical vegetation associations in one form or another cover the entire group. The character of the vegetation changes little in overall physiognomy on an areal basis, but local differences do occur. There are certainly variations resulting from the degree of human interference and from edaphic factors such as slope and both the quantity and quality of the soil.

A great part of American Samoa, almost two-thirds of the 49,200 acres, is occupied by a tree cover ranging from scrub to tropical rainforest. Roughly half the area of the territory can be properly designated forest. The islands are small, and few if any areas have not been interfered with by man in the process of early foraging for food, clearing for agriculture, gathering wood supplies, or more recently in the construction of military installations. Some areas are likely to have been burned by the most recent ash showers and lava flows, or occasionally by deliberate fires. Almost all forest areas are readily accessible to villages and even those areas appearing little altered have probably been selectively logged at some period for particularly desirable species, such as *poumuli* (*Securinega samoana*) or *ife lele* (*Insis bijuga*). Few parts are isolated enough to have been free from human interference and consequently no magnificent "true rainforest" has developed. Yet the main elements characterising rain-
forest are present: epiphytes, parasites, and large ferns (*Alsophila spp.* and *Cyathea spp.*) are all present.

The Tutuila forest patterns covering two-fifths of its area are by no means straightforward and they are indeed markedly less simple than those in Manu‘a. Only in the northwest, on the Aoloau Plateau, is there a large area of forest. But even this area is spotted with patches of scrub and grass and these interruptions become increasingly numerous as Pago Pago Bay is approached. The forest pattern in the east is a veritable jigsaw puzzle of little scattered forest fragments.

The area in open forest and scrub is much less extensive and occupies less than a third of the area in forest, 7,180 acres. It is generally found on the edge of the forest proper, not paralleling the forest perimeter but in a ragged design reflecting the disordered and unsystematic clearing of land, together with the fact that generally, even in these surroundings, forest after clearing regenerates slowly and remains in grass, vine and scrub for long periods.

Grassland is not a significant element in the land use of American Samoa and it does not have a role in the agriculture of the territory. It is however the resultant of contemporaneous land use practice and is associated with land which has been constantly cropped in the past. Excellent examples of land either so constantly cropped or depleted of nutrients that species of secondary forest find it difficult to compete and become established are found on steep slopes to the west of the “urban” villages of Fagatogo and Utulei and on the steeper slopes of the village land at Aua extending directly from the base of Pioa.

**THE FARM LAND**

Although an important amount of food comes from the sea and from the store, both with the earnings of family members or with military allotments, a considerable amount of food still comes from the land. An unimportant quantity of pandanus mats, wooden souvenirs, copra and cacao also is derived from the land but generally subsistence food production is preeminent.

The average size of farmed land adjoining an average size village (384 persons) is 440 acres. Per capita farmland then, is approximately 1.1 acres. This of course gives no idea of the range of sizes
which, within the group of villages studied, varied from 92 acres at Asili to 944 acres at Leusoali'i (Fig. 1).

Land is farmed by extended families \( (aiga) \) under the supervision of an elected chief or \( matai \) who is responsible for alloting traditional family land to its members, organizing farm labor, distributing production and disbursing the proceeds of any sales. In practice an increasing portion of any income from the land is being retained by the individual grower. The \( matai \) is also concerned with seeing that new land is cleared whenever it is needed.

The farmed land of each \( aiga \) is broken up into numerous non-contiguous plots (Fig. 9). Three sample villages indicated that the range in size of plots was from less than half an acre to approximately twenty-one acres. The aggregate size of \( aiga \) plots range from one and a half acres to fifty-five acres. The average \( aiga \) holding was about sixteen acres made up of anything from one to seven plots. In any village the actual size, number and locations of the plots depend on the age of the village, the length of time the \( matai \) title has been in existence, the status of the \( matai \) title, the fertility of the land, the organizing ability of the \( matai \) and the size of the \( aiga \). A large \( aiga \) serving under an important title may have excessively fragmented holdings scattered over a wide area. Because newly cleared land comes under the authority of the title served by the \( aiga \) clearing it, a particularly large energetic family may be adding new parcels every few years. These may be added however, at the perimeters of land already farmed by the \( aiga \) and consequently a new clearing does not necessarily mean the creation of another isolated fragment.

### TABLE 1

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<thead>
<tr>
<th>Category</th>
<th>Area</th>
<th>Per Cent Total Area</th>
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<tbody>
<tr>
<td>Forest</td>
<td>24,230</td>
<td>49</td>
</tr>
<tr>
<td>Farmland</td>
<td>13,910</td>
<td>28</td>
</tr>
<tr>
<td>Scrub and Grass</td>
<td>9,530</td>
<td>20</td>
</tr>
<tr>
<td>Village Sites and Other Uses</td>
<td>1,530</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>49,200</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Data: Field Surveys.

New areas are cleared by slashing scrubby vegetation and allowing it to rot. Sometimes piles of drier material are burned in order to create manageable plots in which taro the major root crop may be
1. Tago'ai
2. Nui
3. Atisanoe
4. Salanoa (High Chief)
5. Va'a
6. Togia'i
7. Iuli
8. Luapo
9. Puaatuua

10. Lesolo
11. Ava
12. Taputu
13. Faletea
14. Ena
15. Leatofo
16. Aumua
17. Uluso'o
18. Lea

P........Pastor

Figure 9
planted. After one or two crops of taro are taken from the same plot it is either planted in bananas or coconuts or if the fertility has been drastically reduced it will go into bush fallow for several years. This, too, will be the case when constant banana cropping so depletes the soil of its fertility that it must be spelled. This shifting type of agriculture involving the rotation of plots always results in a significant area of cleared land lying idle—in American Samoa this is almost forty per cent. Over sixty per cent of the “farmland” is actually in crop which, expressed in terms of population, is 0.72 acres per capita. In American Samoa farming land occupies about 14,000 acres. Its distribution is uneven. In the limited lowlands it ranges over fairly wide area; with increasingly rough terrain the area used becomes more fragmented, each fragment separated from the others by scrub and forest. In excessively difficult country farmland may be completely absent or found only in isolated pockets on more moderate slopes.

Tutuila, the most heavily populated island, has twenty-eight per cent of its total area in farmland, a much higher percentage than less heavily populated Manu’a. It is essentially coastal and except for interruptions to its continuity by the Tafuna lava-field or by steep ridges reaching to the sea, it extends from west to east along the entire southern coast.

This farm zone is very narrow and at its widest, in the central Leone plain, it is not much more than three miles wide. In the Bay area there is a significant agricultural development between Pago Pago village and Matu’u two and a half miles south. Farther east the limited coastal zone continues to Faga’itua, at which point the island narrows to such an extent that, with decreased altitude, a complex pattern extends from the north to the south coast. Farther west, on the north coast are pockets of cultivation from Fagamalo to Masefau. Only at Fagasa is there any significant area of farmland. In the Manu’a group farmland is less obvious and is found on the western and eastern coasts of the main island, much of it because of the lack of lowland at least two hundred feet above sea level.

Eighty-five per cent of the area actually in crops is in tree crops: coconuts, bananas, breadfruit and cacao. The most important root crop, taro, occupies no more than five per cent of crop area and is found in exceptionally small patches from a third to three-quarters of an acre. Almost four-fifths of the crop area is intercultivated with
a variety of tree crops in a dozen major combinations, the most im-
portant of which are combinations of coconuts and bananas, and
coconuts, breadfruit and bananas. Only thirteen per cent of the crop
area is pure stands of coconut, but if coconuts combinations were
reduced to a single-crop equivalent they would occupy forty per cent
of the land actually in crops. Bananas if calculated the same way
would occupy nearly a third of the land in crops. Only three per cent
of the land is in minor crops such as pandanus, sugar-cane, kava,
tapioca, tobacco, yams and exceedingly small areas of European
varieties of vegetables.

Throughout the farmland area are patches of scrub, grass and
forest. The area in forest is insignificant while that in scrub and grass
is related to land cleared, previously cropped and now fallow. A
quarter of the farmland is scrub and a quarter of this is interspersed
among bananas and coconuts and in combination with other crops.
Grass occupies a tenth of the area and like the scrub a half of this
area too is found in small patches among the crops.

PROBLEMS AND CONCLUSIONS

The agriculture of American Samoa is dominantly subsistence un-
affected by a tradition of commercial planting. An insignificant area
has been alienated and at most only a few hundred acres are used for
cash cropping. Judged by prevailing western practices the level of
technology is pathetically low—judged by indigenous standards the
situation warrants little concern. The land provides reasonable sus-
tenance, it performs a useful function in traditional custom and it
provides a special status to the matai who holds authority over it.
Prestige for most Samoans however, may be obtained more readily
away from the land by non-agricultural pursuits and service, and
by paid employment either on Tutuila, in Hawaii or on the main-
land. As a result the lure of paid employment reduces the number of
young farm workers and the people as a whole become considerably
less dependent on their environment than one would normally expect.

The potential of the land is strictly limited. Already in places
slopes of more than thirty-five degrees are cropped. Although satis-
factory unused areas are still available, if Samoans with their rapidly
increasing population were forced to depend on their land, and if
large areas were to be planted for commercial purposes, the pressure
upon land and the demand for new areas to farm would quickly reach alarming proportions.

The pattern of rural land use cannot just be explained in terms of Samoan customs and contemporary aspirations. Other factors have always influenced land use practice. Throughout most of recent history, farmers have received little or no encouragement from the administration to plant cash crops; yet were they to be encouraged they would have found that the demands of the American market for perishable and other tropical produce were already readily met by efficient producers in Hawaii and Central America. Markets closer to American Samoa in Australia and New Zealand are already served by established producers.

Although some slow changes are apparent in the rural area, the present influx of large sums of federal development money has resulted in detailed changes and intensification of established patterns in limited nonagricultural areas. Extensions have been made to the existing airport at Tafuna to accommodate jet planes and new residential patterns associated with its operation are developing in the same area. Roads have been paved, other routes have been up-graded and land has been taken over by a second fish cannery at the head of Pago Pago Bay. Other changes include the building of an educational television system and the construction of a tourist hotel on Goat Island near the administration center at Fagatogo.

With the continuation of liberal federal aid the future could have much in store for American Samoa. Tutuila is likely to continue to serve an important South Pacific transport function which interestingly bears little relation to the group’s present economic activity but more to the strategic plans of the federal government. The same function will no doubt stimulate some tourist traffic and will facilitate the more frequent entry into American Samoa of interested businessmen.

The present type of development coupled with tax incentives, the use of relatively cheap labor and accessibility to the American market is likely to stimulate further industry. But this requires raw materials which may be more easily produced in surrounding oceans, in Western Samoa, or in Tonga without significantly affecting land use in American Samoa. The Tongan interest in supplying raw material for coconut processing is a case in point.
Programs of development in underdeveloped countries frequently stress social development at the expense of economic progress. To be successful all sectors should be developed in a balanced manner. Development of the rural economy in American Samoa is a thorny problem and the territory is likely to develop education, health, transport and commerce while the admittedly limited yet fundamental resource, land, remains in comparison virtually undeveloped.

Numerous comparisons may be made with Western Samoa where a slow but encouraging development is firmly based on the soil. Much could be learned by close association with Western Samoa and from the analysis of its problems rather than operating within a national vacuum. American Samoa has the advantage of federal government backing and a benevolent administration. Western Samoa is by virtue of its economy and long experience more aware of the problems of the land. Closer association than has been the case in the past may very well be of mutual benefit to both territories.